Health-enhancing behaviours in first myocardial infarction survivors

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Doctor of Philosophy (Health)

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University of Western Sydney
PLEASE NOTE

The greatest amount of care has been taken while scanning this thesis,

and the best possible result has been obtained.
~ Dedicated unto Him, El Shaddai ~
Acknowledgements

This thesis has taught me dependence, on my God, my supervisors, my friends and my family.

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The condition of an enlightened mind is a surrendered heart.
~ Alan Redpath ~
Statement of Authentication

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in whole or in part, for a degree at this or any other institution.

...........................................
(Signature)
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<td><strong>Adequate physical activity level</strong></td>
<td>Exercising for at least five times and at least 2½ hours per week of moderate or vigorous intensity physical activity</td>
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<td><strong>Adherence</strong></td>
<td>The match between a patient’s behaviour and medical or health advice</td>
</tr>
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<td></td>
<td>Adherence has been increasingly used to replace the term “compliance” to convey the patient’s active participation in following a therapeutic regimen</td>
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<tr>
<td><strong>Acute myocardial infarction (AMI)</strong></td>
<td>The presence of at least two of the following: (a) positive clinical manifestations of possible infarction; (b) electrocardiograph (ECG) changes; (c) rises in the levels of cardiac enzymes {creatin kinase (CK) &gt;195 U/L, CKMB isoenzyme &gt; 10.0 ng/ml, Relative Index (RI) &lt;2}</td>
</tr>
<tr>
<td><strong>Baseline</strong></td>
<td>The measurement of variables prior to evaluation of the outcome of a program or individual performance. In this study, baseline constitutes measurement of variables at the time of participant’s recruitment, during the hospitalisation period of their first AMI</td>
</tr>
<tr>
<td><strong>Coronary event</strong></td>
<td>A coronary event is defined as angina, documented myocardial infarction, myocardial revascularization, or death from coronary heart disease</td>
</tr>
<tr>
<td><strong>Coronary heart disease (CHD)</strong></td>
<td>A condition in which the heart muscle receives an inadequate blood flow due to an interruption in its blood supply</td>
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<tr>
<td><strong>Exercise</strong></td>
<td>Physical activity that is planned, structured, repetitive, and has purpose in that improvement or maintenance of physical fitness is the intent. Exercise is a subset of physical activity</td>
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## Definition of terms

### Exercise intensity
- **Low:** No noticeable increase in breathing and heart rate with constant (rhythmic) movement, e.g., slow walking, stretching, bowling.
- **Moderate:** Will cause a slight, but noticeable increase in breathing and heart rate and may cause light sweating, e.g., brisk walking, mowing the lawn, low pace swimming, light to moderate-intensity exercise classes.
- **Vigorous:** Will cause heard breathing (or puffing and panting) eg high-intensity keep fit classes, swimming (freestyle), (single) tennis, jogging.

### Generalised resistance resources
Individual characteristics acquired by means of socialisation and genetics, e.g., favourable socioeconomic status, knowledge, intelligence, ego-strength, social support, preventive health orientation or stable cultural background that contribute to the development of a sense of coherence, a pervasive and enduring feeling of confidence that one’s internal and external environment are predictable and things will work out as well as can be reasonably be expected.

### Health behaviours
Activities that convey health benefits or otherwise protect individuals from diseases.

### Health-enhancing behaviours
Five specific goals or indicators of health behaviours recommended by American Heart Association or the National Heart Foundation of Australia in terms of: non-smoking behaviour, body weight management (<25 kg/m²), adequate physical activity (at least five times and at least 2½ hours per week of moderate or vigorous intensity), medication adherence and dietary fat intake (<20% total fat, <7% saturated fat) are referred to as health-enhancing behaviours. They represent a standard of performance rather than simply the behaviour.

### Health-damaging behaviours
Activities that have harmful effects on health.

### Health-promoting behaviours
Activities that have beneficial effects on health.

### Low dietary fat intake
Self-reported dietary fat score using the Short Fat Questionnaire of <20, equivalent to <20% total fat, <7% saturated fat.
### Definition of terms

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<td><strong>Low to moderate intensity exercise</strong></td>
<td>&lt;55 – 70% peak heart rate achieved on graded exercise stress test&lt;br&gt;&lt;40 – 60% VO₂ max&lt;br&gt;&lt;4 – 6 METs&lt;br&gt;Borg rating of perceived exertion of  &lt;11 - 12</td>
</tr>
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<td><strong>Medical intervention</strong></td>
<td>Commonly accepted as including any or all of the following: pharmacologic, behavioural and surgical interventions</td>
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<tr>
<td><strong>Medication adherence</strong></td>
<td>Taking medications strictly as prescribed</td>
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<tr>
<td><strong>Modifiable cardiac risk factors</strong></td>
<td>Risk factors, which when changed, reduce the risk for recurrent coronary heart event and cardiac mortality. These conditions are termed &quot;modifiable&quot; risk factors and include: cigarette smoking, high cholesterol, high fat diet, hypertension, overweight and obesity and physical inactivity</td>
</tr>
<tr>
<td><strong>Non-smoking behaviour</strong></td>
<td>Never smoked or reported to have stopped smoking for at least one month at the time of survey</td>
</tr>
<tr>
<td><strong>Normal BMI</strong></td>
<td>Body mass index within 18.5 to 24.9 kg/m²</td>
</tr>
<tr>
<td><strong>Perception</strong></td>
<td>The interpretation and organisation of all information provided to the brain by the senses. Interpretation is the attachment of information or value judgment to the information involves connecting the information to one’s past experiences</td>
</tr>
<tr>
<td><strong>Perceived social support</strong></td>
<td>A generalised appraisal that individuals develop in various role domains of their lives in which they believe they are cared for, valued and that significant others are available to them in times of need</td>
</tr>
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<td><strong>Perceived stress</strong></td>
<td>Appraised stress of the situations in one’s life, which consists of three components: how unpredictable, uncontrollable and overloaded their lives has been in the last four weeks</td>
</tr>
<tr>
<td><strong>Personality trait</strong></td>
<td>Dispositional orientation of the individual that determines their characteristic perception, thought and style of responding</td>
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<td></td>
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<td>--------------------------------------------------------------------------------------------</td>
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<tr>
<td><strong>Pharmacological intervention</strong></td>
<td>Treatment of a condition or disease using medication</td>
</tr>
<tr>
<td><strong>Physical activity</strong></td>
<td>Bodily movement produced by the skeletal muscles that results in energy expenditure that can range from low to high</td>
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<td><strong>Psychosocial factors</strong></td>
<td>In this study, refers to personality factors (e.g. dispositional optimism and sense of coherence) as well as sociocognitive factors (e.g. psychological stress, self-efficacy and perceived social support)</td>
</tr>
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<td><strong>Primary prevention</strong></td>
<td>Measures taken to prevent the occurrence of a health condition or the onset of the disease</td>
</tr>
<tr>
<td><strong>Risk factor profile</strong></td>
<td>A list of lifestyle habits and physical characteristics that contribute to the likelihood of disease onset or progression</td>
</tr>
<tr>
<td><strong>Secondary prevention</strong></td>
<td>Measures taken to manage a disease at the early and advanced pathogenic stage i.e., after the onset of a disease but before any functional disability has resulted for it</td>
</tr>
<tr>
<td><strong>Smoking cessation</strong></td>
<td>Reported to have stopped smoking for at least one month at the time of survey</td>
</tr>
<tr>
<td><strong>Weight normalisation</strong></td>
<td>Maintaining or restoring to a body mass index to within the normal range (18.5 to 24.9 kg/m²)</td>
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</table>
Abbreviations

4S  Scandinavian Simvastatin Survival Study
ABS  Australian Bureau of Statistics
ACC  American College of Cardiology
ACE  Angiotensin-converting enzyme
AHA  American Heart Association
AHS  Area Health Services
AIRE  Acute Infarction Reperfusion Efficacy
AMI  Acute myocardial infarction
AMOS  Analysis of Moment Structures
ARB  Angiotensin receptor blocker
BMI  Body mass Index
CABG  Coronary Artery Bypass and Graft
CARE  Cholesterol and Recurrent Events
CAST-1  Cardiac Arrhythmia Suppression Trial-1
CCU  Coronary care unit
CHD  Coronary Heart Disease
CK  Creatine kinase
CKMB  Creatine kinase MB isoenzyme
CLAS  Cholesterol Lowering Atherosclerosis Study
DART  Diet and Reinfarction Trial
GRRs  Generalised Resistance Resources
HBM  Health Belief Model
HDL  High Density Lipoprotein
HRA  Health Risk Appraisal
ISIS-2  Second International Study of Infarction Survival
LDL  Low Density Lipoprotein
LIPID  Long-term Intervention with Pravastatin in Ischemic Disease
LOT-R  Life Orientation Test-Revised
MRFIT  Multiple Risk Factor Intervention Trial
MSPSS  Multidimensional Scale of Perceived Social Support
NCEP  National Cholesterol Education Program
Abbreviations (continued...)

NHFA  National Heart Foundation of Australia
NHS   National Health Service (Britain)
NSF   National Service Framework
NSW   New South Wales
OLQ   Orientation to Life Questionnaire
PMT   Protection Motivation Theory
PSS   Perceived Stress Scale
PTCA  Percutaneous Transluminal Coronary Angiography
RI    Relative Index
RITA-2 Randomised Intervention Treatment of Angina
SAVE  Survival and Ventricular Enlargement (SAVE) trial
SCRIP Stanford Coronary Risk Intervention Project
SCM   Social cognition model
SES   Socioeconomic status
SFQ   17-item Short Fat Questionnaire
SOC   Sense of Coherence
SPSS  Statistical Package for Service Solutions
STARS St Thomas Atherosclerosis Regression Study
SWSAHS South Western Sydney Area Health Service
TABP  Type A Behaviour Pattern
TPB   Theory of Planned Behaviour
TRA   Theory of Reasoned Action
TTM   Transtheoretical Model or the Stages of Change model
WHO   World Health Organisation
Abstract

The adoption of health behaviours is essential if coronary heart disease patients are to optimise their chance of survival and reduce the likelihood of recurrent coronary events. However, this behavioural change may not ensue following an acute myocardial infarction (AMI). This study on first AMI subjects sought firstly to examine the psychometric properties of five scaled instruments used for assessing health behaviours. Secondly, the study assessed the prevalence of health-enhancing behaviours at the time of the first AMI and 6 months after this event. Thirdly, the magnitude of health behavioural change was then examined. Fourthly, sociodemographic, clinical and psychosocial predictors of health-enhancing behaviours were explored. These health-enhancing behaviours included non-smoking behaviour, normal body mass index (BMI), adequate physical activity, medication adherence and low dietary fat intake. Finally, the study examined relationships between sociodemographic, psychosocial and modifiable lifestyle factors, based on Antonovsky's hypothesis on sense of coherence (SOC), stress and adaptive coping.

A descriptive longitudinal survey was conducted, which recruited 145 first AMI patients (mean age 57.4 years) from four Coronary Care Units in Sydney's South West. At the 6-month follow-up, 106 (77%) of the participants at baseline completed and returned the follow-up survey.

All five likert-scale instruments demonstrated satisfactory validity. However, the reliability coefficient of the Life Orientation Test-Revised was low (0.63). The prevalence of health-enhancing behaviours reported by participants at the 6-month follow-up were: 89.6% non-smoking behaviour; 34.9% normal BMI; 40.6% adequate physical activity; 88% strict medication adherence and 80.2% low dietary fat intake. There was an overall increase in health-enhancing behaviours at the 6-month follow-up (p < 0.0001), with evidence of selective engagement in some health-enhancing behaviours. In particular, although physical activity improved, the overall prevalence at the 6-month follow-up remained poor. Similarly, although
weight loss of 5% or more was reported by 31% of the overweight or obese subjects, only 2.8% of these subjects returned to normal BMI at the 6-month follow-up.

None of the sociodemographic, clinical or psychosocial factors examined in the study emerged as a consistent predictor of health-enhancing behaviours in logistic regression models. However, attendance at outpatient cardiac rehabilitation was a significant predictor for non-smoking behaviour as well as low dietary fat intake at the 6-month follow-up.

The conceptual model derived from Antonovsky’s hypothesis showed a positive and significant association between high baseline perceived stress and one non-adaptive coping behaviour, total dietary fat intake at the 6-month follow-up. The model also found a positive association between SOC and perceived social support, age and higher educational achievement. This confirmed Antonovsky’s hypothesis on the relationships between generalised resistance resources, SOC and stress but only partly supported the relationship between stress and adaptive coping.

This study highlights that some modifiable risk factors, for example, being overweight or obese and physical inactivity were more resistant to change following an AMI. This finding, and the relationship between stress and increased dietary fat suggest a need for individualised programs to support the specific needs of AMI patients to change their modifiable cardiac risk factors.
PLEASE NOTE

The greatest amount of care has been taken while scanning this thesis,

and the best possible result has been obtained.
Chapter 1
Introduction

1.1 Background
In 1990, the death of 6.3 million people worldwide was attributed to coronary heart disease (CHD), making this disease the most common cause of death.\textsuperscript{1} In Australia, the figures are just as gloomy, with an average of 30,000 deaths per year\textsuperscript{2} being attributed to what is commonly referred to as a ‘disease of lifestyle’.\textsuperscript{3,4} In 1994, CHD accounted for more deaths (24.1\% of deaths from all causes)\textsuperscript{5} and more health expenditure than any other disease or injury group in Australia.\textsuperscript{6} Not surprisingly, cardiovascular disease, which encompasses CHD, is a national health priority area in Australia and goals, targets and strategies for health improvement have been highlighted in Better Health Outcomes for Australians.\textsuperscript{7}

Whilst CHD remains the leading cause of death both worldwide and in Australia, it is also a major contributor to medical morbidity.\textsuperscript{8} Between 1995 and 1996, non-fatal acute myocardial infarction (AMI) accounted for 65\% of reported coronary events.\textsuperscript{2} Interestingly, this percentage is likely to increase, due to the redefinition of acute myocardial infarction (AMI) with the use of newer and more sophisticated techniques that can diagnose non-fatal AMI with myocardial necrosis weighing less than 1.0 g.\textsuperscript{9}

Whilst technological advances in the treatment of CHD have certainly improved survival, they have also produced a rapidly growing subpopulation of individuals at high risk for disease recurrence and further health care expenditure. For example, individuals with established CHD are four to eight times more likely to have a recurrent coronary event.\textsuperscript{10,11} In fact, established CHD is the most powerful predictor of subsequent cardiac death,\textsuperscript{12-14} with the likelihood of death increasing with each successive increase in risk factor.\textsuperscript{15}
In the United States, the cost of cardiovascular disease is estimated to be more than US$117 billion annually, including the cost of physician and nursing services, hospital and nursing home services, medications and lost productivity resulting from disability.\textsuperscript{8} Similarly, it is the most expensive disease in Australia, accounting for 24\% of total cardiovascular health costs. In 1993-94, this amounted to AUS$984 million in direct health system costs.\textsuperscript{2} This figure would be significantly higher if indirect costs (e.g. lost productivity) were also taken into account.

The population of the state of New South Wales (NSW) in Australia has high CHD mortality rates compared to the rest of Australia, being exceeded only by the Northern Territory and Tasmania.\textsuperscript{16} The South Western Sydney Area Health Service (SWSAHS), the location for this study, is one of eight metropolitan Area Health Services in NSW and is generally considered a socially disadvantaged area (lower level of educational achievement, lower income, higher percentage of unskilled workers and higher unemployment rate) compared to many areas in NSW.\textsuperscript{17} In SWSAHS, CHD is the single most common cause of death, accounting for one quarter of all deaths registered in 1995. From 1990 to 1994, 65\% of CHD deaths were from AMI alone, with standardised mortality rates for CHD in SWSAHS residents being 7\% to 8\% higher than the rest of the state of NSW.\textsuperscript{18} This amounts to a sizable addition in health care costs, when the average treatment cost for an AMI is estimated to be AUS$5060 for men and AUS$4760 for women.\textsuperscript{6}

\subsection{1.2 Significance of the current study}

It is now widely recognised that major contributors to CHD are unhealthy lifestyle practices (e.g. cigarette smoking, obesity, habitual inactivity and high fat diet). Public health initiatives in NSW, which focus on preventing CHD, include using statewide information campaigns on issues such as smoking, healthy exercise and good nutrition.\textsuperscript{19} In addition to these primary prevention initiatives, NSW Health is also targeting secondary prevention, that is, the prevention of coronary event recurrence. The development of policy standards for cardiac rehabilitation in 1997 is an example of the secondary prevention initiatives of NSW Health.\textsuperscript{20}
Health behaviours, which are any activity undertaken by individuals for the purpose of preventing disease or disease progression, are considered vital in the secondary prevention of CHD. The specific health behaviours that have been shown to be especially beneficial in reducing risk from CHD are: smoking cessation, weight loss in the overweight or obese, physical activity, and dietary modifications. In order to obtain optimal health benefits from engaging in these health behaviours, an adequate level of change or engagement in health behaviour has to be reached. This study defines this level as health-enhancing behaviour.

Standards for health-enhancing behaviours have been widely published in various guidelines by international health authorities and expert panels in cardiology. Among these guidelines are the National Service Frameworks published by the United Kingdom National Health Service, Alberta Clinical Practice Guideline, the American College of Cardiology and the American Heart Association Task Force Guideline, the International Task Force for CHD prevention, and the National Heart Foundation of Australia guideline. It would appear that setting these standards might be the easier part of the exercise; achieving them and monitoring clinical practice remains the greater challenge. Benchmarking, the systematic process of measuring and comparing key work processes to achieve best health care practices, usually involves using performance indicators and is still in the developmental phase in the management of CHD.

Currently, the best example of comprehensive benchmarking in the nationwide management of CHD, is the National Service Framework published in March 2000 by the United Kingdom National Health Service. These guidelines outline predetermined standards to be achieved for optimal health benefits in CHD patients, and require annual clinical audits on a number of aspects of the management of AMI by the National Institute of Clinical Excellence.
One focus of this study will be to determine the extent to which health-enhancing behaviours are practised by first AMI patients in SWSAHS at the time of their first AMI (baseline) and at the 6-month follow-up and hence, determine the magnitude of health behaviour change. The study involves the use of instruments to measure health behaviours and other selected constructs. For these results to be credible, it is crucial that these instruments are valid and reliable. Hence, it is important to test which instruments are valid and reliable when used as assessment and monitoring tools in the management of CHD.

Researchers have long been interested in understanding why individuals engage in health behaviours.\textsuperscript{39} Whilst some individuals might be aware of their health-damaging behaviours, they still fail to change. Risk perception alone is a poor predictor of behaviour change.\textsuperscript{40} In order to adopt health behaviours, individuals must want to change, as well as have the capacity to do this.\textsuperscript{41} This capacity to change is associated with several factors that have been identified as predictors of health behaviours.\textsuperscript{42} These include attendance at outpatient cardiac rehabilitation, sociodemographic and psychosocial factors. Improved understanding of the relationship between these factors and health behaviours in AMI patients will assist health professionals to target and tailor messages in cardiac rehabilitation programs. This knowledge will provide individualised support to patients and thus, increase their likelihood of success in adopting health behaviours.

The importance of sociodemographic and psychosocial factors, as well as attendance at cardiac rehabilitation programs on health behaviour following an AMI, has not been extensively explored. In addition, the relationship between these factors and health-enhancing behaviours is still unclear. This study will identify the influence of selected sociodemographic and psychosocial factors on health-enhancing behaviours in first AMI survivors. It is hoped that through these research processes and testing of conceptual relationships, this study will provide some answers that will inform and assist health personnel and their patients to adopt and maintain health-enhancing behaviours, and modify their cardiac risk factors.
1.3 Aims

This study seeks to:

a) Examine the psychometric properties and suitability of instruments used to measure health behaviours and other selected psychosocial constructs in first AMI survivors;

b) Explore the extent to which health-enhancing behaviours are practised in first AMI survivors and the magnitude of health behaviour change between baseline and the 6-month follow-up;

c) Determine which factors: sociodemographic, psychosocial or attendance at outpatient cardiac rehabilitation program, are significant predictors of support in health-enhancing behaviours in first AMI survivors six months following the initial coronary event; and

d) Develop and test a proposed model of the relationships between selected sociodemographic and psychosocial factors at baseline, and modifiable cardiac risk factors in first AMI survivors at the 6-month follow-up.

1.4 Organisation of the thesis

The thesis is divided into nine chapters, each focusing on a different stage in the research process.

Chapter 1, Introduction, outlines the significance of the study, research aims and the organisation of this thesis.

Chapter 2, Literature Review, consists of a review of literature on the benefits of health behaviours in the secondary prevention of CHD as well as sociodemographic and selected psychosocial factors associated with health behaviour. In addition, an overview of theories and models that have been developed to explain health behaviour is also presented.

Chapter 3, Study objectives, presents the problem statement and hypotheses generated to achieve the research aims of this thesis.

Chapter 4, Methods, outlines the research design and includes the justification for the inclusion and exclusion criteria, selection of the explanatory variables and longitudinal survey design. A description of the study setting and sample, instruments selected and the procedure is also presented in this chapter.
Chapter 5, *Psychometric properties of instruments*, is an extension of the methods section. It details validity and reliability assessment results of the five Likert scale instruments used to measure either the predictor or outcome variables examined in this thesis.

Chapters 6, 7 and 8 are the “Results” chapters. Chapter 6 presents the rates of health-enhancing behaviour engagement, at both baseline and at the 6-month follow-up, as well as the magnitude of health behaviour change six months after the first AMI.

Chapter 7 mainly focuses on factors directly associated with health-enhancing behaviours at the 6-month follow-up.

Chapter 8 tests a conceptual model that was developed based on Antonovsky’s hypothesis. It examines direct and indirect relationships between specific sociodemographic and psychosocial factors and health-enhancing behaviours at the 6-month follow-up.

The thesis concludes with Chapter 9, *General discussion and conclusions*, providing a discussion of the outcomes of the research. A final assessment of the implications of the findings and recommendations for future research are then provided.

There are five appendices. They consist of ethics clearance information, patient information and consent form, questionnaires used at baseline and at the 6-month follow-up survey, and finally, permission from developers for the use of standardised instruments used in the study.
Chapter 2

Literature Review

2.1 Introduction

This chapter will review cardiac risk factors and the importance of engaging in health-enhancing behaviours to modify these risk factors. Within this context, the scope and nature of health behaviour relevant to individuals experiencing AMI will be described. In particular, this chapter will review previous studies that show the benefits for individuals with established CHD in engaging in specific health behaviours, namely: smoking cessation, weight normalisation, adequate physical activity, medication adherence and low dietary fat intake. These are called health-enhancing behaviours in this study. Health-enhancing behaviours are predetermined targets of health behaviours that have to be reached to achieve optimal health benefits in CHD individuals.

The effects of cardiac rehabilitation, the attendance at an ambulatory outpatient cardiac rehabilitation program, on adopting health behaviour will be discussed. Particular attention will focus on sociodemographic and psychosocial factors and their relationships to health behaviour. Psychosocial factors and their influence on health behaviour is the main focus of this study. These factors are classified into two groups: (a) psychosocial factors that have been identified as having a negative influence on health behaviours; and (b) psychosocial factors that have been identified as having a positive influence on health behaviours. Specific attention will be given to personality traits, which are psychosocial factors that have not been extensively studied in health behaviour research.
The chapter then reviews some of the commonly used models in health behaviour research and provides a rationale for the selection of an adapted model for this study.

2.2 Risk factors and coronary heart disease: the importance of behavioural aspects

Individuals with a history of CHD are at the greatest risk for future premature cardiovascular mortality and morbidity. An estimated 5% to 15% of AMI survivors are likely to die from heart disease within the first year of the coronary event. Individuals who survive one cardiovascular event have a 90% chance of dying from another cardiovascular event. Secondary prevention, the early detection and prompt treatment of disease at an early stage in order to slow disease progression, prevent complications and limit disability, is paramount to individuals with a history of CHD.

Behaviour modification in patients with established CHD has once been likened to "stewards rearranging deck chairs on the Titanic". However, there is now overwhelming evidence to support the effectiveness of not only surgical and pharmacological interventions in reducing subsequent cardiovascular morbidity and mortality, but also behaviour interventions.

The effectiveness of surgical cardiac interventions in reducing risk of death and recurrence of a cardiac event has been well established. In many health care settings, coronary artery bypass and graft (CABG), percutaneous transluminal coronary angioplasty (PTCA) and stents are now considered 'routine'. However, without concurrent pharmacologic intervention and behaviour modification, 45% of coronary grafts will develop significant occlusive disease five years after surgery. Interestingly, the Randomised Intervention Treatment of Angina (RITA-2) study demonstrated that the medical approach (pharmacological and behaviour modification) was more effective than surgical interventions. This trial demonstrated that over a period of three years, the cumulative reported death rate from myocardial infarction was almost twice as high in the PTCA group compared to the pharmacological and behaviour modification group (p = 0.02). With the burgeoning cost of specialised technological procedures (e.g. CABG and PTCA), an argument could be mounted for a more rational application or reallocation of resources to
interventions which include pharmacological approaches and behaviour modification.

It is now widely accepted that in addition to medical treatment after an acute coronary event, patients also need to take responsibility for managing and improving their own health status, by adopting a healthy lifestyle and not just relying on the "magic bullet" approach of the health care system. In patients with CHD, there is usually room for improvement in their health behaviour. In one survey of 1173 patients, 60% had at least one and usually two or more cardiovascular risk factors that could be modified by behavioural change. These health behaviours include: smoking cessation in smokers, weight loss in overweight patients, regular physical activity, adherence to cardioprotective drug therapy, and low dietary fat intake. The physiological benefits of adopting these health behaviours and expected clinical outcomes are summarised in Table 2.1 (p. 10).

One approach that encapsulates secondary prevention has been developed and promoted as a treatment mnemonic for the 10 most important elements and includes all aspects of care (pharmacological and behaviour modification) known as A B C D E. This "A B C D E" approach suggests that health professionals should follow a systematic step-by-step process: aspirin and antianginal agents (A), beta-blocker and blood pressure (B), cholesterol lowering and cigarettes (C), diet and diabetes (D) and exercise and education (E). 61
<table>
<thead>
<tr>
<th>Health behaviour</th>
<th>Cardiovascular physiological benefit</th>
<th>Clinical health benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking cessation in survivors with CHD</td>
<td>Reduction in fibrinogen, haematocrit, plasma viscosity, increases in HDL cholesterol⁶²</td>
<td>Reduction of risk of coronary death. Reduces risk of non-fatal ischaemic event</td>
</tr>
<tr>
<td>Weight loss in overweight and obese survivors with CHD</td>
<td>Increases HDL cholesterol⁶³, ⁶⁴</td>
<td>Reduction in coronary risk</td>
</tr>
<tr>
<td></td>
<td>Reduces arterial hypertension⁶⁵</td>
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<td></td>
<td>Increases insulin sensitivity and reverses blood glucose abnormalities⁶⁶, ⁶⁷</td>
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<tr>
<td>Regular physical activity</td>
<td>Reduces fibrinogen concentrations⁶⁸ and reduces platelet aggregation⁶⁹</td>
<td>Reduction in coronary risk and cardiac death rate</td>
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<tr>
<td></td>
<td>Improves endothelial function⁷⁰</td>
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<td></td>
<td>Reduces dyslipidaemias – increases HDL cholesterol⁷¹</td>
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<td></td>
<td>Improves myocardial perfusion⁷² and lowers degree of myocardial ischaemia at a given level of exercise, thus reducing fatal arrhythmias⁷³</td>
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<tr>
<td></td>
<td>Reduces arterial hypertension⁷⁴</td>
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<tr>
<td>Adherence to cardioprotective medications. Benefits of:</td>
<td></td>
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</tr>
<tr>
<td>platelet-modifying drugs</td>
<td>Reduces platelet aggregation⁷⁵</td>
<td>Reduction in recurrent coronary event, sudden death and all-cause mortality</td>
</tr>
<tr>
<td>beta-blockers</td>
<td>Reduces myocardial workload and oxygen consumption, increases threshold for ventricular fibrillation⁷⁶</td>
<td></td>
</tr>
<tr>
<td>ACE* inhibitors and ARBs†</td>
<td>Reduces systemic vascular resistance and cardiac afterload; reduces aldosterone release leading to reduction in circulating fluid load⁷⁷</td>
<td></td>
</tr>
<tr>
<td>Lipid-lowering drugs, especially the “statins”</td>
<td>Reduces total and LDL cholesterol,⁷⁸ increases plaque stability⁷⁹ and reduces plaque rupture,⁸⁰ improvement in vascular endothelial function⁷⁹,⁸¹</td>
<td></td>
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<tr>
<td>Low saturated fat diet</td>
<td></td>
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<tr>
<td>Mediterranean alpha-linolenic acid-rich diet</td>
<td>Reduces granulocyte counts⁸³ and inhibitory effects on platelet clotting activity and their response to thrombin (i.e. reduces thrombogenesis)⁸⁴ and antiarrhythmic effect⁸⁵</td>
<td>Reduction in recurrent coronary event and sudden death</td>
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</table>

* Angiotensin-converting enzyme
† Angiotensin receptor blockers
2.3 Benefits of health behaviours: clinical evidence
Numerous studies have shown the beneficial effects of practising health-enhancing
behaviours in patients with established CHD (Table 2.1, p.10). Sections 2.3.1 to 2.3.5
discuss the benefits of practising each of the health behaviours.

2.3.1 Smoking cessation
Smoking cessation may be the single most effective means of reducing mortality
after AMI.\textsuperscript{22, 86-88} Longitudinal studies in several countries have substantiated across
a wide age spectrum that cigarette smoking is a major risk factor for CHD.\textsuperscript{89-92} A
graded effect between the number of cigarettes smoked, and the younger age of a
first AMI\textsuperscript{91-93} strengthens the cause-effect relationship between smoking and
premature CHD.

There does not appear to be a safe threshold of any amount of smoking or type of
tobacco product smoked.\textsuperscript{94} Willett and colleagues\textsuperscript{95} showed that as few as one to four
cigarettes per day were associated with a twofold increase in risk of CHD.

Individuals with known CHD who continue to smoke have an increased risk of a
recurrent coronary event and death.\textsuperscript{96-100} On the other hand, smoking cessation after
an AMI results in a 40\% to 90\% reduction in subsequent coronary events compared
with those who continue to smoke.\textsuperscript{100-102} This results in a cardiovascular risk profile
that is about the same as non-smokers by 2-3 years after smoking cessation.\textsuperscript{103} In
first AMI patients who were smokers, studies have reported a smoking cessation rate
that varied from 18\% to 60\%.\textsuperscript{104-107} In a one-year prospective study of patients
treated with thrombolytic therapy, the single best predictor of reinfarction was failure
to quit smoking after the coronary event.\textsuperscript{108}

2.3.2 Weight loss in overweight/obese patients
An increased BMI above 25 kg/m\textsuperscript{2} is a strong predictor of CHD risk both in
women\textsuperscript{109} and men.\textsuperscript{110} Overweight is generally defined as a BMI between 25 and 30
kg/m\textsuperscript{2} and obesity is defined as a BMI of 30 kg/m\textsuperscript{2} and higher.\textsuperscript{111} Being overweight
or obese is associated with dyslipidaemia, hypertension and hyperinsulinaemia and
consequently, a greater risk for CHD.\textsuperscript{112-114} Obesity is also an independent risk factor
for CHD.\textsuperscript{115, 116} A modest weight loss of 5\% to 10\% of body weight in the
overweight or obese person is associated with a reduction in hypertension,\textsuperscript{117}
improved insulin resistance\textsuperscript{118} and improved lipid profile.\textsuperscript{118} A modest weight loss is also associated with regression of coronary artery lesions, reduction in cardiac events, total cardiac mortality and total all cause mortality.\textsuperscript{23,119}

No randomised controlled trials have directly addressed the effect of weight loss on recurrent cardiac events in CHD.\textsuperscript{120,121} In a randomised dietary trial of a cardioprotective diet in patients with AMI, a significant reduction (50 verses 82 patients, p<0.001) in cardiac events was observed in those patients who had as little as 0.5 kg weight loss.\textsuperscript{26} Two other intervention studies, where both diet and exercise resulted in weight loss, showed beneficial angiographic changes.\textsuperscript{25,122}

\section*{2.3.3 Regular physical activity}

Numerous studies, using a variety of approaches ranging from intervention to non-intervention follow-up, support the association between physical inactivity and CHD.\textsuperscript{74,123-126} A sedentary lifestyle doubles the risk of developing CHD.\textsuperscript{127} Physical activity, on the other hand, has been shown to reduce serum cholesterol and triglyceride levels, increase physical work capacity and attenuate the progress of CHD.\textsuperscript{128,129}

Between the period 1974 to 1979, the National Exercise and Heart Disease Project (NEHDP) conducted in the United States demonstrated the benefits of exercise in secondary prevention of CHD.\textsuperscript{130,131} The cumulative 3-year total mortality rate was 4.6\% for the exercise group and 7.3\% for the control group; the 3-year rate for recurrent myocardial infarction was 5.3\% (exercise) and 7.0\% (control) respectively. Higher reductions in mortality were observed in a meta-analysis of seven randomised trials of exercise only in AMI patients.\textsuperscript{24} The reductions over three years were 19\% for total mortality and 27\% for fatal myocardial infarction,\textsuperscript{24} however, neither this group nor the NEHDP study showed a statistically significant reduction in mortality rate.
2.3.4 Adherence to cardioprotective drug therapy

There is compelling clinical evidence showing the benefits of four groups of cardioprotective drugs: the antiplatelet agents, beta-blockers, ACE inhibitors and lipid-lowering agents. However, a recent study of patients with CHD showed that adherence to these cardioprotective medications for secondary prevention is not always ideal. Adherence to recommendations for the use of aspirin following AMI was approximately 80%, less than 66% for beta-blockers, 40% for ACE inhibitors in those with heart failure and less than 20% for lipid-lowering agents. The following summarises selected evidence from clinical trials demonstrating the benefits of using these medications in AMI patients.

Benefits of antiplatelet agents

There is strong evidence from clinical trials which demonstrates the benefit of antiplatelet agents, especially aspirin, following an AMI. In the first ‘mega’ clinical trial, the Second International Study of Infarction Survival (ISIS-2), more than 17,000 patients with suspected AMI were recruited. The benefits of 160 mg daily of aspirin, started within 24 hours, led to a 23% reduction in vascular mortality at the 5-week follow-up. In another large clinical trial of 19,791 patients with AMI reviewed by the Antiplatelet Therapy Trialists, aspirin use resulted in a 12% reduction in death and a 31% reduction in reinfarction.

Benefits of beta-blockers

Yusuf et al pooled the results of 29 trials on beta-blocker interventions and demonstrated an estimated 14% reduction in mortality, 19% reduction in nonfatal reinfarction and 19% reduction in fatal cardiac arrest. The benefit of beta-blockers on all-cause mortality is impressive. For example, after an AMI, the estimated number of patients who would need to be treated with beta-blockers for two years to avoid one death is 42, compared to 200 patients over one year to avoid one death, if treated with Angiotensin-Converting Enzyme (ACE) inhibitors.
Benefits of Angiotensin Converting Enzyme Inhibitors
In recent years, several clinical trials have evaluated the role of ACE inhibition following AMI. In a systematic review and meta-analysis of 98,496 patients in four randomised controlled trials of ACE inhibitor treatment following AMI, ACE inhibitor therapy was associated with a 7% reduction in 30-day mortality. Similar studies such as the Survival and Ventricular Enlargement (SAVE) trial, the Acute Infarction Reperfusion Efficacy (AIRE) study and Heart Outcomes Prevention Evaluation (HOPE) trial also demonstrated the beneficial effects of ACE inhibitors following AMI. In AMI patients with a large anterior infarction, or with significant ventricular dysfunction, up to a 29% reduction in the risk of death at the 1-year follow-up was demonstrated in the Survival of Myocardial Infarction Long-Term Evaluation (SMILE) Study.

Benefits of lipid-lowering agents
There have been at least 11 secondary prevention trials involving pharmacologic lipid-lowering agents on CHD patients. Cholesterol lowering ranging from 6% to 25% has been demonstrated, which parallels a linear reduction of 7% to 42% in cardiac events. The Scandinavian Simvastatin Survival Study (4S) demonstrated that the treatment of patients with raised cholesterol with Simvastatin for an average of 5.4 years was associated with a 30% reduction in total mortality and a 42% reduction in CHD mortality. The Long-term Intervention with Pravastatin in Ischemic Disease (LIPID) study of patients with raised cholesterol treated with Pravastatin for six years, showed a 22% reduction in total mortality with a 24% reduction in CHD mortality. The Cholesterol and Recurrent Events (CARE) study demonstrated that in patients with a mean cholesterol level of 5.4 mmol/L, treatment with Pravastatin for five years was associated with a 24% lower incidence of coronary events. Data from these trials suggest that aggressive lipid-lowering therapy, even in mildly elevated levels of serum cholesterol in patients with established CHD, is beneficial.
2.3.5 Low saturated fat diet

A number of prospective cohort studies have shown that a high saturated fat diet is associated with greater risk for CAD.\textsuperscript{152-154} The association between saturated fat intake and serum cholesterol levels is supported by studies spanning more than 30 years.\textsuperscript{155} A 10% reduction in serum cholesterol concentration, which can be achieved by dietary change,\textsuperscript{156} lowers the risk of recurrent coronary events by 20% to 50%.\textsuperscript{147}

In the Cholesterol Lowering Atherosclerosis Study (CLAS), the development of new coronary lesions was examined in patients receiving dietary intervention. This placebo-controlled, angiographic trial was designed to test the hypothesis that aggressive lowering of low-density lipoprotein cholesterol with concomitant increase in high-density lipoprotein cholesterol would reverse or retard the atherosclerotic process.\textsuperscript{157} Survivors who received 27% dietary fat as their total energy intake did not develop new coronary lesions, but survivors who received 34% dietary fat as their total energy intake developed new coronary lesions.\textsuperscript{158}

There have been four landmark randomised intervention trials on dietary fats and the prevention of CHD recurrence. The first of these was the Oslo Diet-Heart Study, where 412 AMI survivors were randomised to cholesterol-lowering and control diets.\textsuperscript{82} Intensive dietary instructions were given and dieticians made frequent contact with survivors in the intervention group. After five years of dietary modification, there was a statistically significant reduction in reinfarction rates and a 14% reduction in serum cholesterol in the intervention group compared to the control group.

The St Thomas' Atherosclerosis Regression Study (STARS) trial studied 90 middle-aged men referred for coronary angiography with hyperlipidaemia. Survivors were randomised to a lipid-lowering diet and usual care.\textsuperscript{27} Patients were reviewed every three months for 39 months. The findings of this study suggested that the progress of coronary artery disease, evidenced by the degree of obstruction in the coronary arteries, is strongly influenced by the intake of saturated fat (p<0.001).
An important dietary intervention study that highlighted the beneficial effects of fish intake was the Diet and Reinfarction Trial (DART). In this four way factorial randomised design trial on 2033 AMI survivors, patients either received or did not receive advice on each of three dietary factors. These three dietary factors were: a reduction in fat intake and an increase in the polyunsaturated to saturated fat ratio, an increase in fatty fish intake or the use of fish oil capsule (200-400 g/week), or, a high cereal consumption diet in combination with a relatively low-fat diet (35% of total energy). Survivors who were advised to eat fatty fish had a 29% reduction in 2-year CHD and all-cause mortality compared to those who were not given this dietary advice.\textsuperscript{159}

In the Lyon Diet Heart Study, a Mediterranean-type diet (high in fruits, vegetables, olive or canola oil \{high in alpha-linolenic acid\})\textsuperscript{160} was prescribed to 423 survivors after a first myocardial infarction. The treatment group had a lower incidence of all-cause and cardiovascular mortality, and had a lower rate of recurrent coronary event and cardiac death.\textsuperscript{161} This trial demonstrated a 70% reduction in coronary event recurrence in the treatment group after two years.\textsuperscript{160}

2.4 Benefits of multifactorial risk interventions

CHD risk factors are multiplicative rather than additive in effect,\textsuperscript{162,163} hence, a multifactorial mode of risk factor intervention is highly beneficial. A landmark randomised primary prevention trial, the Multiple Risk Factor Intervention Trial (MRFIT), tested the effect of a multifactor intervention program (smoking cessation, weight loss, pharmacological management of hypertension, physical activity, restrict dietary fat, sodium and alcohol intake) on mortality from CHD. In this trial involving 12,866 men with high risk for CHD, the study failed to show a significant difference in CHD or total mortality rate at the 7-year follow-up.\textsuperscript{164} Similarly, in a review of 10 primary prevention trials, the pooled effects suggested no effect on mortality with multiple risk factor interventions, although there were 10% fewer CHD in the intervention group than the control group.\textsuperscript{165}

The situation is vastly different in secondary prevention of CHD. A multifactorial approach provides the most substantial benefit.\textsuperscript{166} In a meta-analysis of randomised controlled trials of cardiac rehabilitation, multifactorial risk reduction resulted in a 26% greater reduction in total mortality compared with exercise training alone.\textsuperscript{167}
Using arteriographic end-points, two multifactor, risk-reduction trials have shown the beneficial effects of a multifactorial approach. These two secondary prevention trials are the: Lifestyle Heart Trial and SCRIP study.

2.4.1 Lifestyle Heart Trial
This was the first prospective, randomised controlled trial to evaluate the effect on coronary artery lesions of non-pharmacologic, behaviour interventions. Both men and women with documented CHD were included in this study which involved comprehensive lifestyle changes. The experimental group (n = 28) were prescribed a lifestyle program that included a low-fat vegetarian diet, moderate aerobic exercise, stress management training, smoking cessation and group support, whilst the control group (n = 20) was assigned to usual care. Table 2. 2 summarises the lifestyle interventions of this study. However, the small sample size in this study and the many conclusions that have been drawn based on this small sample study have been subjected to criticism.

<table>
<thead>
<tr>
<th>Health behaviour</th>
<th>Prescription</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet</td>
<td>Low-fat vegetarian diet, approximately 10% fat</td>
</tr>
<tr>
<td>Exercise</td>
<td>Moderate intensity exercise training, three hours/week, minimum of 30 minutes per session</td>
</tr>
<tr>
<td>Stress management</td>
<td>Meditation, breathing, and relaxation one hour/day</td>
</tr>
<tr>
<td>Smoking cessation</td>
<td>Complete abstinence</td>
</tr>
</tbody>
</table>
The average weight loss after one year in the experimental group was 10.1 kg (p<0.0001), compared with an average weight gain of 0.7 kg in the controls. Serum cholesterol fell by 24.3% (p<0.02) in the experimental group. The experimental group demonstrated an average regression of 82% of coronary lesion in the lumen diameter, compared with a 53% progression of coronary artery lesion in the control group, at the 1-year coronary angiography follow-up. There was a strong correlation between overall adherence and coronary stenosis improvement suggesting that together, they have a bigger impact than each factor alone.\textsuperscript{168} This study showed that dramatic changes in lifestyle could reverse the progression of CHD.

### 2.4.2 Stanford Coronary Risk Intervention Program

One of the largest secondary prevention trials, the Stanford Coronary Risk Intervention Program (SCRIP) on multifactorial risk interventions, studied 300 survivors with coronary lesions diagnosed on angiography.\textsuperscript{170} The study aimed to demonstrate the benefits of a multifactorial risk intervention program that was tailored to the individual. Survivors were randomised to an intervention group and a control group, who had the usual medical care by their personal physicians. The intervention group enrolled in a supervised, comprehensive lifestyle modification program combined with appropriate pharmacotherapy. Some of the risk intervention goals are shown in Table 2.3.

<table>
<thead>
<tr>
<th>Health behaviour</th>
<th>Prescription</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet</td>
<td>Low-fat diet, &lt; 20% total fat, &lt;6% saturated fat</td>
</tr>
<tr>
<td>Exercise</td>
<td>30-45 minutes, every other day, 70-85% of maximum heart rate</td>
</tr>
<tr>
<td>Weight loss</td>
<td>Less than 110% of ideal (BMI &lt; 27.5 kg/m(^2))</td>
</tr>
<tr>
<td>Smoking cessation</td>
<td>Complete abstinence</td>
</tr>
<tr>
<td>Pharmacotherapy</td>
<td>Lipid-lowering agents</td>
</tr>
</tbody>
</table>

At the 4-year angiographic study, both groups showed coronary lesion progression, however, the intervention group had 47% less coronary narrowing than the control group (average coronary narrowing in control group was 0.046 mm/year) and more than 30% reduction in hospitalisation of recurrent cardiac event.\textsuperscript{170}
2.5 Recommended targets for health behaviours

2.5.1 Consensus for best practice
Clinical evidence from observational studies,\textsuperscript{49, 171-173} intervention trials,\textsuperscript{174, 175} as well as meta-analyses,\textsuperscript{167, 176} has strengthened our understanding about the enormous personal, community and economic health benefits of optimal cardiac risk management in those with established CHD. With the goal of producing a more unified and effective approach in the secondary prevention of CHD in clinical practice, a number of cardiac societies and associations have put forward guidelines or consensus statements to guide clinical practice. Expert panels, in collaboration with professional societies, develop these recommendations with a common interest of reducing the burden of CHD.\textsuperscript{177} However, the proposed recommendations are not always strictly evidence-based, some of these recommendations are based on clinical judgement. In addition, a unified approach does not extend across continents. Different professional societies and associations in different continents have developed slightly different recommendations. Table 2.4 (p. 20) summarises the recommendations on health behaviours for those with established CHD, by key professional societies and associations.
<table>
<thead>
<tr>
<th>Consensus statement or guideline</th>
<th>Society or Association recommending the standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Smoking cessation</strong></td>
<td>American College of Cardiology and American Heart Association; Alberta Medical Association; National Heart Foundation of Australia; Second Joint Task Force of European Societies</td>
</tr>
<tr>
<td><em>Complete cessation</em></td>
<td></td>
</tr>
<tr>
<td><strong>Weight loss</strong></td>
<td>National Heart Foundation of Australia;</td>
</tr>
<tr>
<td><em>Target weight loss to</em></td>
<td>American College of Cardiology and American Heart Association; Second Joint Task Force of European Societies</td>
</tr>
<tr>
<td>&lt;25 kg/m² or waist circumference <em>&lt;90 cm for males and 80 cm for females</em></td>
<td></td>
</tr>
<tr>
<td><em>Intervention if &gt;120% of ideal weight for height</em></td>
<td></td>
</tr>
<tr>
<td><em>Target weight loss: to achieve ideal weight</em></td>
<td></td>
</tr>
<tr>
<td><strong>Physical activity</strong></td>
<td>Centres for Disease Control and American College of Sports Medicine; NIH Consensus; Alberta Medical Association; National Heart Foundation of Australia</td>
</tr>
<tr>
<td><em>Accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week</em></td>
<td></td>
</tr>
<tr>
<td><strong>Cardioprotective medications</strong></td>
<td>American College of Cardiology and American Heart Association; British Medical Journal publication of best clinical evidence; British Cardiac Society, British Hyperlipidaemia Association and British Hypertension Society</td>
</tr>
<tr>
<td><em>to be used for all, or some of the patients following AMI:</em></td>
<td></td>
</tr>
<tr>
<td>1, 30, 177 aspirin, beta-blockers, ACE inhibitors and lipid-lowering agents</td>
<td></td>
</tr>
<tr>
<td><strong>Dietary modification</strong></td>
<td>American College of Cardiology and American Heart Association; National Heart Foundation of Australia; Second Joint Task Force of European Societies</td>
</tr>
<tr>
<td><em>AHA Step II diet, low in saturated fat and cholesterol (&lt;7% of total calories as saturated fat)</em></td>
<td></td>
</tr>
<tr>
<td><em>NHF of Australia recommends saturated fatty acids and trans fatty acids contribute no more than 8% of total energy intake,</em></td>
<td></td>
</tr>
<tr>
<td><em>n-6 polyunsaturated fatty acids – 8 to 10% of total energy intake,</em></td>
<td></td>
</tr>
<tr>
<td><em>at least two fish meals per week and at least 2g of plant n-3 polyunsaturated fatty acid intakes per day</em></td>
<td></td>
</tr>
<tr>
<td><em>European Joint Task Force recommends ≤30% total fat intake, saturated ≤one third of total fat intake,</em></td>
<td></td>
</tr>
<tr>
<td><em>more monounsaturated and polyunsaturated fats from both vegetable and marine sources,</em></td>
<td></td>
</tr>
<tr>
<td><em>increases fresh fruits, cereals and vegetables,</em></td>
<td></td>
</tr>
<tr>
<td><em>reduces total calorie when weight reduction is needed reduces salt and alcohol use when BP is elevated</em></td>
<td></td>
</tr>
</tbody>
</table>
2.5.2 Health-enhancing behaviour: defining targets

Due to the variation in the standards of some health behaviours recommended by
different cardiac societies or associations, a predetermined standard is set for each of
the health behaviours to be examined in this study. These set standards of health
behaviours are called health-enhancing behaviours.

Health-enhancing behaviours in this study are defined as the five goals of health
behaviours guided by the recommendation from the American Heart Association or
the National Heart Foundation of Australia. They are defined as:

(a) non-smoking behaviour (complete abstinence for at least one month before the
preceeding survey);
(b) body weight management (BMI: 18.5 to 24.9 kg/m²);
(c) adequate physical activity (at least five times and at least 2½ hours per week of
moderate or vigorous intensity);
(d) strict medication adherence (100% compliance with prescribed medication
regime); and
(e) dietary fat intake (<20% total fat, <7% saturated fat).

2.6 Factors influencing health behaviour

Although the benefits of health behavioural change are compelling, health
professionals realise that there are social, psychological and environmental factors
that are operating to either enhance or hinder the adoption of health behaviours in
individuals with CHD.

One focus of this study is to examine the psychosocial factors that may influence
health behavioural change regardless of outside interventions. In order to investigate
this, this study also takes into consideration survivors’ attendance at cardiac
rehabilitation, as it has been repeatedly shown to influence health behaviour.184-187

Throughout this review, several key areas are identified as influencing health
behaviours. These will be grouped into attendance at a cardiac rehabilitation
program, sociodemographic and psychosocial factors. This study also aimed to
examine specific relationships between selected psychosocial factors, which are
derived from existing theories on health behaviour and health behavioural change.
2.6.1 Attendance at outpatient cardiac rehabilitation and health behaviours

The first factor to be considered in this review of factors influencing health behaviour is attendance at an ambulatory outpatient cardiac rehabilitation program. Although all AMI patients are eligible to attend an outpatient cardiac rehabilitation program, not all first AMI patients attend following discharge from hospital. This could be due to not being informed about the program, choosing not to attend or simply being unable to attend the program (e.g., transport problems).

Cardiac rehabilitation is defined by the Australian National Heart Foundation as “all measures used to help cardiac patients return to an active and satisfying life and to prevent recurrence of cardiac events.” The aims of cardiac rehabilitation are to: i) maximise physical, psychological and social functioning to enable patients to live productively and with confidence; and ii) assist and encourage behaviours that may minimise the risk of further cardiac events and conditions” (p.1).

In October 1995, the Agency for Health Care Policy and Research and the National Heart, Lung, and Blood Institute issued the Clinical Practice Guideline for Cardiac Rehabilitation. The expert panel used the US Public Health Service definition of cardiac rehabilitation services which are “comprehensive, long-term programs involving medical evaluation, prescribed exercise, cardiac risk factor modification, education, and counselling and behaviour interventions”. This definition of cardiac rehabilitation services compares closely with the UK National Health Service and NSW Health.

Cardiac rehabilitation has two main components. The first is individually prescribed exercise designed to improve tolerance to physical activity. The second component is a combination of educational, counselling and behaviour interventions to help patients stop smoking, lower blood pressure, change eating habits, lose weight, improve lipid profiles and improve psychosocial well-being.

The benefits of cardiac rehabilitation include a reduction in mortality rate, improvement in quality of life and lowering of hospital readmission rates. Meta-analysis of studies of cardiac rehabilitation after myocardial infarction demonstrate that cardiac rehabilitation lowers the risk of death in survivors by 20% to 25% compared to controls, although the risk of non-fatal MI was similar in both
groups. Cardiac rehabilitation has been compared with other post-MI treatment interventions and has been shown to be more cost-effective than thrombolytic therapy, coronary bypass surgery and cholesterol lowering drugs alone.\textsuperscript{191} In practice however, cardiac rehabilitation is used concurrently with these interventions.

Despite the growing evidence about the benefits of cardiac rehabilitation, as little as 10% of eligible patients have been reported to participate in formal cardiac rehabilitation programs.\textsuperscript{193} Outpatient cardiac rehabilitation programs are under-subscribed, especially by patients who seem to need them most, namely women, older individuals, those with less education and the unemployed.\textsuperscript{194} Additionally, survivors who are more likely to drop out of outpatient cardiac rehabilitation exercise programs are the smokers, overweight patients, blue-collar workers, patients with sedentary lifestyles and depressed patients.\textsuperscript{195} Unfortunately, these individuals, who are most likely to have a number of modifiable risk factors, would benefit most from these programs. De Busk suggests a number of reasons for the low participation rates, including: a) lack of support by physicians; b) inconvenience of the group format; and c) patients with low risk may not perceive any medical benefits from the program.\textsuperscript{196}

In cardiac rehabilitation programs, information or health education messages should be tailored to each individual patient, taking into account the risk profile of the patient and where the individual is in the change continuum.\textsuperscript{197,198} Regrettably, this does not always occur in traditional cardiac rehabilitation programs. It is not uncommon for all attendees to receive the same health information in the programs. These programs often use a highly structured and sequential format, which may be a very effective method of equipping patients with knowledge. Whilst knowledge is important because it prepares patients to adopt health-promoting behaviours,\textsuperscript{199-201} numerous studies have demonstrated that increased knowledge does not always translate to increased health-promoting behaviour.\textsuperscript{202-205}


2.6.2 Sociodemographic factors and health behaviours

Sociodemographic factors have been found to be associated with health behaviours in CHD patients. These factors include: age, gender, marital status and educational attainment, a proxy indicator for socioeconomic status.

Age

In the adult population, older adults are more likely to engage in protective health behaviours and are more likely to change health-damaging behaviours.\textsuperscript{206} They are more likely to attempt to quit smoking and continue to abstain, compared to younger adults,\textsuperscript{207-209} and are less likely to be involved in risk-taking behaviours.\textsuperscript{210} In fact, age appears to show a curvilinear relationship with a much lower incidence of health-damaging behaviour in children and older adults.\textsuperscript{211}

Gender

Several studies have reported gender differences in a range of health behaviours. Overall, females are more likely to engage in health behaviours,\textsuperscript{212} particularly healthier eating patterns.\textsuperscript{213,214} However, females are less likely to be successful in smoking cessation compared to males.\textsuperscript{215}

Marital status

Being married or living with a spouse is associated with a healthier lifestyle.\textsuperscript{216} Married men and women have been demonstrated to have healthier eating habits compared to their unmarried counterparts\textsuperscript{213} and are less likely to engage in health-damaging behaviours.\textsuperscript{217,218}

Educational attainment and socioeconomic status

Education is the most widely used measure of socioeconomic status in epidemiologic studies. In a review of the studies of chronic disease published in the American Journal of Epidemiology between 1982 to 1985, education was used by 45% of studies as a surrogate measure of socioeconomic status.\textsuperscript{219} Low socioeconomic status (SES) is associated with increased levels of high-risk behaviours.\textsuperscript{220} It is also associated with a higher rate of smoking,\textsuperscript{221,222} obesity,\textsuperscript{223,224} lower levels of physical activity,\textsuperscript{225,226} lower rate of adherence to medical recommendations,\textsuperscript{227-229} and poorer dietary habits.\textsuperscript{230,231} Negative psychosocial orientations such as depression,
hopelessness and cynical hostility have all been shown to have an inverse association with SES.\textsuperscript{232}

There is some evidence that suggests that low socioeconomic status is an independent cardiovascular risk factor.\textsuperscript{228, 233-235} In the Beta Blocker Heart Attack Trial, social class was an independent predictor of functional recovery, after controlling for clinical, demographic and psychosocial factors.\textsuperscript{236}

### 2.6.3 Psychosocial factors and health behaviours

To some extent, health professionals can influence a patient’s attendance at an outpatient cardiac rehabilitation program. Similarly, health professionals can also influence a number of psychosocial factors that may be associated with increased cardiac mortality and morbidity. A meta-analysis of 23 clinical trials involving more than 3,000 CHD patients found that those who received psychosocial interventions experienced a 41% reduction in mortality and a 46% reduction in nonfatal cardiac events.\textsuperscript{237} A second meta-analysis of 37 studies found that health education and stress management programs reduced mortality by 34% and decreased AMI recurrence by 29%.\textsuperscript{238}

Psychosocial interventions (e.g. stress management and cognitive-behaviour therapy) may influence mortality and morbidity from CHD through the mechanism of health behaviour. However, our current understanding regarding the impact of psychosocial factors on health behaviours and health outcome is still in its infancy, unlike the more clearly defined cardiac risk factors such as hypertension, hyperlipidaemia and cigarette smoking. There is a need for more research into psychosocial factors that influence health behaviour which promote a quick recovery and keep people healthy.\textsuperscript{239} Psychosocial factors that are linked to both health-damaging and health-promoting behaviours require further exploration.

### Psychosocial factors associated with health-damaging behaviours

A number of psychosocial factors have been found to be associated with increased CHD risk and a poor CHD prognosis. These psychosocial characteristics are linked to neurohormonal and cardiovascular changes that may result in atherosclerosis, myocardial ischaemia and sudden death.\textsuperscript{240} However, their pathophysiology is not yet fully understood.\textsuperscript{241}
In addition, these psychosocial factors can have a negative impact on survival independent of CHD severity.\textsuperscript{242,243} Psychosocial factors that have been the most commonly tested are: depression, anxiety, type A personality (especially the cynical hostility and expressive anger component), social isolation and psychological stress. A number of mechanisms linking these psychosocial factors to CHD risk and prognosis have been proposed. Depression, which is associated with excessive glucocorticoid production,\textsuperscript{244} also increases the risk for CHD.\textsuperscript{245} Chronic stress and depression may alter the functioning of the hypothalamic-pituitary-adrenocortical axis. This alteration can result in the metabolic syndrome of central obesity, glucose intolerance, insulin resistance, dyslipidaemia and reduced fibrinolysis, all of which increase CHD risk.\textsuperscript{246} Health-damaging psychosocial factors like job strain, depression, hostility, anxiety, and social isolation also tend to cluster in certain individuals.\textsuperscript{247} Five specific, negative psychosocial factors will be discussed in this chapter, with particular emphasis on their associations with health behaviours.

\textbf{Depression}

The association between depression and increased mortality has been studied extensively in AMI patients,\textsuperscript{248-256} as have the adverse effects of depression on health behaviour.\textsuperscript{257-260} The presence of depressive symptoms is associated with an increased risk of coronary events.\textsuperscript{245} Whilst 65\% of AMI patients manifest some depressive symptoms,\textsuperscript{261} up to 25\% of them have severe, often recurrent major depression following an AMI.\textsuperscript{262} Depressed patients have a 3 to 4-fold increase in cardiac mortality in the first 18 months following an AMI and are also at increased risk of recurrent coronary events.\textsuperscript{242,243} They are also less likely to be successful in smoking cessation,\textsuperscript{263,264} less likely to adhere to cardioprotective medications,\textsuperscript{265,266} less likely to undertake regular exercise\textsuperscript{259,267} and are less likely to adhere to a low-fat diet.\textsuperscript{259} The National Heart, Lung, and Blood Institute (NHLBI) is currently funding the Enhancing Recovery In Coronary Heart Disease (ENRICHD) multicentre study, where the depression and social isolation factors will be explored in the 3,000 AMI patients to be recruited in the USA.\textsuperscript{268,269} The current study will focus on other psychosocial factors that have not been well examined.
**Anxiety**

Like depression, anxiety commonly occurs in patients with CHD. The prevalence of anxiety among patients in the coronary care unit is as high as 50% to 69%.\(^{256,270}\) It is unclear if anxiety is caused by the situational hospitalisation following the acute coronary event or other factors. However, the Global Utilisation of Streptokinase and Tissue Plasminogen Activator for Occluded Arteries (GUSTO) trial showed that a high level of in-hospital anxiety was associated with an almost 5-fold increase in recurrent ischaemia, reinfarction or death, compared to AMI patients without high levels of anxiety.\(^{270}\) High anxiety levels are also associated with fatal CHD, in particular, sudden cardiac death.\(^{271}\) It also decreases physical functioning in individuals with CHD\(^{272}\) and predisposes to poor eating behaviours.\(^{273}\)

**Social isolation**

The Alameda County study was one of the first to demonstrate that social isolation, or lack of social integration or participation in intimate social relationships, predicts mortality in the elderly.\(^{274}\) Low levels of emotional support have been shown to result in a 3-fold increase in the mortality of CHD patients.\(^{275,276}\) Individuals who are socially isolated are more prone to negative emotions than those living with others.\(^{277}\) In the Cardiac Arrhythmia Suppression Trial-1 (CAST-1), men who were socially isolated also reported high levels of stress and had a four-fold increase in post-AMI mortality.\(^{278}\) Urban dwellers who were socially isolated had riskier profiles of health behaviour; were more likely to smoke, drank heavily and undertook less physical activity than their non-urban counterparts.\(^{279}\) A similar result was reported in a study which found a higher prevalence of smoking among socially isolated women with CHD.\(^{280}\) Social isolation per se is not explored in this study, however, social support is included.

**Stress**

Psychological stress is commonly cited as *that which is appraised as stressful*. The major proponents of this theory are Lazarus and Folkman.\(^{281}\) They define psychological stress as "*a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being*" (p.19).\(^{281}\) Stress is commonly attributed by patients as the cause of their AMI.\(^{282,283}\) Stress exposure and reactivity have been associated with cardiac dysrhythmias, myocardial ischaemia, insulin
resistance, increased fibrinogen levels and platelet aggregation.\textsuperscript{284, 285} Psychological stress symptoms, assessed using the 20-item General Health Questionnaire (GHQ) during hospitalisation following an AMI, have been shown to be associated with an increase in cardiac mortality by nearly threefold and a 1.5-fold increase in risk of reinfarction over the five years.\textsuperscript{286} 

Unlike the more tangible targets for CHD risk interventions (e.g. smoking, hyperlipidaemia, hypertension), stress is less clear-cut and harder to define because it is not always observable nor can it be quantified by some biochemical laboratory tests. Whilst most patients identify stress as the cause of their AMI,\textsuperscript{41, 287} there is no conclusive evidence to link stress as a causative factor of AMI.\textsuperscript{283}

Although the causative role of stress in CHD is unclear,\textsuperscript{283, 288} acute stress may trigger myocardial ischaemia, life-threatening arrhythmias, and even death in some individuals.\textsuperscript{289, 290} Some studies suggest stress management is important in reducing CHD risk. One study by Blumenthal and colleagues\textsuperscript{8} showed that stress management was more beneficial than exercise in reducing recurrent cardiac events. In this study, 67 patients with myocardial ischaemia were randomly assigned to either a program of aerobic exercise (45 minutes three times per week) or stress management (weekly sessions). Each program lasted for 16 weeks. Another group of 40 participants were randomly assigned to receive usual care and served as the control group. Five years later, patients in the stress management group had a relative risk of 0.26 for recurrent cardiac events compared with controls. The study did not detect a statistical difference in cardiac events between the exercise group and the usual care group, possibly contributed by the small sample size of this study.

Psychological stress alters health-related behaviours, as demonstrated by a range of studies. Pregnant women with high psychological stress were more likely to smoke.\textsuperscript{291} High stress levels were also associated with failure to give up smoking in a study on nursing students,\textsuperscript{292} as well as failure to stop smoking after AMI.\textsuperscript{293} Although high perceived stress has been associated with reduced exercise behaviour,\textsuperscript{294, 295} other studies have found no such relation between perceived stress and exercise frequency or energy expended.\textsuperscript{295-297} High stress levels have been found to be associated with increased food intake,\textsuperscript{298-300} disordered eating behaviours\textsuperscript{301} and failure to adhere to a dietary regimen.\textsuperscript{302, 303} Most of these studies which examined stress and health-related behaviours were cross-sectional studies and thus, it was not
possible to determine the cause and effect, nevertheless, it is possible that both are caused by some underlying vulnerabilities. The influence of stress on health behaviour can only be borne out by longitudinal studies on stress and health behaviours to establish if there is a causal effect of stress on health behaviour. This follow-up study will examine the influence of psychological stress on health-enhancing behaviours at follow-up.

**Personality traits**

Personality trait is defined as an enduring set of characteristics that influence one’s thoughts, feelings, and behaviour, and has been suggested to be an influencing factor in the relatively stable and consistent behavioural pattern of an individual, over time and across situations. This does not mean that behaviour is independent of the situation or that a person possessing the trait behaves the same way in all situations. An individual’s behaviour in a particular situation is also dependent on other factors such as their perception of the situation and other relevant demands of the situation.

Personality traits can have negative or positive effects on health behaviour. One personality trait that is associated with health-damaging behaviour is hostility. The link between a personality trait, the Type A Behaviour Pattern (TABP), as a risk factor for CHD was first proposed by Friedman and Rosenman in the 1950s. They conceptualised the TABP as:

> “an action-emotion complex that can be observed in any person who is aggressively involved in a chronic, incessant struggle to achieve more and more in less and less time, and if required to do so, against opposing efforts of other things or other persons” (Friedman and Rosenman, 1974, p.67).

A number of subsequent studies have failed to show an increased CHD risk with TABP. Further investigations on TABP uncovered only some components of this multidimensional construct as “toxic” in relation to CHD. Hostility is considered by many to be most toxic. It manifests itself as cynical mistrust, frequent anger, resentfulness and suspicion. Hostility has been associated with more severe CHD, and increases both CHD mortality and all-cause mortality. One possible mechanism linking hostility with increased CHD risk is its strong association with an unhealthy lifestyle. Hostility is strongly associated with smoking behaviour, higher alcohol consumption, higher relative body weight, less adherence to medication regimen and higher dietary fat intake.
Interestingly, one study found hostility to be positively related to vigorous physical activity.  

**Psychosocial factors associated with health-promoting behaviours**

Whilst personality traits such as hostility have been linked with higher CHD mortality and health-damaging behaviours, personality traits like sense of coherence, optimism and hardiness, that are purported to be health-promoting and are associated with adaptive coping, have not received similar attention in CHD research.

Like the clustering of psychosocial factors that are associated with health-damaging behaviours, psychosocial factors that are associated with health-promoting behaviours also tend to aggregate together. Among the psychosocial factors that have been suggested to predispose towards health and health-promoting behaviours are health locus of control, self-efficacy, optimism, hardiness, sense of coherence and social support.

**Health locus of control**

The term “locus of control” was coined by Rotter. It suggests that one’s belief orientation (internal, external or powerful others, chance or fate) influences behavioural engagement. Rotter’s proposal was based on expectancy-value theory. He hypothesised that behavioural engagement is a function of i) beliefs that the behaviours will lead to a specific outcome (i.e. locus of control) and; ii) the value one places on the outcome of that situation. A health-orientated locus of control scale was developed by Wallston, Wallston and DeVellis to investigate the association between the locus of control construct and health-related behaviours. The health locus of control was thought of as a disposition to act in a certain manner in health-related situations, and not thought to be as stable as the general locus of control beliefs. Wallston suggested that the more important construct which should be measured when studying health behaviour is the “value of health construct”, not health locus of control.

However, a review of studies of health locus of control and health value show that these factors rarely explain more than 10% of the variance in health behaviour. For this reason, this factor was not examined in this study.
**Outcome expectancies and self-efficacy**

The adoption of health behaviour is influenced by outcome expectancies and self-efficacy. Outcome expectancies are judgments of the likely consequences a specific behaviour will produce (e.g. stopping smoking will prevent me from getting lung cancer), although it plays a less important role than self-efficacy in initiating and maintaining health behaviour.

A psychosocial factor that has been shown to be important in cardiac risk factor modification is self-efficacy. Self-efficacy is defined by Bandura as the "individuals' judgments in their capabilities to organise and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has, but with the judgments of what one can do with whatever skills one possesses." (p.391). If individuals judge themselves capable of performing the behaviour, they are more likely to act, make the effort and persist when encountering difficulties and obstacles. Self-efficacy is specific to the particular behaviour and situation in which the behaviour occurs. Bandura suggested that this perception of self-confidence has its source from within four areas of human learning: (i) past experiences of success or failure in the particular action (performance accomplishment); (ii) observing others performing the behaviour and evaluating the consequences (vicarious experiences); (iii) the influence of others informing one about capabilities (verbal persuasion and social support) and; (iv) physical feelings that accompany performing the activity (physiological arousal and feedback). These four areas are particularly well suited for interventions to enhance self-efficacy.

Various aspects of self-efficacy have been found to be powerful predictors of health behaviour. Self-efficacy has been used to predict both smoking cessation, physical activity and eating behaviours. Despite the strong predictive power of self-efficacy on certain health behaviour, this study does not include Bandura's self-efficacy construct for two main reasons. Firstly, self-efficacy as defined by Bandura relates only to beliefs about one's capacity to perform well in a specific task (e.g. smoking cessation) and is not a global disposition that can be measured by an omnibus test. Bandura was emphatic that measures of self-efficacy must be tailored to each domain of health behaviour that is being explored. Thus, to include this construct in the study, self-efficacy for each health-
enhancing behaviour (smoking cessation, weight normalisation, adequate physical activity, medication adherence and low dietary fat intake) would need to be assessed. To date, no validated instrument is available that could measure the self-efficacy of all five health-enhancing behaviours, and that is suitable for use in AMI patients. The development of such an instrument is beyond the scope of this study. Secondly, this study will be assessing a personality trait, sense of coherence and the meaningfulness component of this construct is similar to Bandura’s concept of self-efficacy. In addition, this is a global dispositional construct and could be generalised across the five health behaviours explored in this study.

In keeping with the notions of the role of personality traits and health behaviour, several key aspects of personality traits (optimism, hardiness, sense of coherence) will be discussed and their particular application to this study will be outlined.

**Optimism**

Optimism which pertains to expectancies and reflects a positive outlook is embedded in the theoretical model of behaviour self-regulation. According to this theory, individuals strive for goals as long as they see them as attainable and believe that their actions will produce the desired outcome. This expectancy can be generalised across situations and is stable over time. Therefore, the label “dispositional optimism” has been chosen by the developers. Dispositional optimism is a generalised expectation that good, as opposed to bad outcomes, generally occur when confronting problems across important life domains.

According to Scheier and Carver, this belief results in optimists exerting greater effort toward attaining desired outcomes, whereas pessimists reduce or withdraw effort and eventually abandon their desired goals.

Dispositional optimism has been found to have beneficial effects on psychological and physical well-being, more favourable quality of life after surgery and a faster rate of recovery following AMI. Optimists have also displayed increased resistance to the development of postpartum depressive symptoms. It is suggested that optimistic individuals are also more likely to tap into social support. A number of studies have shown a strong inverse relationship between optimism and stress. Some researchers suggest that optimistic individuals cope more adaptively with stress. It is recognised that personality, stress and other
psychosocial variables have a strong impact on the neuroendocrine as well as the immune system. Optimism and the immune response may influence biological processes directly, or indirectly, by attenuating the effects of stress. Optimism has also been associated with adaptive coping. In a cardiac rehabilitation program over an 18-week period, optimism was found to be a predictor of success in making lifestyle changes. It was also shown to be positively related to health-promoting behaviour in a large group of undergraduate students.

Aside from these studies, the empirical evidence showing optimism as a significant predictor of health behaviour is sparse. However, this is not the only justification that warrants further examination of the relationship between optimism and health behaviour. According to Seligman, who in 1991 coined the phrase “learned optimism”, pessimism can be changed greatly by using subtle, self-aggrandising deception that fosters good cheer and good health. Taking this argument one step further, if optimism is also found to influence health behavioural practices, the malleability of this psychological factor would be a potential avenue for interventions in promoting health-enhancing behaviours in CHD patients. Because of these two reasons, dispositional optimism is included in this study.

**Hardiness**

In 1979, Kobasa published a theory, focusing on the “wellness” orientation, and developed the hardy personality concept, which emerged from an existential theory of personality. According to Kobasa, a hardy person possesses three general characteristics: i) the belief that they can control or influence the events of their experience; ii) an ability to feel deeply involved in or committed to the activities of their lives; and iii) the anticipation of change as an exciting challenge to further development.

Hardiness is suggested to moderate the harmful effects of life stress by activation of transformational coping. Transformational coping includes interpretations of situational events, activating imagination to produce new possible ways of confronting the stressful situation, decisions on worthwhile and possible ways of dealing with such events, mobilising resources, and performing other activities to carry out these decisions.
Hardiness is also associated with better physical and psychological health. In a review of 12 studies performed on a wide array of populations by Kobasa,\(^{379}\) strong associations between high levels of hardiness and health were reported. The hardiness concept was originally hypothesised as a moderator of stress on health.\(^{380}\) An inverse relationship between stress and hardiness has been reported in work-related stress among nurses\(^ {381}\) and highway patrol officers.\(^ {382}\) However, it has been shown that hardy individuals are healthier regardless of stress.\(^ {383}\)

Whilst hardiness has been found to be positively associated with regular physical activity\(^ {260}\) and other health-promoting behaviours,\(^ {384,385}\) it is not an encompassing concept. The 50-item hardiness scale used to measure this construct is strongly related to “health proneness” but lacks discrimination for negative affect.\(^ {386}\) This study selects a similar construct for exploration, sense of coherence, in the context of first AMI survivors. Sense of coherence examines both the positive and the negative affect.

**Sense of coherence**

**The salutogenic origin and sense of coherence**

In 1970 in Israel, Antonovsky was studying how women of different ethnic origins adapted to menopause. He compared a group of female concentration camp survivors with a control group. Antonovsky found that 29% of concentration camp surviving women and 51% of women in the control group had good overall physical and emotional health. Instead of attempting to find an explanation for the differences between the two groups, Antonovsky focused on the 29% of concentration camp survivors. This group, who had gone through the horror of the concentration camp, had witnessed three wars and still emerged from the experiences with reasonable physical and mental health. Antonovsky attributed this to the “generalised resistance resources” of the person.\(^ {387}\) These generalised resistance resources include ego strength, money, cultural stability, social support and spiritual beliefs. What is common to all generalised resistance resources is that they help to make sense out of several stressors and, over time, they generate a strong sense of coherence (SOC).\(^ {388}\) Alternatively, “generalised resistance deficits” (e.g. few material resources, inadequate social support, weak ego identity) provide experiences that weaken SOC. It is a high SOC that is thought to promote health.\(^ {389}\)
SOC is defined by Antonovsky as:

a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable, and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement (p.19).

SOC consists of three intertwined components: comprehensibility, manageability and meaningfulness. Comprehensibility refers to the extent to which individuals perceive the stimuli that confront them as making cognitive sense. The problem or stimuli is perceived to be in context and is consistent, structured and clear rather than chaotic, random and unpredictable. Manageability refers to the extent to which individuals perceive that resources are at their disposal to meet the demands imposed by the stimuli. Meaningfulness refers to the extent to which one feels that life makes sense emotionally, that at least some of the problems and demands posed by living are worth investing energy in, and are worthy of commitment and engagement. Meaningfulness is regarded to be the most crucial component for successful coping.

Antonovsky suggested that SOC is a key variable in maintaining health, describing SOC as a personality trait, a dispositional orientation of a person and not a state that fluctuates. He believed a person's SOC stabilised by about the age of 30, barring radical and lasting changes in one's life situation.

However, one randomised controlled study on CHD survivors involving major lifestyle changes and stress management demonstrated a positive and significant change in SOC over the one year period of the study (p = 0.002). Likewise, a recent study on the Canadian Working Population that followed 5,945 workers in the labour force between 1994 and 1998 also uncovered a significant decrease in SOC score when the workers experienced a drop in their occupational status. Although it is not the objective of this study to examine the change in SOC, the study adopts the view that SOC is malleable and can change over time, because of change in external factors which include clinical interventions by health professionals.
Sense of coherence and stress

In addition to being influenced by a number of external factors, SOC also has a negative or a buffering effect on stress. The appraisal of stress by the individual is pivotal in determining whether a stimulus is (i) a stressor and (ii) if the stressor is deemed positive, negative, benign or irrelevant. If a stimulus is perceived a stressor, it causes tension, but if it is perceived as benign or irrelevant, the tension goes away.\textsuperscript{395} Antonovsky proposed that individuals with strong SOC are more likely to perceive a stimulus as a nonstressor because they are more confident of their ability to cope with the demand.\textsuperscript{390} A strong sense of coherence does not represent a particular coping style but rather an approach to choose the appropriate coping strategy from a repertoire of resources for a given situation.\textsuperscript{390}

Several studies have provided empirical support for Antonovsky’s hypothesis. People with high sense of coherence choose more adaptive coping processes.\textsuperscript{362} SOC has also been shown to be an important contributing factor in successful emotional coping\textsuperscript{396} and promotes a better immune response.\textsuperscript{397} Caregivers of elderly persons with high SOC were less likely to perceive role overload.\textsuperscript{398} Depressed people have also been reported to have lower sense of coherence than nondepressed people.\textsuperscript{399}

Sense of coherence and health behaviour

Antonovsky\textsuperscript{393} postulated that individuals with strong SOC are more likely to engage in health-promoting behaviour because they are better able to accurately assess the stressors and mobilise appropriate resources to deal with these stressors.

In empirical studies on SOC and health behaviours, high SOC has been shown to be a significant negative predictor of alcohol problems among a group of 952 older adults; that is, the higher the SOC, the less alcohol problems experienced.\textsuperscript{400} In a group of 88 Type-2 diabetic patients, high SOC was also shown to be positively correlated to lower glycosylated haemoglobin, an indicator of good adherence to the diabetic treatment regimen.\textsuperscript{401} High SOC has also been shown to predict non-dropout in a multidrug intervention program\textsuperscript{402} and more frequent exercise behaviour.\textsuperscript{260, 403}
As previously mentioned, although the SOC construct was purported to be a personality trait by Antonovsky, at least two studies have shown that SOC changes significantly over time, with or without clinical interventions.\textsuperscript{168, 394} If the SOC construct is an influencing factor in health behaviour, the mutability of this factor adds weight to why it requires further investigation in health behavioural research.

Compared to a very similar construct, hardiness, the sense of coherence construct is also more encompassing. For example, approximately 50\% of the 29-items on the Orientation to Life Questionnaire (OLQ) inquire about the respondent's affect with the "feeling" term included in the item. Only about 10\% of items on the Hardiness Scale used this term. Secondly, SOC taps into the positive as well as the negative affect of an individual's psychological being, whereas hardiness is mostly related to the positive affect dimension. For these reasons, the SOC construct was selected in preference to the hardiness personality construct for inclusion in this study.

**Social support**

The positive relationship between social support and health has been recognised for many years.\textsuperscript{404} Social support research has been criticised because of the significant differences in the way the concept is defined and measured.\textsuperscript{405, 406} This study adopts Heller and Swindle's definition of social support, which is "a generalised appraisal that individuals develop in various role domains of their lives in which they believe they are cared for, valued and that significant others are available to them in times of need. Furthermore, they are satisfied with the relationships they have"\textsuperscript{406} (p.467).

In patients with CHD, social support could be provided by families, friends, significant others, or by health care professionals in hospital or community settings. Individuals with higher levels of social support reported better health and well-being,\textsuperscript{407, 408} faster recovery after a cardiac event,\textsuperscript{409} and had less psychological stress after cardiac surgery.\textsuperscript{410} It has also been shown to improve survival after AMI.\textsuperscript{276, 411}
Several studies have found that social support is inversely related to depression.\textsuperscript{249} It has been argued that social support is a function of a combination of personality traits,\textsuperscript{365, 413} suggesting that social support aggregates with certain personality traits. Sumi\textsuperscript{414} has suggested there is a three-way interaction between social support, stress and personality traits. This study will be testing the relationship between these three factors.

**Social support and health behaviour**

The association between social support and positive health behavioural outcomes has been reported in a number of studies, however, the exact mechanism by which social support influences health behaviour is still unknown.\textsuperscript{415} A number of social support theorists maintain that social support can enhance coping and adjustment directly, by increasing the individual’s positive affect, self-confidence and sense of personal satisfaction.\textsuperscript{406, 408, 416-418} It can also influence behavioural change by providing appropriate information, or, encouraging individuals to engage in health behaviours, seek help or adhere to treatment regimens.\textsuperscript{419}

The social support concept has been associated with success at all stages of smoking cessation,\textsuperscript{293, 304, 420, 421} weight loss,\textsuperscript{422-424} physical exercise,\textsuperscript{304, 425} and adherence to dietary recommendations.\textsuperscript{426-428} Given the nature of the health-enhancing behaviours required of first AMI survivors, social support may play a vital role in understanding such behaviours. Hence, this study will examine both the direct effect of social support and the indirect effects of social support through other psychosocial factors.

**2.7 Health behaviour models**

There are many and varied approaches taken to understand factors that determine the performance of health behaviours. A broad classification can be made between factors intrinsic to the individual (e.g. sociodemographic factors, personality traits, cognition) and factors extrinsic to the individual (taxing tobacco and alcohol, fines for not wearing seat-belts). Intrinsic factors, particularly cognitive factors have received most attention and have been widely used and tested by psychologists. The following section is a review of theories and models that combine some or all these intrinsic factors.
A variety of theories and models have been developed to help explain, predict, and facilitate change in human behaviour. These models generally incorporate factors that have been deemed accountable for individual differences in the propensity to adopt health behaviours. They may include demographic factors, social factors, emotional factors, perceived symptoms and healthcare-seeking behaviours, personality factors and health beliefs. In attempting to promote behavioural change, therapists and other health care providers often use aspects of multiple theories simultaneously. None of the pre-existing health behaviour models are used in this study. A brief overview of the two main types of health models is however discussed.

2.7.1 Social cognitive approaches and health behaviour models

Social cognition models (SCMs) are concerned with the interrelationships between the various aspects of an individual’s thought processes and their effects on health behaviours. The social cognitive approaches, focus on how individuals make sense of social situations. There is still no general consensus that considers which social cognitive models are better in health behaviours. Some of the commonly used models are: the health locus of control, the health belief model (HBM), protection motivation theory (PMT), theory of planned behaviour (TPB) and self-efficacy models. There is considerable overlap of the constructs in these models. The following is a brief outline of these models.

Health Belief Model

The Health Belief Model (HBM) was first used to predict health screening behaviour in the early 1950s. Since this time, it has received more attention than any other model on health behaviour. It has been used to study a variety of populations over a wide range of health behaviours. Two aspects of an individual’s cognition of health behaviour are represented in this model: threat perception of illness and evaluation of behaviours to overcome this threat. Threat perception is represented by two constructs, perceived susceptibility to illness and perceived severity of such illness. Behavioural evaluation is also represented by two constructs, perceived benefits of a recommended health behaviour and perceived barriers to carrying out the health behaviour.
However, not all components of this model perform well in predicting health behaviours. In one review of 29 HBM investigations, perceived barriers were shown to be the HBM dimensions with the strongest predictor power of health behaviour. The perceived barrier dimension has been considered to be too broad because it includes both internal and external barriers. A case for the inclusion of self-efficacy into the model has also been strongly argued. An example of a HBM tool, the Standardised Compliance Questionnaire, has been used to predict compliance to the cardiac rehabilitation program. It explained an additional 5.2% in the variance of cardiac rehabilitation attendance, but has not been tested for validity or reliability (see Appendix 5.5). However, the nebulous definitions of the other constructs in this model (perceived susceptibility, perceived severity, perceived benefits and perceived barriers), and the lack of validated tools precluded its inclusion in the current study.

**Protection Motivation Theory**

The original PMT was proposed within the framework of fear-arousing communication, that fear influences cognition, attitudes, behavioural intentions and health behaviour. A revision of the PMT extended the model to incorporate self-efficacy and included a broader statement on the coping process.

Like the health belief model, protection motivation theory stresses illness dimensions, especially the consequences of illness. According to this model, health behaviour (adaptive response, e.g. refusing to ride with a drinking driver) or maladaptive response (e.g. riding with a drinking driver) depends primarily on four cognitive perceptions which arouse protection motivation: severity of the health problems, personal vulnerability for the disease, the capability to undertake the behavioural change (self-efficacy), and whether the behavioural change will alleviate or obliterate the health problem (response efficacy). PMT describes adaptive and maladaptive coping with a health threat and the influence of two appraisal processes on health behaviour: threat appraisal and coping appraisal. Threat appraisal evaluates the chance of contracting a disease (perceived vulnerability) and evaluates the seriousness of the disease (perceived severity). Threat appraisal is supposed to inhibit maladaptive response and the advantage of maladaptive behaviour (eg. pleasure of smoking) increases the likelihood of maladaptive coping. The coping appraisal process is related to components which are
related to the individual’s expectancy to remove the threat by carrying out the health behaviour and the individual’s belief about their ability to carry out the behaviour (self-efficacy). Coping appraisal enhances coping responses whereas the cost of adaptive behaviours (e.g. cost of nicotine replacement to aid smoking cessation) inhibits coping responses.  

Although the PMT model has been shown to be successful in predicting health intention, and the constructs provide a sound conceptual framework for understanding health behaviours, they overlook the physiological basis and the social aspects of certain health-damaging behaviours (e.g. nicotine dependence and failure to quit smoking). Additionally, there is a lack of valid and reliable instruments suitable to test this model in patients with CHD. The development of such instruments was beyond the scope of the study.

**Theory of Planned Behaviour**

This theory was first developed by Ajzen and colleagues in 1985. The Theory of Planned Behaviour (TPB) is a progression from the theory of reasoned action. The theory of reasoned action (TRA) emphasised the central role of attitude, and social environment or subjective norms. The TPB included non-motivational determinants of behaviour in the TRA model.

According to the TPB, behavioural intention is a function of three distinct constructs. The first construct, attitude towards the behaviour, is determined by positive and negative evaluation of a particular behaviour and beliefs about the outcome of the behaviour. The second construct, subjective norm, is determined by social pressure to comply or avoid the behaviour. The third construct, perceived behaviour control, is determined by internal control factors (e.g. skills, abilities, information) and external control factors (e.g. time, money). The three constructs have a positive correlation with one another and a high behavioural intention increases the likelihood of health behaviour.

Unlike the HBM and PMT, this model addresses social and environmental factors and perceived behaviour control. The TPB has been shown to be useful in predicting a variety of health behaviours, including exercise behaviour, weight loss and breast self-examination. However, the TPB model does not include factors such as personality traits or perceived stress. Hence this health behaviour model was not selected for the current study.
**Transtheoretical Model**

The Transtheoretical Model (TTM) or the Stages of Change model was developed as a general explanatory model of intentional behavioural change. Each stage is characterised by distinct cognitive markers. The model is based on the premise that an individual moves from being uninterested (precontemplation stage) to considering a change (contemplation stage), to deciding and preparing to make a change (preparation stage). The model describes the various motivational stages among individuals, from:

1. Precontemplation: not intending to make any changes;
2. Contemplation: considering a change;
3. Preparation: making small changes;
4. Action: actively engaging in a new behaviour; and
5. Maintenance: sustaining the change over time.

An individual can stay in one stage of change for a considerable period of time or move to another stage quickly. The stage-of-change concept is used to guide assessment of motivational readiness to adopt new behaviours and to select the appropriate intervention techniques for each stage.

This model is probably the most influential model to emerge in recent years because it is useful for selecting the appropriate interventions, depending on the motivational stage of the individual. It has demonstrated widespread utility in explaining health behaviours and helping individuals change their health-damaging behaviours: from smoking behaviour, exercise intention and behaviour, dietary intake to breast self-examination. However, most of these studies used cross-sectional designs and recent longitudinal studies on addictive health habits do not support this model.

There is still relatively little evidence comparing the stage-based with other non-stage-based interventions to demonstrate its advantage. Recently variables from the social cognition models, self-efficacy and outcome expectancy, were shown to be better predictors of change than the stages in the TTM. Therefore TTM cannot be the only model to be examined in current health behaviour research. Other health behaviour models also warrant further investigation, including the proposed model outlined in this current study.
2.8 Conceptual model: relationships between psychosocial factors and health-enhancing behaviours

Health behavioural change is influenced by many factors. However, some factors such as depression and self-efficacy have been shown to be more likely to influence health behavioural change than other factors such as health locus of control and fear. Models which include more factors are generally better predictors of health behaviour. However, no one efficient model has yet been developed. Since the emergence of the Health Belief Model over 50 years ago, at least 14 models have been developed to help explain health behavioural change.\(^{336,444}\) In this study none of the existing health behaviour models work for two reasons. There are the lack of context-specific instruments for CHD survivors and the exclusion of personality traits in existing health behaviour models.

Many health behaviour models require instruments that are context-specific, and there are no validated instruments that could be used to test a number of these constructs for CHD survivors. Hence, to test one of these models would possibly require instrument development as well as instrument testing, which is beyond the scope of this thesis.

Secondly, none of the existing socio-cognitive models included personality traits as a predictor of change. One of the objectives of this study is to examine the relationships between personality traits (specifically, dispositional optimism and sense of coherence) and sociodemographic, clinical and other psychosocial factors (social support and perceived stress) and the influence of these relationships on health behaviours in first AMI survivors.

A new model is developed for this study. The conceptual framework which underpins the design of this study, is based on one of the pathways hypothesised by Antonovsky, i.e. that the personality trait, ‘sense of coherence’ influences an individual to choose health-promoting behaviours (adaptive coping).\(^{472}\) In this study, a model that incorporates Antonovsky’s hypothesis on stress and coping and generalised resistance resources (e.g. educational attainment and social support), is combined with sociodemographic factors to predict health-enhancing behaviours and perceived stress in first AMI patients. A schematic representation of this conceptual model appears in Figure 2.1 (p. 45). This figure proposes that positive relationships exist between perceived social support, educational achievement and age and the two
personality traits, sense of coherence and dispositional optimism. The model also proposes that first AMI survivors with higher sense of coherence and dispositional optimism experience less stress which in turn will promote adaptive coping, the engagement of health-enhancing behaviours. As previously discussed, both sense of coherence and dispositional optimism has a negative or buffering effect on stress and stress is pivotal in influencing adaptive health-related behaviours.
Figure 2.1 Conceptual model of the relationships between psychosocial factors and health-enhancing behaviours at the 6-month follow-up: the integrated health-enhancing behaviour model.
2.9 Summary

In summary, this review of the literature has highlighted several key points that have influenced the design and execution of this thesis:

a) Behavioural management approaches are a substantial part of the intervention repertoire available to health professionals assisting AMI survivors;

b) There are five core health-enhancing behaviours of importance to survivors of first AMI: non-smoking behaviour, weight normalisation, adequate physical activity, medication adherence and low dietary fat intake;

c) Although certain health-enhancing behaviours have been identified to substantially reduce the risk of recurrent cardiac event and improve survival (e.g., smoking cessation), there is a suggestion of a multiplicative benefit of engaging in several of the health-enhancing behaviours rather than simply one health-enhancing behaviour. Hence the examination of all five core health-enhancing behaviours simultaneously is important;

d) Cardiac rehabilitation programs provide an excellent opportunity for delivering education relating to how to develop or enhance these five core health-enhancing behaviours, although those most at risk may not attend such programs;

e) Cross-sectional research designs, often used in behaviour research, are unlikely to provide evidence of behavioural change over a defined time period. For this clinical group; the true influence of psychosocial factors on health behaviour need to be examined using a prospective study design;

f) There are a range of possible sociodemographic and psychosocial factors that may be influential in specific health behavioural change, a selection of these has been chosen based on existing or lack of existing research, or the possibility that evidence found to influence other behaviours may have a place in changing behaviour in first AMI survivors; and
g) Although there are several behaviour models commonly used to explain or predict health behaviour in clinical situations, Antonovsky’s hypothesis on stress and coping was chosen by this investigator because of the opportunity to explore the influence of personality traits and stress upon adaptive coping, which in this case refers to the engagement in health-enhancing behaviours.

The next chapter describes the problem statement and specific hypotheses to be addressed within this study.
Chapter 3
Study objectives

3.1 Introduction and problem statement
Following an acute coronary event, lifestyle modification is necessary for optimal cardiac risk management. In this study of first AMI survivors, the set standards of health behaviours are known as health-enhancing behaviours. They are: i) non-smoking behaviour; ii) weight normalisation; iii) adequate physical activity; iv) strict medication adherence; and v) low dietary fat intake (previously outlined in Section 2.5.2, p.21).

Despite being confronted with a life-threatening event such as an AMI, engagement of health-enhancing behaviours does not always ensue. Whilst AMI survivors may readily adopt some health-enhancing behaviours, other health-enhancing behaviours may have a low participation rate. It could be that some first AMI patients are unaware of the need to modify certain risk factors. It could also be that some health-enhancing behaviours are easier to adopt than others. Almost all research on health behavioural changes following an acute coronary event focuses on selected health behaviours and not on all health-enhancing behaviours. Still fewer have addressed personality traits in conjunction with other psychosocial factors and sociodemographic factors on the engagement of health-enhancing behaviours in AMI survivors.

As discussed in Chapter 2, attendance at outpatient cardiac rehabilitation has been linked with positive health practices, and sociodemographic and psychosocial factors may either hinder or enhance positive health behavioural change following a coronary event. All these factors may have a direct or indirect effect on these individuals in achieving the target health-enhancing behaviours, as well as perpetuate the practice of health-damaging behaviours.
Section 1.3 in Chapter 1 (p.5) stated four aims of this study. These four aims seek to examine:

a) the psychometric properties of the scale instruments used in this study;
b) the extent to which health-enhancing behaviour is practised, both at baseline and at the 6-month follow-up, and the magnitude of health behavioural change between baseline and the 6-month follow-up;
c) if attendance at outpatient cardiac rehabilitation, sociodemographic or psychosocial factors predict health-enhancing behaviours at the 6-month follow-up; and
d) the proposed model derived from Antonovsky’s hypothesis on the direct and indirect relationships between selected sociodemographic and psychosocial factors on cardiac risk factors at the 6-month follow-up.

To address these aims, a number of specific hypotheses will be tested.

3.2 Hypotheses

The first set of hypotheses relates to the extent to which health-enhancing behaviours were practised and the magnitude of health behavioural change between the time of the initial cardiac event (baseline) and six months following this event (6-month follow-up). The associations between these health-enhancing behaviours were also examined.

In first AMI patients in SWSAHS:

H1.1: Smoking behaviour (any self-reported smoking at time of AMI or in the one month preceding the AMI) will be less at the 6-month follow-up than at the time of the initial cardiac event.

H1.2: For survivors with a BMI greater than 25 kg/m² at the time of the initial cardiac event, BMI will return to within the normal range (18.6 to 24.9 kg/m²) by the time of the 6-month follow-up.

H1.3: Participation in adequate physical activity (at least five times and at least 2½ hours per week of moderate or vigorous intensity) will increase by the time of the 6-month follow-up compared to at the time of the initial cardiac event.

H1.4: Saturated fat diet (<7% saturated fat) will be less at the time of the 6-month follow-up compared to at the time of the initial cardiac event.
H1.5: There will be an increase in the number of health-enhancing behaviours at the time of the 6-month follow-up compared to at the time of the initial cardiac event.

The second set of hypotheses relates to predictors of health-enhancing behaviours at the 6-month follow-up. The following is a list of predictors of health-enhancing behaviours and where appropriate, the methods of measurement used to assess these predictors are included in brackets: attendance at outpatient cardiac rehabilitation, sociodemographic factors (age, gender, living with partner and highest educational achievement) and psychosocial factors (perceived stress, \{as measured by the Perceived Stress Scale\}, optimism \{as measured by the Life Orientation Test-Revised\}, sense of coherence \{as measured by the Orientation to Life Questionnaire\}, perceived social support \{as measured by the Multidimensional Perceived Social Support Scale\}).

Hence, the second set of hypotheses is:

**H2.1** Non-smoking behaviour (self-reported non-smoking at least one month preceding the 6-month follow-up survey) in first AMI survivors at the 6-month follow-up will be associated with attendance at an outpatient cardiac rehabilitation program, sociodemographic and psychosocial factors.

**H2.2** Weight normalisation (BMI: 18.5 to 24.9 kg/m²) in first AMI survivors at the 6-month follow-up will be associated with attendance at an outpatient cardiac rehabilitation program, sociodemographic and psychosocial factors.

**H2.3** Adequate physical activity (at least five times and at least 2½ hours per week of moderate or vigorous intensity) in first AMI survivors at the 6-month follow-up will be associated with attendance at an outpatient cardiac rehabilitation program, sociodemographic and psychosocial factors.

**H2.4** Strict medication adherence (measured by a single-item response, "taking medication strictly as ordered by the doctor") in first AMI survivors at the 6-month follow-up will be associated with attendance at an outpatient cardiac rehabilitation program, sociodemographic and psychosocial factors.
H2.5 Low dietary fat intake (<20% total fat, <7% saturated fat {measured by the 17-item Short Fat Questionnaire as having a score of less than 20}) in first AMI survivors at the 6-month follow-up will be associated with attendance at an outpatient cardiac rehabilitation program, sociodemographic and psychosocial factors.

H2.6 The engagement of more than three health-enhancing behaviours in first AMI survivors at the 6-month follow-up will be positively associated with attendance at an outpatient cardiac rehabilitation program, sociodemographic and psychosocial factors.

The third set of hypotheses was generated to test the conceptual model of this study, derived from Antonovsky’s hypothesis on stress and coping but in the context of first AMI patients. Generalised resistance resources are factors that promote the development of a strong SOC. They include wealth, ego strength, educational achievement, cultural stability and social support.\(^{473}\) Three generalised resistance resources were included in this model: perceived social support (measured by the *Multidimensional Perceived Social Support Scale*), educational achievement and age. Both social support and educational achievement have been listed as examples of generalised resistance resources by Antonovsky.\(^{388,390,474,475}\) Age, in this study, was included as one of the generalised resistance resources for two reasons: first, it has been shown that SOC is positively associated with age\(^{476,477}\), second, high SOC is associated with better health,\(^{388,390,478-481}\) and thus individuals with high SOC are likely to suffer their AMI at a later age. A diagram of the conceptual model is presented in Figure 2.1 (p. 45) and tests the following hypotheses:

H3.1 Generalised resistance resources (i.e. perceived social support and educational achievement) and age are positively associated with health-enhancing personality traits (i.e. dispositional optimism {as measured by the *Life Orientation Test-Revised*} and sense of coherence {as measured by the *Orientation to Life Questionnaire*}).
H3.2 Health-enhancing personality traits (i.e. dispositional optimism (as measured by the Life Orientation Test-Revised) and sense of coherence (as measured by the Orientation to Life Questionnaire)) are negatively associated with perceived stress (as measured by the Perceived Stress Scale).

H3.3 Perceived stress at baseline (as measured by the Perceived Stress Scale) will have a negative effect on the five health-enhancing behaviours (non-smoking behaviour (self-reported non-smoking at least one month preceding the 6-month follow-up survey), BMI within the normal range (18.6 to 24.9 kg/m²), adequate physical activity (at least five times and at least 2½ hours per week of moderate or vigorous intensity), medication adherence (taking medication strictly as ordered by the doctor) and low dietary fat intake (<20% total fat, <7% saturated fat) ) at the 6-month follow-up.

These defined hypotheses will be shaped into a series of three major studies. The method used to examine these hypotheses are described in detail with the following chapter.
Chapter 4
Methods

4.1 Introduction
This chapter will provide a rationale for the research design, sampling method and procedure for data collection. A detailed exploration of the measuring instruments used in the study will be presented in Chapter 5, which will include a description of data analysis used on these measuring instruments.

4.2 Rationale for research design
The research aims of this study are to examine the magnitude of health behavioural change in AMI patients and to explore predictors, particularly psychosocial predictors, of health behaviour following the initial acute coronary event. If health behavioural changes are to occur, it is most likely that these will have taken place, and have been incorporated into the person's daily lifestyle, by six months after their life-threatening experience. Following an AMI, mortality rates are greatest in the first year with an estimated 5% to 15% of patients likely to die from heart disease during this period. Thus, it is crucial for health behavioural change to occur within the first year of the acute coronary event. For these reasons, longitudinal studies on AMI patients often choose six months after the AMI as the time to follow-up patients to assess changes in their health status. This study examines changes in health behaviours six months after the coronary event.

This study chose to examine health behavioural change in a naturalistic setting in which patients might or might not have attended formal outpatient cardiac rehabilitation. Hence, a descriptive, non-experimental, follow-up design was selected. The prospective nature of the study improves the argument for causality since the psychosocial variables of interest can be measured in a consistent manner for each participant, before the outcome variables are measured.
4.2.1 Inclusion/exclusion criteria
AMI patients who fail to adopt health behavioural change are more likely to suffer reinfarction.\textsuperscript{487,488} Similarly, diabetic patients who do not engage in health behaviour are also more likely to have an AMI.\textsuperscript{489,490} Despite this, the current study will not include these patients because they have already encountered a serious health condition that required them to modify their health behaviours. Only first AMI patients who were not diabetic were included in this study. This is also an important group to study because they are most likely to be highly motivated to adopt health behaviours, and any health advice given by health professionals at this time is often given more weight.\textsuperscript{41} Hence, the study excludes patients who had a previous history of an AMI and patients who had previously been diagnosed with diabetes mellitus, to avoid including individuals who are resistant to change.

4.2.2 Benchmarks of health-enhancing behaviours
As previously discussed in Section 2.4.2, a predetermined standard of health behaviour is necessary in order to achieve optimal health benefits for AMI patients. These benchmarks of health behaviours are called health-enhancing behaviours. In this study they are:

a) Non-smoking behaviour. This includes individuals who never smoked or individuals who had stopped smoking completely, at least one month before the time of survey. This definition is consistent with other studies on smoking cessation in AMI patients.\textsuperscript{93}

b) Weight normalisation (BMI: 18.5 to 24.9 kg/m\textsuperscript{2}). This is the recommended range of target BMI prescribed by the National Heart Foundation of Australia,\textsuperscript{33} and has been known to lower CHD risks in prospective cohort studies.

c) Adequate physical activity level (at least five times and at least 2½ hours per week of moderate or vigorous intensity). This level of physical activity is recommended by a number of cardiac societies and medical associations, including the National Heart Foundation of Australia and the American College of Sports Medicine.\textsuperscript{29,180-182}
d) Strict medication adherence. Four groups of cardioprotective drugs; the antiplatelet agents, beta-blockers, ACE inhibitors and lipid-lowering agents, improve survival rates in AMI patients.\textsuperscript{45, 76, 134, 148, 491-493} However, for these medications to be effective, patients need to adhere strictly to the medication regimen.\textsuperscript{494}

e) Low dietary fat intake (<20% total fat, <7% saturated fat). This is the American Heart Association (AHA) Step II diet, low in saturated fat and cholesterol\textsuperscript{50} and has been shown to lower CHD risks in prospective cohort studies.\textsuperscript{152-154}

Non-smoking behaviour and physical activity measurement were based on the method used in the Australian Risk Factor Prevalence Study,\textsuperscript{495} and measurement of medication adherence was adapted from items used in a long-term follow-up study of lifestyle changes in AMI survivors.\textsuperscript{496} BMI classification for normal weight, overweight and obesity is based on WHO clinical guidelines on overweight and obesity in adults.\textsuperscript{497} Dietary fat intake was measured using the 17-item Short Fat Questionnaire developed to investigate Australian dietary fat intake.\textsuperscript{498} These benchmarks form the dependent variables in this research study.

4.2.3 Selection of predictor and other variables

The purpose of this study was to examine patient characteristics that predict health behaviours following hospitalisation for their first AMI. The study included a broad range of potential predictor variables from two categories: sociodemographic and psychosocial variables. Table 4.1 shows the two groups of potential predictor variables included. These variables are used to test for direct and indirect relationships with the dependent variables, the health-enhancing behaviours.

<table>
<thead>
<tr>
<th>Sociodemographic variables</th>
<th>Psychosocial variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>• age</td>
<td>• perceived stress</td>
</tr>
<tr>
<td>• gender</td>
<td>• dispositional optimism</td>
</tr>
<tr>
<td>• living with partner</td>
<td>• sense of coherence</td>
</tr>
<tr>
<td>• occupation</td>
<td>• perceived social support</td>
</tr>
<tr>
<td>• highest educational achievement</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.1 Predictor variables included in the study
Sociodemographic variables

Sociodemographic variables selected for this study such as age, gender and marital status have been shown repeatedly to influence health behaviour. An indicator of socioeconomic status was measured using the educational level of the survivors. Education is the most widely used indicator of socioeconomic status in epidemiological studies for two principal reasons. Firstly, questions to respondents about education have relatively low non-response rates and are not complex. Secondly, educational level has been shown to be the most consistent predictor of cardiovascular risk factors.

Psychosocial variables

The main aim of this study was to investigate the psychosocial resources that empower individuals to adopt and maintain cardiac health behaviours. Three psychosocial resources were selected for the study: sense of coherence, dispositional optimism and perceived social support. The first two constructs are personality dispositions that have been shown to be beneficial in maintaining health as reviewed in Section 2.5.3 (pp. 32 and 37). As best as could be determined, with the exception of one study, the influence of the two personality traits have not been explored simultaneously on health or health behaviour. This study is interested in comparing the influences of these two personality traits on health behaviour. The third psychosocial construct selected for the study, social support, is a construct that has been well explored in health and health behaviour but its relationship with personality traits in health behaviour has not been well studied. The fourth psychosocial construct included in the study, perceived stress, is the only psychosocial construct that has been implicated in ill health and linked with poor health behaviour.

The first psychosocial variable included in the study, sense of coherence (SOC) refers to a personality construct that is central to health and well-being, in contrast to the traditional focus on pathogenesis and illness.

The second psychosocial variable was dispositional optimism. Dispositional optimism refers to the general belief that outcomes will be positive rather than negative. The general belief that good outcomes are attainable and bad outcomes are avoidable results in optimists exerting greater effort toward achieving the desired goals. The Life Orientation Test (LOT) scale was developed to measure optimism
exclusive of generalised outcome expectancies and is the most widely used measure of dispositional optimism. This instrument was revised to a 10-item format, which involved the deletion of two items from the scale (Life Orientation Test-Revised {LOT-R}).

The third psychosocial variable included in the study was perceived social support. There are significant differences in the way social support is defined and measured. Social support is a multidimensional construct and the dimensions that have been identified include:

- amount of support;
- types of support (e.g. emotional versus instrumental);
- sources of support (e.g. family, friends, significant other, co-workers);
- structure of support network (e.g. size, accessibility, stability); and
- perceived adequacy of the support.

Perceived social support refers to a generalised appraisal in which individuals feel they are cared for and valued, that support is available in times of need and that they are satisfied with the relationships. Perceived social support has been found to be more predictive of positive outcome than availability of support. Perceived or appraised social support has been shown to be strongly related to mortality.

Various measures of perceived social support have been reported, some of which have been tested for reliability, validity and internal consistency. The Multidimensional Scale of Perceived Social Support Scale (MSPSS) was chosen for this study. This scale consists of only 12 items, and measures the three main sources of social support: family, friends and significant others. It has good internal reliability for the total scale as well as for the subscales, and adequate stability over a 2-3 month period.

The fourth psychosocial construct that was included in the study was perceived stress. Since 1985, over 3,000 papers on stress and health have been published in psychological and sociological journals. Three major objective forms of stressors that have been widely investigated are: life events, chronic strains and daily hassles. Life events are specific stressful events (e.g. bereavement, divorce), chronic strains are persistent or recurrent demands on an individual (e.g. high population density, poverty) and daily hassles are mini-events that require behavioural readjustments daily (e.g. traffic jams). Objective measures of stress assume that the events
themselves are detrimental to health and do not take into account the coping
resources available to the individual, whereas appraised stress views challenging
events in light of available coping resources.\textsuperscript{281} Cohen’s perceived stress scale (PSS)
is a global measure of appraised stress.\textsuperscript{510} Three components of stress were included
in the 10 items of this scale: how unpredictable, uncontrollable and overloaded the
respondents perceived their lives in the past four weeks.\textsuperscript{511} The scale aims to obtain
information as to whether demands of situations exceed their ability to cope. Unlike
the Hassles Scale by Lazarus and Folkman, that measures only responses to a
specific list of events, PSS does not tie appraisal to particular situations. It is
sensitive to non-occurrence of events, stress resulting from events in the lives of
significant others and stress related to expectations of future events.\textsuperscript{512}

\subsection*{4.2.4 Self-report survey design}
A survey is defined as an inquiry which involves the collection of systematic data
across a sample of survivors\textsuperscript{513} and self-reports are defined as self administered or
interviewer-administered recall questionnaires, activity logs or diaries.\textsuperscript{514} Although
research assistants were required to extract information from medical records, the
main data collected for this study was based on self-reports. The benefits of self-
report measures are their ability to collect data from a large number of participants at
low cost.\textsuperscript{514} Self report surveys are affirmed to be reliable in assessing personality,\textsuperscript{515}
assessing physical activity,\textsuperscript{514} cigarette smoking\textsuperscript{516} and the amount of alcohol
intake.\textsuperscript{517} They also provide similar information to more expensive and elaborate
methods of assessing and monitoring functional status.\textsuperscript{518} In large-scale population
surveys, self-report is the only feasible method of measurement for assessing health
behaviour\textsuperscript{519} and is one of the most common methods of collecting data in the social
and behavioural sciences.\textsuperscript{520} However, one primary problem of concern in survey
research is the low response rate.\textsuperscript{521} In business marketing research as well as
hospitality research, a response rate of as little as 15 to 30\% is common and results
from such studies are still considered as worthwhile.\textsuperscript{522, 523} In large health surveys,
the response rates are usually considerably higher, ranging from 52\% to 78\%.\textsuperscript{524-528}
However, response rates have been reported to vary across groups, older individuals,
women, individuals from the higher socio-economic groups are more likely to
respond to mail surveys.\textsuperscript{529-531}
Nevertheless, this form of data collection is also a relatively inexpensive and fast method of collecting information from a group of survivors about their health behaviours, sociodemographic and psychosocial factors. Therefore, it was an appropriate choice for the purpose of this study. Additionally, the instruments chosen for this study were developed to be completed in this manner.

4.2.5 Study setting

CHD mortality rates in New South Wales (NSW) are high compared with the rest of Australia, being exceeded only by the Northern Territory and Tasmania. The South Western Sydney Area Health Service (SWSAHS), the site for this study, is one of nine urban area health services (AHS) in NSW (Figure 4.1). It is currently the second largest area health service in terms of population. It is the only urban AHS whose socioeconomic status (SES) is below the NSW average. After adjusting for age, the CHD mortality in SWSAHS is significantly higher than the average NSW rate (7% higher in males and 14% higher in females).

Figure 4.1 South Western Sydney Area Health Service (SWSAHS)
Although the mortality from CHD in Australia has been declining since the mid-1960s, AHS regions with low SES, such as SWSAHS, still have higher rates of premature death and hospitalisation from diseases such as CHD. In light of this, it is crucial that SWSAHS targets the high-risk groups, for example, residents with a history of an AMI, promoting and improving cardiac health and well-being.

**Outpatient Cardiac Rehabilitation Programs**

All four hospitals in SWSAHS selected for inclusion in study conduct an outpatient cardiac program for post AMI patients. Two of these four hospitals had an exercise component in their programs whereby the patients could participate in an on-site supervised exercise program.

The length of these outpatient cardiac rehabilitation programs is typically six weeks in duration comprises of six sessions. Each session is approximately two hours focusing on the following topics: a) heart disease and risk factors; b) medications; c) smoking cessation; d) diet; e) stress management; and f) exercise. Health personnel who conducted these sessions include nurses, occupational therapists, pharmacists, drug and alcohol counsellor, dietician, physiotherapist and psychologist.

**4.3 Design**

Using a longitudinal design, the study sought to examine changes in specific health behaviours that have been previously shown to be pertinent in preventing recurrent coronary events and improving survival. The design also enabled the study to examine the extent to which health-enhancing behaviours were engaged at baseline and six months following the first AMI, as well as the magnitude of health behavioural change. It also enables the study to examine direct predictors of health-enhancing behaviours and test the proposed health behaviour conceptual model described in Chapter 2 (Figure 2.1, p. 45).
4.4 Sample

One hundred and forty-five \( n = 145 \) patients from four hospitals in SWSAHS participated in this study. These hospitals were chosen to represent hospitals of various sizes in the area, from a small rural hospital of less than 100 beds to a tertiary teaching hospital with more than 500 beds. All of these hospitals had a Coronary Care Unit (CCU) where AMI patients were admitted for immediate care during the first few days following the acute coronary event.

Survivors in this study were patients who were admitted to CCUs with a definitive diagnosis of first AMI, evidenced by elevated cardiac enzyme profile (elevated cardiac enzyme is defined as Creatine Kinase isoenzyme MB \{CKMB\} >7.5 ng/ml and Relative Index \{RI\} >2 for that blood sample). All eligible patients had not previously been admitted to hospital with a cardiac event (e.g. chest pain, unstable angina, AMI and heart failure). In addition, as patients were required to respond to a series of questionnaires, eligible patients were literate in English. Patients with a previous diagnosis of diabetes mellitus (both Type 1 and Type 2) were also excluded from the study. Finally, patients who were mentally incapacitated and could not adequately respond to a self-administered questionnaires (e.g. comatose, psychotic or dementia patients) were not included in the sample.

4.5 Instruments

In addition to single-item questions, five scales were used in this study (Appendices 3 and 4). The five instruments used were: Orientation to Life Questionnaire (OLQ), Perceived Stress Scale (PSS), Life Orientation Test-Revised (LOT-R), Multidimensional Scale of Perceived Social Support Scale (MSPSS), and the 17-item Short Fat Questionnaire (SFQ). A detailed description of these instruments and discussion on their validity and reliability will be addressed in Chapter 5.
4.6 Procedure

Recruitment of AMI survivors for this study occurred from July 1997 to March 1999 after obtaining ethics clearance (Appendix 1). Survivors were approached by the research assistant during their stay in the Coronary Care Unit (CCU). The research assistant informed them of the study and the enrolment process. All survivors who met the study criteria and consented (Appendix 2) to the study were contacted at two different points in time. The first contact occurred in hospital, three to seven days after hospital admission. During the first contact, sociodemographic and clinical details about the coronary event were collected from the participant’s clinical record and by asking the participant. The participant was also asked to complete the baseline questionnaire (Appendix 3). The second contact occurred six months after the participant’s first admission to the CCU with an AMI. Survivors were contacted by mail six months after the first contact and were asked to complete another set of self-administered questions (Appendix 4). A summary of the study procedure is presented in Table 4.2 (p.62).

Four research assistants were employed to recruit AMI survivors for this study. One hundred and sixty-one (161) eligible patients in the CCUs were identified. Of these, five refused to participate and 11 patients were assessed as being too sick to participate. At the end of the recruitment period, 145 (90%) of survivors consented to participate in the study and completed the baseline survey. Of these, 106 completed and returned the 6-month follow-up survey.

The recruitment of only 161 eligible patients over a period of 20 months across the four CCUs in SWSAHS appears small. There are a number of reasons for this small sample size. First, 26.3% of the population in SWSAHS are from a Non-English Speaking Background (NESB) – the largest of any of the Area Health Services in NSW. A high proportion of these patients were not literate in English, hence were excluded from the study. Second, patients recurrent AMI patients and patients with a previous diagnosis of Type 1 or Type 2 diabetes mellitus were also excluded from the study. Although the two categories are not mutually exclusive, each of these categories represents at least 20% of patients admitted to hospital with AMI.
Table 4.2 Summary: procedure of the study

<table>
<thead>
<tr>
<th>CONTACT METHOD</th>
<th>CONTACT 1</th>
<th>CONTACT 2</th>
<th>CONTACT 3&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
<td>Three to seven days after admission to CCU</td>
<td>Six months after first admission to CCU with first acute MI</td>
<td>2 weeks after Contact 2</td>
</tr>
<tr>
<td>CONTACT METHOD</td>
<td>Personal contact</td>
<td>Mail-out self-administered questionnaire packet</td>
<td>Reminder letter and the same mail-out questionnaire packet as in Contact 2</td>
</tr>
<tr>
<td>PARTICIPANT ACTIONS</td>
<td>Complete: OLQ, LOT, PSS, MSPSS, SFQ Questions on: smoking, exercise, height &amp; body weight and health behaviour rating</td>
<td>Complete: PSS, SFQ Questions on: smoking, exercise, height &amp; body weight, medication adherence, health behavioural rating and health behavioural change, attended cardiac rehabilitation program</td>
<td>Same as in Contact 2&lt;sup&gt;a&lt;/sup&gt; Contact 3 - only for individuals who did not respond to ‘mail-out’ in Contact 2 within two weeks</td>
</tr>
<tr>
<td>RESEARCHER ACTIONS</td>
<td>Obtain consent Complete: sociodemographic, history of acute MI details and medications details</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.7 Ethical Considerations

All questions and self-administered instruments used were non-invasive. The study avoided questions that might be deemed as sensitive or intrusive (e.g. personal income or sexual activity). An information sheet was given, briefing potential survivors about the study and a statement informing them that refusal to participate in the study would in no way alter the caring relationship between them and the Area Health Service (Appendix 2). Written consent was obtained from all participants.

Survivors were identified by ‘Unique Record’ number on the data collection questionnaire, which remained in a locked cabinet when not in use by the researcher. Data were used for the purposes disclosed. Individuals were not identifiable in any report or other publication.

Ethics approval for this study was sought and granted from the SWSAHS Research Ethics Committee (Project No. 97/29) and the University of Western Sydney Macarthur Ethics Review Committee (Human Subjects) (Project No. 97/22).
Chapter 5
Psychometric properties of scale instruments

5.1 Introduction
The focus of this chapter is to examine the validity and reliability of the five scale instruments used in the study. A valid instrument measures the underlying concept accurately,\textsuperscript{543} whilst a reliable instrument yields consistent results under similar conditions.\textsuperscript{544} Validity is also synonymous with authenticity and soundness, whereas reliability is synonymous with predictability and stability.\textsuperscript{545} Both validity and reliability are central to measurement in all research. However, because validity and reliability of instruments are not automatically generalisable to all contexts, samples or populations, an instrument’s accuracy and consistency need to be demonstrated for each study. This is especially important for this study because none of the instruments was developed or tested on CHD patients. These instruments were tested predominantly on student samples or on healthy adults in the community.

This chapter will firstly discuss issues of validity and reliability followed by a brief overview of when the instruments were administered in the study. This is then followed by each of the four instruments used to assess psychosocial domains and the one instrument used to assess an aspect of health behaviour in the study. In the discussion on each of the instruments, the following areas will be included: i) a brief overview of the instrument; ii) analyses used to confirm the validity and reliability; iii) conclusion relating to the validity and reliability results of the instrument. Finally, the chapter concludes with a general discussion of all the instruments, study limitations and conclusions.
5.2 Issues of validity and reliability

There are three aspects of validity: content validity, criterion validity and construct validity.\textsuperscript{546} Content validity is based on expert considerations about the relevance of the content of the measure, criterion validity involves comparing the new measure with the current ‘gold standard’ measure, which may be the diagnostic criterion\textsuperscript{546} and construct validity evaluates how well the new measure reflects some underlying construct or latent variable.\textsuperscript{545} Both criterion validity and construct validity consist of subtypes. Table 5.1 provides a summary of the subtypes and tests used to demonstrate evidence of validity.

<table>
<thead>
<tr>
<th>Type of validity</th>
<th>Statistical test commonly used to support validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>None, supported by good agreement of expert opinion about content and its coverage</td>
</tr>
<tr>
<td>Criterion</td>
<td>Correlation</td>
</tr>
<tr>
<td>• Concurrent – examines the relationship between an instrument and an outside criterion at the same time</td>
<td>Correlation</td>
</tr>
<tr>
<td>• Predictive – examines how well an instrument predicts some criterion in the future</td>
<td>Correlation</td>
</tr>
<tr>
<td>Construct</td>
<td>Correlation</td>
</tr>
<tr>
<td>• Convergent – determines the relationship between an instrument and some other measure(s) of the same concept</td>
<td>Correlation</td>
</tr>
<tr>
<td>• Discriminant – differentiates an instrument from unrelated measures or concepts</td>
<td>Correlation</td>
</tr>
<tr>
<td>• Factorial – provides evidence of clustering of items (usually done with factor analysis) that supports the theory-based grouping of items</td>
<td>Factor analysis</td>
</tr>
</tbody>
</table>

Table 5.1 Evidence of validity for scale instrument

(Adapted from Morgan, Gliner & Harmon\textsuperscript{547})
5.2.1 Types of validity

Table 5.1 (p.64) provides a number of approaches that can be used to assess the validity of an instrument. Content validity depends on the agreement of experts, hence, in itself is not considered as a sufficient demonstration of instrument validity.\(^{548}\) However, it is important in the initial phase of instrument development as it may be all that is known about a criterion, which may be derived from the gleanings of a literature review. In many situations, the attribute or quality is not "operationally defined." Construct validity is used to test validity of the instrument when no definite criterion measure of the quality of interest is available, and thus, one must use indirect measures. In multi-item scale instruments like those used in this study, factor analysis is the most common approach used to examine construct validity. Factor analysis uses a statistical approach to uncover the factors or explanatory concepts of a set of items within an instrument, so that a small number of factors will account for approximately the same information as the larger set of items.\(^{549}\)

Two common statistical techniques are used in factor analysis; exploratory and confirmatory analysis. Exploratory factor analysis (EFA) is the more widely used technique to obtain evidence of construct validity.\(^{550}\) EFA does not impose any hypothesised model on the data.\(^{551}\) In contrast to EFA, which is a theory-generating procedure, confirmatory factor analysis (CFA) is more of a theory testing procedure and is based on a strong theoretical/empirical foundation where the exact factors are specified by the researcher.\(^{552}\) This study will only use CFA because one of the study objectives is to explicitly test the factor structures proposed by the developers using the data in the study. CFA allows the specification of \textit{a priori} factors and it seeks to optimally match the observed and theoretic factor structures for the given data set of the study.\(^{551}\) In addition to CFA, convergent validity will also be used in the study to examine construct validity of the instruments.

Another approach that could be used to assess instrument validity is criterion validity. Criterion-related validity is used to establish a relationship between the instrument and a criterion (gold standard).\(^{553}\) A distinction is sometimes made between two types of criterion-related validity, as outlined in Table 5.1 (p.65).
Concurrent validity is commonly measured by comparing scores obtained from the
instrument examined with an alternative tool which measures similar attributes, whilst predictive validity involves assessing the degree to which an instrument predicts the criterion observed at a future time.

### 5.2.2 Reliability

An instrument is judged reliable when it consistently produces the same results, particularly when applied to the same individuals at different times. The exception is when real change has occurred. A number of approaches are used to test the reliability of an instrument. These include test-retest reliability, inter-rater reliability and internal consistency. Test-retest reliability ascertains if an instrument is stable, inter-rater reliability assesses the correlation of scores between independent raters on the same criteria and finally, internal consistency assesses whether components of an instrument measure the same attribute each time it is used. In multi-item scales, the preferred method of assessing internal consistency is the Cronbach coefficient alpha which estimates the extent to which individual item scores correlate with other individual item scores of the same construct or related constructs. In the instrument development phase, items with low intercorrelation are generally modified or deleted.

### 5.3 Instruments

Five Likert scale type instruments were included as part of the survey questionnaire. These were: Orientation to Life Questionnaire (OLQ), Perceived Stress Scale (PSS), Life Orientation Test-Revised (LOT-R), Multidimensional Scale of Perceived Social Support (MSPSS), 17-item Short Fat Questionnaire (SFQ) and two single-item measures (Appendixes 4 and 5). Permission was sought and granted for the use of non-public domain scale instruments: PSS, LOT-R, MSPSS and SFQ (Appendix 5).
5.4 Methods

As previously outlined, data were collected at two points in time: at the initial encounter during the survivors’ hospitalisation for their first AMI (baseline data) and at the 6-month follow-up. One hundred and forty-five (145) survivors completed the baseline survey questionnaire. Of these, 106 respondents completed and returned the 6-month follow-up survey questionnaire.

Table 5.2 provides a brief description of the Likert scale instruments used and the timing of administration of these instruments in this study.

<table>
<thead>
<tr>
<th>Likert scale instrument</th>
<th>Timing of administration</th>
<th>Construct(s) measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation to Life Questionnaire (OLO)\textsuperscript{590}</td>
<td>✓</td>
<td>Sense of coherence: comprehensibility, manageability, meaningfulness</td>
</tr>
<tr>
<td>Perceived Stress Scale (PSS)\textsuperscript{516}</td>
<td>✓ ✓</td>
<td>Perceived stress</td>
</tr>
<tr>
<td>Life Orientation Test-Revised (LOT-R)\textsuperscript{503}</td>
<td>✓</td>
<td>Perceived dispositional optimism</td>
</tr>
<tr>
<td>Multidimensional Scale of Perceived Social Support (MSPSS)\textsuperscript{508}</td>
<td>✓</td>
<td>Perceived social support from: friends, special person and family</td>
</tr>
<tr>
<td>17-item Short Fat Questionnaire (SFQ)\textsuperscript{498}</td>
<td>✓ ✓</td>
<td>Total fat &amp; saturated dietary fat intake</td>
</tr>
</tbody>
</table>
5.5 Analysis

All five scales used in this study have been reported to be valid and reliable in a number of studies.\textsuperscript{390, 498, 503, 510} Construct validity using factor analysis has been reported on four of the five scale measures: OLQ,\textsuperscript{396} PSS,\textsuperscript{510} LOT-R\textsuperscript{354, 503} and MSPSS.\textsuperscript{508, 558-560} In the case of both Antonovsky's OLQ,\textsuperscript{390} and the MSPSS\textsuperscript{508} factor analysis results have been reported in multiple studies.\textsuperscript{558, 559, 561-565} However, construct validity using factor analysis has not been reported for the SFQ. This questionnaire was developed from a series of questions used in a health promotion program and not developed to assess different dimensions of dietary fat intake.\textsuperscript{498} Because of this, factor analysis would not be appropriate to determine the construct validity of this instrument.

Factor analysis was performed on the four scale instruments purported to possess different underlying latent constructs. This study used structural equation modelling (SEM) for confirmatory factor analysis (CFA) for theoretic factor structures that had previously been specified by the developers. This is the recommended method when the investigator poses a hypothesis about the number and nature of factors that make up the structure of the instrument.\textsuperscript{550} CFA imposes a structure to the models based on \textit{a priori} information.\textsuperscript{566} In this study, these model structures are those factors stipulated by the developers of the instruments. The SEM technique also allows for the specification of associations between the factors and accounts explicitly for measurement error.\textsuperscript{567} The relationship between items and the factors, factor loadings were presented as standardised factor loadings to enable easy comparison of factor loadings between different models. Error variance, the variance not explained by the factor but is taken into account in SEM was also presented.

Sample size is an important issue in SEM. There is generally no consensus on sample size for SEM.\textsuperscript{568, 569} However, Boomsma\textsuperscript{570} showed that Maximum Likelihood Estimation in SEM with latent variables collapsed badly in samples of less than 100. Gebrin and Anderson\textsuperscript{571} also reached the same conclusion with sample sizes of under 100 cases, however, they found that fairly robust estimates could be achieved with sample sizes of less than 200. Between 1995 and 2001, a number of studies on the CFA of scale instruments have used the SEM technique on sample sizes that range between 100 and 200. The results of these studies are published in peer-
reviewed journals.\textsuperscript{355, 572-576} These publications provide support for the use of CFA in the current study. Despite the limited sample size, the use of CFA in this study would contribute significantly to the literature. This would be one of the first studies to use CFA to validate some of these measures.

Analysis of Moment Structures (AMOS) Version 4.0\textsuperscript{577} computer software was used to perform CFA and test the models empirically for goodness-of-fit. The fit indices indicate the degree of correspondence between the implied and observed covariance matrices.\textsuperscript{578} Each researcher and statistician seems to have different preferences of fit indices. Hence, this study reports multiple assessments of model fit indices which is the recommended method of reporting fit indices in SEM.\textsuperscript{579-583} In addition, if multiple fit indices are used and all indices suggest good fit, one can be more confident when drawing conclusions about the adequacy of the CFA results of the instrument.

The indices reported are chi-square/degrees of freedom ratio (Normed Chi-square), Root Mean Square Error of Approximation (RMSEA), Goodness-of-Fit Index (GFI), Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI). The following is a brief description of each of these indices.

A chi-square test is commonly used to compare the predicted covariance matrix of the observed variables for the model with the actual covariance matrix. Small values of the test (normed chi-square\textsuperscript{584} \(\chi^2/df\) recommended levels: 1.0 to 3.0) suggest only minor differences between the two matrices, and hence, a good fit of the data to the model. However, the chi-square test is sensitive to sample size and additional fit indices are required to ensure goodness-of-fit.\textsuperscript{585}

GFI measures overall fit and indicates the relative amount of variances and covariances jointly accounted for by a model.\textsuperscript{583} The CFI was developed to avoid the underestimation of fit in small samples but performs well at all sample sizes.\textsuperscript{585} The RMSEA is another fit index widely used because it offers a “close” test of statistical fit for the model. This test allows for a discrepancy of fit per degree of freedom.\textsuperscript{586} Values of 0.05 to 0.08 indicate a reasonable fit of the model, whereas values lower than 0.05 indicate a close fit.\textsuperscript{581} TLI was selected because it adjusts for parsimony and penalises overfitting of data.\textsuperscript{587} A summary of goodness-of-fit indices used in this study is presented in Table 5.3 (p.71).
<table>
<thead>
<tr>
<th>Name</th>
<th>Abbreviation</th>
<th>Acceptable Level</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-square, degree of freedom and p-value</td>
<td>$\chi^2$ (df, p)</td>
<td>$P &gt; 0.05$</td>
<td>Greatly affected by sample size. The larger the sample the more likely the p-value will indicate a significant difference between the model and the data</td>
</tr>
<tr>
<td>Normed (relative) chi-square</td>
<td>$\chi^2$/df</td>
<td>$1.0 &lt; \chi^2 &lt; 3.0$</td>
<td>Values close to 1 indicate good fit but values less than 1 may indicate overfit</td>
</tr>
<tr>
<td>Goodness-of-Fit Index</td>
<td>GFI</td>
<td>$&gt; 0.90$</td>
<td>Values between .90 to .95 may indicate satisfactory fit</td>
</tr>
<tr>
<td>Root Mean-Square Error of Approximation</td>
<td>RMSEA</td>
<td>$0.05$ to $0.08$</td>
<td>Large values when all other fit indices suggest good fit may indicate outliers in the raw data.</td>
</tr>
<tr>
<td>Tucker-Lewis Index Comparative Fit Index</td>
<td>TLI/CFI</td>
<td>Close to 1</td>
<td>Values close to 1 indicate very good fit. Values greater than 1 may indicate overfit</td>
</tr>
</tbody>
</table>

In addition to CFA, convergent validity was the other construct validity assessment tested on the OLQ and LOT-R and MSPSS instruments. Internal consistency measured by Cronbach coefficient alpha was the only method used to test the reliability of the instruments in this study. These analyses are performed using the SPSS Version 10 computer software.588

The psychometric properties of each instrument will be presented from Sections 5.6 to 5.10. In each of these sections, an instrument overview will be presented, followed by results and discussion on that instrument.
5.6.1 Overview of the Orientation to Life Questionnaire (OLQ)

Antonovsky, first identified and described the sense of coherence concept, and later developed the OLQ to assess the construct.\textsuperscript{390} This instrument has a seven-point semantic differential scale with two anchoring phrases. It was developed to assess a single dimension of the individual personality, consisting of three intertwined components: comprehensibility, manageability and meaningfulness.\textsuperscript{390} The potential range of the scale is from 29 to 203. This 29-item instrument was developed using facet-theoretical design. Facet Theory is a systematic approach to facilitate theory construction, research design, and data analysis for complex studies appropriate for the behaviour and social sciences. Facet Theory is based on: i) a definitional framework for a universe of observations in the area of study; ii) empirical structures of observations within this framework; and iii) a search for correspondence between the definitional system and aspects of the empirical structure for the observations.\textsuperscript{589}

Perception or thinking about a collection of variables should lead to the identification of semantic or perceptual properties (facets) that characterise basic components of relevant variables. These facets are presented in the form of a mapping sentence.\textsuperscript{590} It is purported to be a useful technique for constructing questionnaires and for designing research instruments,\textsuperscript{590} however, instruments derived from this theoretical approach are known to have poor factor structures.\textsuperscript{591} In light of this, there is no basis for deriving distinguishable subscores for comprehensibility, manageability and meaningfulness.\textsuperscript{473,592} This is why Antonovsky\textsuperscript{390} warned researchers not to use this scale to study the subcomponents of the SOC concept and may explain why several factor analyses of this scale have shown an inconsistent number of factors.\textsuperscript{562,593,594}

Nevertheless, some studies have reported a single factor solution.\textsuperscript{561,595-598}
Excellent internal consistency of this scale has been reported in a variety of populations.\textsuperscript{473} Antonovsky's review of the OLQ identified 26 studies which reported a Cronbach's alpha range of 0.82 to 0.95.\textsuperscript{592} A few studies have investigated and reported the test-retest reliability of this scale. One study\textsuperscript{596} reported a correlation of 0.80 in a 6-month test-retest situation. Another study\textsuperscript{599} reported a correlation of 0.78 in a 1-year test-retest follow-up, indicating the reliability of the measure and the relative stability of the construct. This study will examine one aspect of instrument reliability, the internal consistency of the OLQ.

Antonovsky was hopeful that SOC would be a construct that was universally meaningful, cutting across lines of gender and culture.\textsuperscript{473} Subsequent studies uncovered no significant differences in SOC between genders\textsuperscript{599,600} and have validated the non-culturally specific nature of SOC.\textsuperscript{601} However, SOC has been shown to increase with age\textsuperscript{602-604} and individuals with a higher education level are also more likely to have higher SOC scores.\textsuperscript{605,606} Individuals with lower SOC scores are often more anxious\textsuperscript{607-610} and report higher levels of stress.\textsuperscript{561,611-613}

Mullen studied the role of spiritual resources, family strengths and SOC on psychological stress of cancer patients and their spouses.\textsuperscript{614} His findings suggest high SOC to be a strong buffering effect from the negative impact of psychological stress in both patients and their spouses. McSherry and Holm\textsuperscript{615} found individuals with strong SOC reported higher levels of perceived coping resources to stress. Their study also suggested that weak SOC individuals lack confidence in their ability to cope and are less effective in dealing with stress. A study in a Swedish population found SOC was significantly correlated with participants' mental and social health status but not to their physical functional status.\textsuperscript{616} In homeless minority women at risk of HIV infection, higher SOC scores were associated with few high-risk behaviours\textsuperscript{617} and in a study on older adults approaching retirement, high SOC was found to predict healthier drinking behaviours and fewer alcohol problems.\textsuperscript{400}
5.6.2 Validity and reliability results of the OLQ

CFA of both the 3-factor solution and the 1-factor solution was performed. The 3-factor model examined if the data fitted the three components, comprehensibility, manageability and meaningfulness, as purported by Antonovsky. The 1-factor model was performed in an attempt to uncover the single dimension previously reported on this instrument. Convergent validity was examined by correlating the scores of the OLQ with two other health-enhancing psychosocial measures, dispositional optimism and perceived social support, as well as with scores on the perceived stress scale. Perceived stress was assessed both at baseline and at the 6-month follow-up. Given the findings of McSherry and Holm, positive correlations were expected between OLQ, dispositional optimism and perceived social support, and a negative correlation was expected between OLQ and perceived stress, if the OLQ was to be valid in this sample. Finally, Cronbach’s alpha for the scores on the 29-item scale was determined to examine the internal consistency of the instrument.
Testing the 3-factor model of the OLQ

One hundred and forty-five survivors at baseline completed all 29 items of this instrument. The 3-factor CFA solution together with its estimated error variances, standardised factor loadings between items and constructs and between superordinate construct (sense of coherence) and subconstructs (comprehensibility, manageability and meaningfulness) is illustrated in Figure 5.1. This 29-item questionnaire is included in Appendix 3.

Figure 5.1 3-factor CFA solution of the OLQ

\[\text{ma} = \text{manageability; me} = \text{meaningfulness; c} = \text{comprehensibility}\]
All paths from the constructs to the items and from the superordinate construct to the three subconstructs were statistically significant at the 5% level. The factor loading range for each item (0.31 to 0.65 for comprehensibility, 0.44 to 0.71 for meaningfulness and 0.32 to 0.67 for manageability) suggests good indicators for the three constructs (Figure 5.1, p.75).

Table 5.4  Goodness-of-fit: Chi-square index and other fit indices of the 3-factor CFA solution of OLQ

<table>
<thead>
<tr>
<th>Model</th>
<th>Normed $\chi^2$ (p value)</th>
<th>GFI</th>
<th>RMSEA</th>
<th>TLI</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-factor model of OLQ</td>
<td>1.99 (&lt;0.001)</td>
<td>0.68</td>
<td>0.10</td>
<td>0.63</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Table 5.4 presents the goodness-of-fit indices of the 3-factor CFA solution of the OLQ. The fit indices for the 3-factor model demonstrate poor fit. Although the normed chi-square was within the 1.0 to 3.0 range, GFI, TLI and CFI were < 0.90 and RMSEA was > 0.08. This suggests insufficient support of the 3-factor proposed model.

Although the overall factor loadings of the 3-factor model model reflect strong relationships between factors and items on the OLQ, the poor fit indices imply the model is not plausible.\textsuperscript{618}
Testing the 1-factor model of the OLQ

The 1-factor CFA solution together with its estimated error variances, standardised factor loadings between items and the single superordinate construct, sense of coherence is illustrated in Figure 5.2.

![Diagram showing the 1-factor CFA solution of the OLQ](image)

Figure 5.2 1-factor CFA solution of the OLQ

(mark = manageability; me = meaningfulness; c = comprehensibility)

All paths from the superordinate construct to the 29 items were statistically significant at the 5% level with factor loadings ranging from 0.27 to 0.72. Item 23 had a factor loading that was less than 0.3. However, all the other items had a factor loading that were above 0.3 value, which suggests the items are good indicators of the superordinate construct.
The 1-factor solution fit indices on the OLQ are shown in Table 5.5. As with the 3-factor solution, the fit indices GFI, TLI, CFI and RMSEA did not achieve the recommended levels to support a satisfactory fit (Table 5.5). Hence, despite the overall acceptable factor loading for this model, the poor fit indices reflect that is model is also non-plausible.

<table>
<thead>
<tr>
<th>Model</th>
<th>Normed $\chi^2$ (p value)</th>
<th>GFI</th>
<th>RMSEA</th>
<th>TLI</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-factor model of OLQ</td>
<td>2.43 (&lt;0.001)</td>
<td>0.69</td>
<td>0.10</td>
<td>0.59</td>
<td>0.62</td>
</tr>
</tbody>
</table>

**Convergent validity of the OLQ**

The relationship between stress and SOC was investigated, together with two other stress resistant variables, perceived social support and dispositional optimism. There was a significant moderate inverse relationship between SOC as assessed by the OLQ, and perceived stress, at both baseline and at follow-up, with a stronger negative correlation at baseline (Table 5.6). This moderate correlation between OLQ and perceived stress persisted after sociodemographic variables (age, education level, gender, marital status) were held constant ($r = -0.59$, $p < 0.001$ at baseline and $r = -0.51$, $p < 0.001$ at follow-up). Both dispositional optimism and perceived social support were moderately correlated with SOC (Table 5.6). This relationship also persisted (albeit weakened) after controlling for the same sociodemographic variables ($r = -0.51$, $p < 0.001$ for dispositional optimism and $r = -0.30$, $p = 0.003$ for perceived social support).

**Table 5.6 Pearson's correlation coefficients between SOC and related constructs**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense of coherence (OLQ)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stress at baseline (PSS)</td>
<td>-0.62***</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stress at follow-up (PSS)</td>
<td>-0.51***</td>
<td>0.52***</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispositional Optimism (LOT-R)</td>
<td>0.57***</td>
<td>-0.42***</td>
<td>-0.29**</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Perceived Social support (MSPSS)</td>
<td>0.33***</td>
<td>-0.20**</td>
<td>-0.27**</td>
<td>0.19*</td>
<td>1.0</td>
</tr>
</tbody>
</table>

* = $p<0.05$ level (2-tailed)
** = $p<0.01$ level (2-tailed)
***= $p<0.001$ level (2-tailed)
Reliability of the OLQ

Internal consistency was 0.90 when assessed by Cronbach’s alpha (Table 5.7). The inter-item correlation was also analysed to determine if this scale was unidimensional. The mean inter-item correlation of 0.25 was within the acceptable range (recommended range: 0.15 to 0.50) for homogeneity. Only 19% of the inter-item correlations were outside this recommended range. All 29 items contributed uniformly to the scale with no appreciable difference in alpha level when each item was deleted from the scale.

Table 5.7  OLQ: Total scale and Cronbach’s alpha reliability coefficient, mean, and standard deviation of the sample

<table>
<thead>
<tr>
<th></th>
<th>Alpha</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total scale</td>
<td>0.90</td>
<td>145</td>
<td>144.6</td>
<td>27.1</td>
</tr>
</tbody>
</table>

5.6.3 Conclusion: OLQ

Standardised factor loadings of both the 3-factor solution as well as the 1-factor solution of the OLQ in this study suggest that the items are good indicators of the subconstructs, comprehensibility, manageability and meaningfulness, as well as the principal construct, sense of coherence. In the 3-factor solution, the high factor loadings between the superordinate construct (sense of coherence) and the subconstructs provided support for Antonovsky’s assertion that the sense of coherence construct has three intertwined components - comprehensibility, manageability and meaningfulness. However, neither the 3-factor CFA solution nor the 1-factor CFA solution demonstrated satisfactory fit between the proposed measurement model and the data. Although previous psychometric studies on the OLQ have found the single dimension solution to be the most parsimonious and meaningful, other studies using CFA, like the current study, failed to support a single common factor of this instrument.

Despite the failure to confirm construct validity of this instrument by using CFA, the study was able to demonstrate convergent validity of the SOC instrument. There were significant negative correlations between SOC and baseline perceived stress, as well as perceived stress at the 6-month follow-up, which were also consistent with previous studies. In addition, high internal consistency uncovered in this study is consistent with the high Cronbach’s alpha reported in other studies.
Overall inter-item correlations and mean inter-item correlations obtained in this study were within the recommended range, with only 19% of items outside the recommended range, thus demonstrating the homogeneity of the items in this 29-item scale.

5.7.1 Overview of the Perceived Stress Scale (PSS)

Although perceived stress is thought to play a central role in the experience of stress, most measures of stress ignore the individual’s perception of stress and focus on the objective features of life events.\textsuperscript{281, 623} The PSS was designed to measure the degree to which survivors appraise their lives as being unpredictable, uncontrollable and overloading, factors that have been repeatedly linked to the central components of the experience of stress.\textsuperscript{624, 625} Cohen and colleagues argue that this scale is more sensitive to stress from chronic situations that are not generally listed on life event scales.\textsuperscript{510} The PSS, a 10-item instrument, can be completed in a few minutes and is easy to score with total scores ranging from 0 to 40 points, counting the ratings on each question on a 5-point Likert-type scales anchored by never (0) and very often (4). Higher total scores reflect higher levels of perceived stress. Concurrent and predictive validity, internal consistency and stability of this instrument have been demonstrated in undergraduates.\textsuperscript{510} Predictive validity of this instrument has also been shown in failure to quit smoking\textsuperscript{626} and failure to adhere to a diabetic regimen.\textsuperscript{627}

5.7.2 Validity and reliability of the PSS

This scale was administered at two points in time - at baseline and at follow-up. To avoid redundancy, only the 2-factor model, as specified by the developer of the instrument,\textsuperscript{511} was imposed on the scale using the baseline data. The first factor consists of six positively worded items and the second factor consists of four negatively worded items. No other label was given to these two factors by the developer. Hence, this study will follow the developer and call these factors, positively-worded items and negatively-worded items. The internal consistency of the instrument and the subscales were also estimated with the Cronbach’s alpha statistics.
Testing the 2-factor model of the PSS: baseline data

The 2-factor CFA solution together with its estimated error variances, standardised factor loadings between items and correlation between the two factors, is illustrated in Figure 5.3. One hundred and forty-five survivors at baseline completed all 10 items of this instrument. The 10 items of the PSS are included in Appendix 3.

![Diagram showing the 2-factor solution CFA of the PSS: baseline data](image)

Figure 5.3  2-factor solution CFA of the PSS: baseline data
(PSS = Perceived stress scale item)

All paths from the constructs to the items and correlation between the two constructs were statistically significant at the 5% level. The standardised factor loadings ranged from 0.52 to 0.90, suggesting that the items were good indicators of the two constructs. As expected, the two factors (positively worded and negatively worded item factors) were inversely correlated.
The goodness-of-fit indices shown in Table 5.8 suggest good fit between the proposed model and baseline data, based on a normed chi-square that was less than 2.0 on high GFI, TLI and CFI (>0.90) and low RMSEA (<0.08).

<table>
<thead>
<tr>
<th>Model</th>
<th>Normed $\chi^2$ (p value)</th>
<th>GFI</th>
<th>RMSEA</th>
<th>TLI</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-factor model of PSS (baseline data)</td>
<td>1.37 (0.08)</td>
<td>0.95</td>
<td>0.05</td>
<td>0.98</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Reliability of the PSS

Cronbach’s alpha coefficient for the 10-item PSS at baseline was 0.89. Analysis of the items according to the ‘alpha if item deleted’ procedure demonstrated that the removal of any of the items listed would not have much consequence on the alpha value. Internal consistency was 0.88 for the positively worded item factor and 0.78 for the negatively worded item factor. In the PSS at the 6-month follow-up, internal consistency of the 10-item scale was 0.90, with 0.92 for the positively worded factor and 0.75 for the negatively worded factor (Table 5.9). Lower mean scores at the 6-month follow-up reflected lower levels of perceived stress. Both total PSS scores at baseline and at the 6-month follow-up were normally distributed.

<table>
<thead>
<tr>
<th>Total and subscales</th>
<th>Alpha</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total PSS at baseline</td>
<td>0.89</td>
<td>145</td>
<td>17.4</td>
<td>8.1</td>
</tr>
<tr>
<td>Positively worded items (Factor 1)</td>
<td>0.88</td>
<td>145</td>
<td>11.7</td>
<td>5.8</td>
</tr>
<tr>
<td>Negatively worded items (Factor 2)</td>
<td>0.78</td>
<td>145</td>
<td>5.7</td>
<td>3.2</td>
</tr>
<tr>
<td>Total PSS at follow-up</td>
<td>0.90</td>
<td>106</td>
<td>14.7</td>
<td>8.6</td>
</tr>
<tr>
<td>Positively worded items (Factor 1)</td>
<td>0.92</td>
<td>106</td>
<td>9.7</td>
<td>6.3</td>
</tr>
<tr>
<td>Negatively worded items (Factor 2)</td>
<td>0.75</td>
<td>106</td>
<td>5.0</td>
<td>3.2</td>
</tr>
</tbody>
</table>
5.7.3 Conclusion: PSS

CFA results from the 2-factor structure imposed at baseline corroborated with the factor structure reported by the developer of this instrument. The factors were identified using the same labels given by the developer of this instrument, “positively-worded items” and “negatively worded items”. The results of the PSS at baseline and at the 6-month follow-up also showed adequate internal consistency with consistently high factor loadings for individual items throughout the scale.

5.8.1 Overview of the Life Orientation Test (LOT-R)

It is commonly accepted that if expectation of a successful outcome is favourable, there is renewed effort to attain set goals. Such a view embodies the concept of optimism. Optimists are more persistent in engaging in goal-seeking behaviours and thus, more likely to succeed. Scheier and Carver’s LOT is a measure of generalised expectancies of the occurrence of good versus bad outcomes in one’s life. This scale assesses dispositional optimism and was revised from the original 12-item instrument. The LOT-R is a 10-item self-report measure. Only six of the 10 items in this scale are scored, three are scored in a positive direction and three are scored in a negative direction. Respondents were asked to indicate the extent of their agreement with each of the items. Using a response format ranging from 0 (strongly disagree), to 4 (strongly agree) the LOT-R yields a total potential score ranging from 0 to 24 points. A higher score reflects higher level of dispositional optimism. The other four items in the LOT-R scale are filler items.

Comparison of factor structures in this study can only be made with the original 12-item scale, as there are no published factor structure findings on the 10-item scale (LOT-R). Factor structure of the original 12-item scale yielded two factors; the first factor was defined by those items worded in a negative direction (non-optimism), and the second factor was defined by those items worded in a positive direction (optimism). Other studies also supported a two-factor solution consisting of separate optimism and pessimism factors.

To establish convergent validity, Scheier and Carver administered the 12-item LOT along with a variety of scales, including measures of hopelessness, depression, self-esteem and perceived stress. They concluded that LOT demonstrated convergent validity as the LOT was moderately (r = -0.55 to 0.48), but significantly correlated
with conceptually related constructs.\(^{354}\) The original instrument (LOT) as well as the revised instrument (LOT-R) have been widely used since the initial development.\(^ {355, 364, 365, 630-634}\)

### 5.8.2 Validity and reliability of the LOT-R

CFA was performed on this scale to examine whether the six scored items in the scale contributed to the intended component. The four filler items were excluded in the analysis. This study specified the 2-factor CFA model similar to previously reported CFA study on this instrument.\(^ {354, 366, 402, 629}\) The study also evaluated convergent validity by comparing group differences between the optimists and non-optimists as scored on the LOT-R, with perceived stress scores and global lifestyle ratings collected both at baseline and at the 6-month follow-up. The study also examined the internal consistency of the scale using Cronbach’s alpha statistics.

### Testing the 2-factor model of the LOT-R

This instrument was administered once, at baseline. One hundred and forty-five survivors at baseline completed all 10 items of this instrument. The six items of this instrument are included in Appendix 3.

![Diagram](image.png)

**Figure 5.4** 2-factor solution CFA of the LOT-R

(LOT = Life Orientation Test item)
All paths from the constructs to the items as well as correlation between the two constructs were statistically significant at the 5% level. The standardised factor loadings range (0.35 to 0.69) suggests the items are adequate indicators of each of the constructs. Consistent with previous findings, the positively worded item factor is negatively correlated to the negatively worded item factor.

All the goodness-of-fit indices for the model (Figure 5.4, p. 84) using data obtained at baseline suggest an excellent fit, based on a normed chi-square that was just above 1.0, on high GFI, TLI and CFI (>0.90) and low RMSEA (<0.08) values (Table 5.10).

Table 5.10  Goodness-of-fit: Chi-square index and other fit indices of LOT-R

<table>
<thead>
<tr>
<th>Model</th>
<th>Normed $\chi^2$ (p value)</th>
<th>GFI</th>
<th>RMSEA</th>
<th>TLI</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-factor model of LOT-R</td>
<td>1.03 (0.402)</td>
<td>0.98</td>
<td>0.02</td>
<td>0.99</td>
<td>0.99</td>
</tr>
</tbody>
</table>

**Convergent validity of the LOT-R**

Total scores of the LOT-R were normally distributed. In order to examine convergent validity, survivors were grouped to either “optimist” or “non-optimist”, based on a median split of the LOT score (median = 12) obtained at baseline. The between-group analyses revealed that optimists reported less stress (optimists – mean: 16.55, SD: 8.05; non-optimists – mean: 21.08, SD: 7.57) at baseline ($t_{143} = 2.64, p = 0.009$) and less stress (optimists – mean: 13.48, SD: 8.14; non-optimists – mean: 21.69, SD: 7.73) at the 6-month follow-up ($t_{105} = 3.43, p = 0.001$). Sixty-four percent of optimists perceived their lifestyles as healthy at baseline, compared to only 34% of non-optimists ($\chi^2 = 9.59, p = 0.002$). However, there was no difference between optimists and non-optimists in their 6-month follow-up lifestyle ratings.
Reliability of the LOT-R

Cronbach's alpha was 0.63, which is below the recommended 0.70 level for adequate internal consistency. Further analysis revealed that not all items contributed equivalently to Cronbach's alpha. Four items, when systematically deleted (one at a time), dropped the alpha level considerably, however, the deletion of items 1 and 10 resulted in a relatively unchanged alpha. Item 1 and item 10 also had lower corrected item-scale correlations (Table 5.11).

<table>
<thead>
<tr>
<th>Item</th>
<th>Corrected item-scale correlation</th>
<th>Alpha with item deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>0.21</td>
<td>0.64</td>
</tr>
<tr>
<td>Item 10</td>
<td>0.27</td>
<td>0.62</td>
</tr>
<tr>
<td>Item 3</td>
<td>0.43</td>
<td>0.56</td>
</tr>
<tr>
<td>Item 4</td>
<td>0.40</td>
<td>0.58</td>
</tr>
<tr>
<td>Item 7</td>
<td>0.46</td>
<td>0.55</td>
</tr>
<tr>
<td>Item 9</td>
<td>0.42</td>
<td>0.57</td>
</tr>
</tbody>
</table>

5.8.3 Conclusion: LOT-R

This study found that a two-factor solution has a good fit to the data which is consistent with other studies that supported a two-factor solution. Both perceived stress at baseline and at the 6-month follow-up were negatively correlated to LOT-R, which is consistent with the findings of Scheier and Carver that optimists were more likely to perceive less stress.

Although the developers of this instrument have reported Cronbach's alpha with an acceptable level of internal consistency, the results of this study did not achieve the recommended 0.70 level. This is of some concern, as the LOT-R would appear to have, in this study, low internal consistency. A lower alpha of 0.71 has been previously reported which was only achieved after dropping one item (the item dropped was not identified in the study) with low inter-item correlation.
5.9.1 Overview of the MSPSS

The study of perceived social support has been hampered due to a lack of consensus on the operational definitions of social support and a plethora of social support scales with poor supporting psychometric properties.\textsuperscript{418, 636-638} Marital status has been widely used as a single-item measure of social support, but has been criticised for lacking validity\textsuperscript{555, 639} because alone, it provides no insight into the dynamics of the social network. Due to the lack of consensus in the definition of social support, there is no gold standard with which to compare social support measures.\textsuperscript{640}

Social support measures are commonly divided into three categories: support network measures, measures of actual support received and measures of support the individual perceives to be available.\textsuperscript{641} Support network measures assess the characteristics of network size, and social networks among members.\textsuperscript{637} Received support measures the specific supportive acts received, for example, a friend loaning money. Perceived support measures assess to what extent individuals believe support is available to them.\textsuperscript{642} In a study examining the effects on social adjustment to the first cardiac event, Helgeson\textsuperscript{642} found that perceived support had a greater impact on adjustment than received support. Other studies that examined both perceived and received support also concluded that the perception of support seems to be a better predictor of health outcomes than actual support received.\textsuperscript{383, 643}

This study selected the 12-item 7-point Likert format Multidimensional Scale of Perceived Social Support (MSPSS), which was administered at baseline. The total scores range from 12 to 84 points, counting the ratings on each item on a 7-point Likert-type scales anchored by \textit{very strong disagree (1)} and \textit{very strongly agree (7)}. This is a perceived social support measure that has been widely used in a variety of settings for over a decade,\textsuperscript{558-560, 638} since publication of the psychometric properties of this instrument in 1987 on a group of cardiac patients.\textsuperscript{508}

The scale addresses perceived support from family, friends and special person (or significant others). Cronbach’s coefficient alpha for the total scale, and for the special person, family, and friends subscales in the study reported by Blumenthal\textsuperscript{508} were 0.88, 0.99, 0.87 and 0.85 respectively. In addition to good internal consistency, the MSPSS has been shown to have adequate stability over a two to three month time period.
5.9.2 Validity and reliability of the MSPSS

A 3-factor structure was imposed according to the factor structures previously reported.\textsuperscript{508, 558-560, 638} Convergent validity was examined by correlation with the “living with spouse” variable as marital status is often used as a proxy measure of social support.\textsuperscript{249} Internal consistency of the scale, as well as subscales, were estimated using Cronbach’s alpha statistics.

Testing the 3-factor model of the MSPSS

The 3-factor solution with its estimated error variances, standardised factor loadings between items and correlations between the three factors is presented in Figure 5.5. One hundred and forty-five survivors at baseline completed all 12 items of this instrument.

![Diagram](image)

**Figure 5.5 3-factor solution CFA of the MSPSS**

*(SS = Multidimensional perceived social support scale item)*

All paths, from the three constructs to the items were statistically significant at the 5% level, with factor loadings ranging from 0.77 to 0.93. The high coefficient values suggest that some of the 12 items were overlapping and possibly redundant. As expected, the three factors were positively and significantly correlated.
The 3-factor solution fit indices on the MSPSS are presented in Table 5.12.

<table>
<thead>
<tr>
<th>Model</th>
<th>Normed $\chi^2$ (p value)</th>
<th>GFI</th>
<th>RMSEA</th>
<th>TLI</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-factor model of MSPSS</td>
<td>1.53 (0.014)</td>
<td>0.93</td>
<td>0.06</td>
<td>0.98</td>
<td>0.99</td>
</tr>
</tbody>
</table>

The normed chi-square value was significant at the 0.05 level ($p = 0.014$) indicating poor fit. However, the normal chi-square value supported a satisfactory fit, as well as all the other fit indices, GFI, TLI, CFI and RMSEA (Table 5.12). This suggests good fit of data to the 3-factor CFA model.

**Convergent validity of the MSPSS**

The only other measurement in this study that was related to social support was living with spouse, which could be used as a proxy measurement for social support from family or from a special person. Correlations were carried out using “living with spouse” variable with two factors extracted from the CFA – “social support from family” and “social support from special person”. There was a weak positive but significant correlation between living with a spouse and the “social support from significant other” component ($r = 0.28, p = 0.001$) and the “social support from family” component ($r = 0.23, p = 0.006$).

**Reliability of the MSPSS**

Cronbach’s alpha for the total scale was 0.93. Analysis of the items according to the ‘alpha if item deleted’ procedure showed that the removal of any of the items listed would not have much consequence on the alpha value. The “special person” and “friends” factors both had an internal consistency of 0.94 while the “family” factor was 0.92 (Table 5.13, p.90). The inter-item correlations indicated a unidimensional scale with a range of inter-item correlation of 0.63 to 0.76.
Table 5.13  MSPSS: Total scale and subscales Cronbach’s alpha reliability coefficients, mean, and standard deviation

<table>
<thead>
<tr>
<th>Total and subscales</th>
<th>Alpha</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total MSPSS</td>
<td>0.93</td>
<td>145</td>
<td>69.6</td>
<td>13.6</td>
</tr>
<tr>
<td>“Special person” factor</td>
<td>0.94</td>
<td>145</td>
<td>24.6</td>
<td>5.2</td>
</tr>
<tr>
<td>“Friends” factor</td>
<td>0.94</td>
<td>145</td>
<td>21.6</td>
<td>5.7</td>
</tr>
<tr>
<td>“Family” factor</td>
<td>0.92</td>
<td>145</td>
<td>23.4</td>
<td>5.7</td>
</tr>
</tbody>
</table>

5.9.3 Conclusion: MSPSS

The 3-factor model demonstrated good fit, which supports the factor structures reported by the developer of this scale.\textsuperscript{508} The findings are also consistent with other publications on construct validity as well as internal consistency.\textsuperscript{558-560, 563-565} However, the high inter-item correlation scores suggest a high degree of overlap between the 12 items of this scale (preferred range: 0.15 to 0.50), indicating some of the items were overlapping and thus redundant.\textsuperscript{644, 645} Overall, the MSPSS demonstrated satisfactory construct validity. The significant correlations between the two factor structures (social support from significant other and social support from family) with living with a spouse lent support to the validity of this instrument. This scale, showed good internal consistency as reflected by the high Cronbach’s alpha value.

5.10.1 Overview of the 17-item Short Fat Questionnaire (SFQ)

The questionnaire was developed to measure dietary fat intake in the Australian population and validated for this population. This brief, self-administered instrument measures behaviour related to dietary fat intake. The questionnaire included items such as: “How much of the fat on meat do you eat?” For this question, possible responses and scores are: most of the fat (2), some of the fat (1), none of the fat/ I am a vegetarian (0). Total range of scores for the 17 items ranged from 0 to 63.\textsuperscript{498} A score of 20 or below was estimated to be equivalent to 20% total fat and 7% saturated fat consumption. Criterion validity and predictive validity of the instrument have been reported in a study comprising 800 adults randomly selected from a community population.\textsuperscript{445} The correlations between Short Fat Questionnaire scores and percentage of total fat (r = 0.55) and percentage of saturated fat (r = 0.67) were moderate.\textsuperscript{498}
This study did not evaluate construct validity for this instrument because the questionnaire was developed from a series of questions from a "Facts on Fat" kit developed by a Health Promotion Unit in Australia. No other related or unrelated information on dietary fat intake was collected in this study and thus, convergent or discriminant validity could not be examined. Consequently, internal consistency of this instrument using Cronbach’s alpha was the only statistical test performed on the SFQ within the study.

5.10.2 Reliability of the SFQ

Cronbach’s alpha results of the total scale was above 0.7 on data obtained at baseline and at the 6-month follow-up (Table 5.14). Analysis of the items according to the ‘alpha if item deleted’ procedure showed that the removal of any of the items listed would not have much consequence on the alpha value. Table 5.14 provides a summary of findings of the SFQ results on data collected at baseline and at the 6-month follow-up.

<table>
<thead>
<tr>
<th>Total and subscales</th>
<th>Alpha</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total SFQ at baseline</td>
<td>0.78</td>
<td>145</td>
<td>24.5</td>
<td>8.3</td>
</tr>
<tr>
<td>Total SFQ at follow-up</td>
<td>0.75</td>
<td>106</td>
<td>14.8</td>
<td>6.5</td>
</tr>
</tbody>
</table>

5.10.3 Conclusion: SFQ

Both at baseline and at the 6-month follow-up, analyses of data on this scale showed high internal consistency. The high internal consistency of the instrument and the fact that this instrument was developed specifically to measure dietary fat consumption in the Australian population made the selection of this instrument the best option available.
5.11 Study Limitations

Although the results demonstrate acceptable validity and reliability of the instruments tested, two limitations of this research must be considered. Firstly, the small sample size increases the risk that the obtained factor structures will not be confirmed in other studies. Secondly, the population used in this study was fairly homogeneous (Anglo-Australians) with an under-representation of survivors from culturally and linguistically diverse groups. However, in most cases, the factor structures uncovered were the same as previous studies, therefore this may not have been a problem.

5.12 Summary

This chapter sought to examine the validity and reliability of scale instruments used in the study. Specific issues related to each instrument have previously been discussed, hence, this section contains general validity and reliability issues related to these instruments.

Four of the five scale instruments used in this study were purported to have subdimensions, by either the developers of these instruments or subsequent reports of other researchers who tested the psychometric properties of these instruments. CFA of these four instruments (OLQ, PSS, LOT-R and MSPSS) yielded similar results to previous studies. For the PSS, this is the first time CFA has been used to confirm the constructs identified by Cohen in his initial study following the development of the PSS. Unlike previous studies that investigated the validity and reliability of these instruments on healthy participants, this study demonstrated the applicability of these instruments in survivors of acute myocardial infarction. Despite the small sample, it was able to demonstrate similar factor structures as those of previous researchers in a population of first AMI survivors.

This study also confirmed the reliability of four of the five instruments. All Likert scale instruments in this study had acceptable levels of internal consistency, except for the LOT-R which did not achieve the recommended 0.7 level of Cronbach's alpha. Low internal consistency has been previously reported for this instrument. Nevertheless, results of construct and convergent validity on the LOT-R supported previously published results.
Chapter 6
Magnitude of health behavioural change six months after the first AMI

6.1 Introduction
If health behavioural changes are to occur, it is most likely that these would have taken place and have been incorporated into the person’s daily lifestyle by six months after their life-threatening experience. This chapter examines the degree to which first AMI survivors engaged in health-enhancing behaviours six months after the initial cardiac event. Health-enhancing behaviours, as previously described in Chapter 2, are critical for optimal health after an AMI but more importantly, are essential if the person is to avoid recurrent coronary events.

Before examining the health-enhancing behaviours at the 6-month follow-up and the magnitude of health behavioural change, the characteristics of survivors who responded to the 6-month follow-up are compared with non-responders. This is necessary because if the non-responders had different characteristics to the responders, results obtained from the 6-month follow-up group would not be representative of the baseline population. Similarly, the characteristics of attendees and non-attendees at an outpatient cardiac rehabilitation are compared to uncover any differences in these two groups. Following the examination of sample characteristics, hypothesis testing identified in Chapter 3 (Hypotheses 1.1 to 1.5) will be conducted, exploring changes in four health-enhancing behaviours (non-smoking behaviour, weight normalisation, adequate physical activity, low dietary fat intake) six months after the first AMI.

6.2 Methods
A full description of the design, sample and setting, instruments and procedures has been presented in Chapters 4 and 5. Only additional information necessary for the interpretation of the results is presented here. Survivors were recruited from four hospitals in the South Western Sydney Metropolitan area. Although there were wide
variations in the size of each hospital (72 beds to 420 beds), all four hospitals had Coronary Care Units. Forty-nine percent (n=71) of survivors were recruited from Hospital 1, 27% (n=39) from Hospital 2, 16% (n=23) from Hospital 3 and 8% (n=12) from Hospital 4.

6.2.1 Data collection procedures
The survey form for data collection included the health behaviours - smoking behaviour, body weight and height, physical activities and dietary fat intake, (Appendix 3), and was initially administered within the hospital setting. A follow-up questionnaire which included medication adherence in addition to the above (see Appendix 4), was then sent to the patient’s home six months later. If no response was received within two weeks, a reminder letter and another questionnaire were sent to the patient. A second reminder letter together with another questionnaire were sent if no response was received two weeks after the first reminder.

6.2.2 Measures
Three types of measures: single-item measures, open-ended questions and a Likert scale instrument, were used in this study. The single-item measures and open-ended questions were used to obtain the following information: height and body weight of the survivors, smoking status and behaviour, participation in physical activity and medication adherence. A Likert scale instrument, the 17-item Short Fat Questionnaire, measured dietary fat intake. A detailed description of these health behaviours and justification for their inclusion in the study were discussed in Chapters 2 and 4.

6.2.3 Data Transformation
Four health-enhancing behaviours, measured at both baseline and the 6-month follow-up, was each allocated a code of “1” for presence of health-enhancing behaviour and “0” absence of health-enhancing behaviour, as shown in Tables 6.1 and 6.2 (p.95).
### Table 6.1 Recoding of variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Initial Measure</th>
<th>Recode</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Behaviours</strong></td>
<td></td>
<td><strong>Health-enhancing behaviours</strong></td>
</tr>
<tr>
<td>Smoking behaviour</td>
<td>Yes or No</td>
<td>Yes: 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No: 1</td>
</tr>
<tr>
<td>BMI</td>
<td>Range of scores: 15 to 37</td>
<td>Normal BMI: 18.5 to 24.9: 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-normal BMI: equal to and &lt;18.4 or ≥25: 0</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Frequency per fortnight and cumulative total hours per fortnight</td>
<td>Sufficient physical activity: at least five times and at least 2½ hours per week of moderate intensity physical activity: 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Insufficient physical activity: less than five times or less than 2½ hours per week of moderate intensity physical activity: 0</td>
</tr>
<tr>
<td>Medication adherence</td>
<td>Take medications strictly as prescribed</td>
<td>Medication adherers: 1</td>
</tr>
<tr>
<td></td>
<td>Occasionally miss doses</td>
<td>Non-medication adherers: 0</td>
</tr>
<tr>
<td>Dietary fat intake</td>
<td>Range of scores: 0 to 63</td>
<td>Low fat intake &lt;20: 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High fat intake ≥20: 0</td>
</tr>
</tbody>
</table>

### Table 6.2 Computation of the total number of health-enhancing behaviours

<table>
<thead>
<tr>
<th>Variable</th>
<th>Initial Units of Measure</th>
<th>Number of health-enhancing behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of health-enhancing behaviours</td>
<td>Non-smoking behaviour (complete abstinence for at least 1 month) = 1</td>
<td>Sum of scores of all four health-enhancing behaviours</td>
</tr>
<tr>
<td></td>
<td>Smoking behaviour = 0</td>
<td><em>(Scores range from 0 to 4)</em></td>
</tr>
<tr>
<td></td>
<td>Normal BMI (BMI: 18.5 to 24.9) = 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-normal BMI (equal to &lt;18.4 or ≥25) = 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adequate physical activity (at least moderate intensity physical activity on at least 5 times/week or at least 2½ hours/week) = 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inadequate physical activity = 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low fat dietary intake (&lt;20% total fat, &lt;7% saturated fat) = 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High fat dietary intake = 0</td>
<td></td>
</tr>
</tbody>
</table>

Note: Total number of health-enhancing behaviours was obtained by adding the units
6.2.4 Analysis

The results for this chapter were analysed using SPSS Version 10 computer software. Univariate descriptive statistics were used to examine the sample characteristics. Nominal data were summarised in terms of frequencies, whilst continuous data were summarised in terms that include means, median and standard deviations.

Comparison of respondents and non-respondents to the 6-month follow-up survey was analysed in the following manner: differences in categorical variables were examined using the Pearson Chi-square test and independent samples $t$ test for continuous variables. The comparison of change in the number of health behaviours was tested using the McNemar's chi-squared test for dichotomous variables and paired $t$-tests for continuous variables. The difference in the number of health-enhancing behaviour at baseline and at the 6-month follow-up were analysed using a non-parametric procedure, the Wilcoxon signed-rank test. All tests were two-tailed with values of $p < 0.05$ considered statistically significant.

6.3 Participant characteristics

6.3.1 Sociodemographic and clinical features

The sociodemographic characteristics and modifiable coronary risk factors of survivors at baseline are provided in Table 6.3 (p. 97). Three-quarters of the sample were male and about the same proportion were living with their partner. Less than a quarter (16.6%) had above secondary school education and less than half (42%) the sample was in paid employment. Of those who were in paid employment, nearly half of these were blue-collar workers. More than 40% of the survivors were retired. Among the modifiable risk factors, more than 30% of the survivors were smokers at baseline and close to 90% did not undertake an adequate level of physical activity. The mean peaked creatine kinase level was just over 1400 U/L with a wide spread in the distribution of scores (SD=1495.3U/L). A high proportion of the survivors (89.7%) were classified as Killip Class 1, i.e., assessed to have no heart failure on hospital admission following the AMI (Table 6.3, p. 97).
<table>
<thead>
<tr>
<th>Characteristic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>57.4 (11.4)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male, ( n ) (%)</td>
<td>106 (73.1)</td>
</tr>
<tr>
<td>Female, ( n ) (%)</td>
<td>39 (26.9)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
</tr>
<tr>
<td>Living with partner, ( n ) (%)</td>
<td>105 (72.4)</td>
</tr>
<tr>
<td>Not living with partner, ( n ) (%)</td>
<td>40 (27.6)</td>
</tr>
<tr>
<td><strong>Country of birth</strong></td>
<td></td>
</tr>
<tr>
<td>Born in Australia, ( n ) (%)</td>
<td>96 (66.2)</td>
</tr>
<tr>
<td>Born overseas, ( n ) (%)</td>
<td>49 (33.8)</td>
</tr>
<tr>
<td><strong>Highest education achievement</strong></td>
<td></td>
</tr>
<tr>
<td>Some primary, ( n ) (%)</td>
<td>4 (2.7)</td>
</tr>
<tr>
<td>Completed primary, ( n ) (%)</td>
<td>8 (5.5)</td>
</tr>
<tr>
<td>Some secondary, ( n ) (%)</td>
<td>71 (49.0)</td>
</tr>
<tr>
<td>Completed secondary, ( n ) (%)</td>
<td>38 (26.2)</td>
</tr>
<tr>
<td>Tertiary, ( n ) (%)</td>
<td>24 (16.6)</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
</tr>
<tr>
<td>Professional, ( n ) (%)</td>
<td>16 (11.0)</td>
</tr>
<tr>
<td>White collar worker, ( n ) (%)</td>
<td>17 (11.7)</td>
</tr>
<tr>
<td>Blue collar worker, ( n ) (%)</td>
<td>28 (19.3)</td>
</tr>
<tr>
<td>Home-duties, ( n ) (%)</td>
<td>11 (7.6)</td>
</tr>
<tr>
<td>Unemployed, ( n ) (%)</td>
<td>4 (2.8)</td>
</tr>
<tr>
<td>Retired, ( n ) (%)</td>
<td>60 (41.4)</td>
</tr>
<tr>
<td>Not known, ( n ) (%)</td>
<td>9 (6.2)</td>
</tr>
<tr>
<td><strong>Modifiable clinical risk factors</strong></td>
<td></td>
</tr>
<tr>
<td>Smoking, ( n ) (%)</td>
<td>47 (32.4)</td>
</tr>
<tr>
<td>Hypertension, ( n ) (%)</td>
<td>55 (37.9)</td>
</tr>
<tr>
<td>Hyperlipidaemia, ( n ) (%)</td>
<td>60 (41.4)</td>
</tr>
<tr>
<td>BMI ( \geq 25 ), ( n ) (%)</td>
<td>89 (61.3)</td>
</tr>
<tr>
<td>High dietary fat intake ( &gt;20% ) ( n ) (%)</td>
<td>43 (29.7)</td>
</tr>
<tr>
<td>Inadequate physical activity, ( n ) (%) (&lt; 5 \text{ times/week or } &lt;2\frac{1}{2} \text{ hours/week})</td>
<td>125 (86.2)</td>
</tr>
</tbody>
</table>

**Severity of AMI**

- Peaked creatine kinase \((\text{U/L})\), *mean (SD)*: 1419.3 (1495.3)
- Killip class – no heart failure, \( n \) (%): 130 (89.7)
6.3.2 Comparison of characteristics between respondents and non-respondents to the 6-month follow-up

One hundred and twelve subjects (77%) responded to the 6-month follow-up survey. Six of the responses were received from the survivors’ relative or solicitor informing of the participant’s death sometime during the 6-month period of the study. The remaining 106 survivors responded by returning the completed 6-month follow-up survey questionnaire.

There were no significant differences in sociodemographic, clinical or psychological characteristics between respondents and non-respondents to the 6-month follow-up with the exception of respondents to the 6-month follow-up being older (p=0.041) than non-respondents (Table 6.4, p. 99).
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Respondent (n=106)</th>
<th>Non-respondent (n=39)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD) years</td>
<td>58.6 (10.9)</td>
<td>54.2 (12.2)</td>
<td>p=0.041*</td>
</tr>
<tr>
<td>Gender (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>71.7</td>
<td>76.9</td>
<td>p=0.529†</td>
</tr>
<tr>
<td>Female</td>
<td>28.3</td>
<td>23.1</td>
<td></td>
</tr>
<tr>
<td>Origin (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australian born</td>
<td>67.0</td>
<td>64.1</td>
<td>p=0.745†</td>
</tr>
<tr>
<td>Overseas</td>
<td>33.0</td>
<td>35.9</td>
<td></td>
</tr>
<tr>
<td>Marital status (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living with partner</td>
<td>71.7</td>
<td>74.4</td>
<td>p=0.751†</td>
</tr>
<tr>
<td>Not living with partner</td>
<td>28.3</td>
<td>25.6</td>
<td></td>
</tr>
<tr>
<td>Highest educational achievement (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some primary schooling</td>
<td>2.8</td>
<td>2.6</td>
<td>p=0.910†</td>
</tr>
<tr>
<td>Completed primary schooling</td>
<td>6.6</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Some high schooling</td>
<td>49.1</td>
<td>48.7</td>
<td></td>
</tr>
<tr>
<td>Completed secondary schooling</td>
<td>25.5</td>
<td>28.2</td>
<td></td>
</tr>
<tr>
<td>Tertiary education</td>
<td>16.0</td>
<td>17.9</td>
<td></td>
</tr>
<tr>
<td>Employment status (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional</td>
<td>9.5</td>
<td>15.4</td>
<td></td>
</tr>
<tr>
<td>White collar worker</td>
<td>11.4</td>
<td>12.8</td>
<td></td>
</tr>
<tr>
<td>Blue collar worker</td>
<td>17.1</td>
<td>25.6</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>2.9</td>
<td>2.6</td>
<td>p=0.656†</td>
</tr>
<tr>
<td>Homemaker</td>
<td>8.6</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>Retired</td>
<td>45.7</td>
<td>30.8</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>4.8</td>
<td>7.7</td>
<td></td>
</tr>
<tr>
<td>Killip class (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No heart failure</td>
<td>92.3</td>
<td>87.2</td>
<td>p=0.342†</td>
</tr>
<tr>
<td>Mild to moderate heart failure</td>
<td>7.7</td>
<td>12.8</td>
<td></td>
</tr>
<tr>
<td>Peak creatine kinase mean (SD)</td>
<td>1366.8 (1343.6)</td>
<td>1563.2 (1861.9)</td>
<td>p=0.490*</td>
</tr>
<tr>
<td>Adequate physical activity (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15.1</td>
<td>10.3</td>
<td>p=0.454*</td>
</tr>
<tr>
<td>No</td>
<td>84.9</td>
<td>89.7</td>
<td></td>
</tr>
<tr>
<td>Cigarette smoking (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>29.2</td>
<td>41.0</td>
<td>p=0.179†</td>
</tr>
<tr>
<td>No</td>
<td>70.8</td>
<td>59.0</td>
<td></td>
</tr>
<tr>
<td>Total Diet score, mean (SD)</td>
<td>23.8 (7.7)</td>
<td>22.6 (10.0)</td>
<td>p=0.458*</td>
</tr>
<tr>
<td>Classification of body mass index (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>4.0</td>
<td>2.9</td>
<td>p=0.954†</td>
</tr>
<tr>
<td>Normal weight</td>
<td>30.3</td>
<td>26.5</td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>42.4</td>
<td>47.1</td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>23.2</td>
<td>23.5</td>
<td></td>
</tr>
</tbody>
</table>

* independent sample t-test
† Pearson χ² test
‡ at least five times per week and at least 2½ hours total per week
6.3.4 Characteristics of attendees and non-attendees at an outpatient cardiac rehabilitation program

As attendance at a cardiac rehabilitation program could influence change in behaviour, close examination of any differences in attendees and non-attendees will inform the results presented later in Chapter 7.

Attendees at an outpatient cardiac rehabilitation program were more likely to be living with a spouse than non-attendees. Aside from this difference, there were no significant differences between attendees and non-attendees at baseline. However, at the 6-month follow-up, attendees were more likely to report a positive and significant change in their lifestyle and to be feeling healthier than the non-attendee group. They were also more likely to report low fat diet (p = 0.037) compared to the non-attendees at a cardiac rehabilitation program. There was a trend for lower perceived stress scores and lower percentage of non-smoking behaviour in outpatient cardiac rehabilitation attendees. However the sample size in this study was too small to yield statistical significance of these two characteristics. (Table 6.5, p.101).
Table 6.5  Characteristics of attendees and non-attendees at an outpatient cardiac rehabilitation program (n = 106)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Attendee (n=62)</th>
<th>Non-attendee (n=44)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age mean (SD), years</td>
<td>57.3 (9.9)</td>
<td>60.2 (12.2)</td>
<td>0.172*</td>
</tr>
<tr>
<td>Gender male, %</td>
<td>72.6</td>
<td>70.5</td>
<td>0.811†</td>
</tr>
<tr>
<td>Born in Australia, %</td>
<td>66.1</td>
<td>68.2</td>
<td>0.825†</td>
</tr>
<tr>
<td>Living with spouse, %</td>
<td>79.0</td>
<td>61.4</td>
<td>0.047†</td>
</tr>
<tr>
<td>Education: more than primary schooling, %</td>
<td>56.5</td>
<td>61.4</td>
<td>0.613†</td>
</tr>
<tr>
<td>Killip class: no failure, %</td>
<td>91.9</td>
<td>93.2</td>
<td>0.811†</td>
</tr>
<tr>
<td>Peak creatine kinase mean (SD) U/L</td>
<td>1528.8 (1505.7)</td>
<td>1127.7 (1031.3)</td>
<td>0.110*</td>
</tr>
<tr>
<td>Psychosocial (score)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimism, mean (SD)</td>
<td>15.2 (3.5)</td>
<td>15.1 (4.1)</td>
<td>0.880*</td>
</tr>
<tr>
<td>Sense of coherence, mean (SD)</td>
<td>147.8 (25.9)</td>
<td>144.3 (30)</td>
<td>0.527*</td>
</tr>
<tr>
<td>Social support, mean (SD)</td>
<td>69.9 (13.0)</td>
<td>70.5 (15.3)</td>
<td>0.820*</td>
</tr>
<tr>
<td>Stress at baseline, mean (SD)</td>
<td>17.3 (8.5)</td>
<td>17.2 (9.0)</td>
<td>0.956*</td>
</tr>
<tr>
<td>Stress at follow-up, mean (SD)</td>
<td>13.9 (7.5)</td>
<td>15.4 (9.7)</td>
<td>0.405*</td>
</tr>
<tr>
<td>Perception about health and health behaviour</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception of lifestyle at baseline: healthy, %</td>
<td>53.2</td>
<td>68.2</td>
<td>0.122†</td>
</tr>
<tr>
<td>Perception of lifestyle at follow-up: healthy, %</td>
<td>83.9</td>
<td>75.0</td>
<td>0.259†</td>
</tr>
<tr>
<td>Feels healthier at follow-up, %</td>
<td>56.9</td>
<td>36.4</td>
<td>0.040†</td>
</tr>
<tr>
<td>Significant lifestyle change at follow-up, %</td>
<td>86.4</td>
<td>55.8</td>
<td>0.002†</td>
</tr>
<tr>
<td>Health-enhancing behaviour</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-smoking at baseline, %</td>
<td>69.4</td>
<td>72.7</td>
<td>0.707†</td>
</tr>
<tr>
<td>Non-smoking at follow-up, %</td>
<td>93.5</td>
<td>84.1</td>
<td>0.116†</td>
</tr>
<tr>
<td>Normal BMI range† at baseline, %</td>
<td>27.4</td>
<td>43.2</td>
<td>0.091†</td>
</tr>
<tr>
<td>Normal BMI range† at follow-up, %</td>
<td>30.6</td>
<td>45.5</td>
<td>0.119†</td>
</tr>
<tr>
<td>Adequate physical activity† at baseline, %</td>
<td>14.5</td>
<td>9.1</td>
<td>0.401†</td>
</tr>
<tr>
<td>Adequate physical activity† at follow-up, %</td>
<td>41.9</td>
<td>38.6</td>
<td>0.733†</td>
</tr>
<tr>
<td>Medication adherence, %</td>
<td>83.9</td>
<td>88.6</td>
<td>0.488†</td>
</tr>
<tr>
<td>Low fat intake□ at baseline, %</td>
<td>24.2</td>
<td>31.8</td>
<td>0.386†</td>
</tr>
<tr>
<td>Low fat intake□ at follow-up, %</td>
<td>87.1</td>
<td>70.5</td>
<td>0.034†</td>
</tr>
</tbody>
</table>

Comparison tests:
* independent sample t-test
† Pearson χ² test.
‡ BMI with 18.5 to 24.9 kg/m²
§ Physical activity: at least 5x/week and at least 2½ hours total per week
□ Low dietary fat intake: less than 7% saturated fat
6.3.5 Magnitude of health behavioural change

Following the first AMI, literature review supports a positive change in health behaviours; hence, hypotheses are written in a unidirectional manner. However, to take into account a potential negative health behavioural change at the 6-month follow-up, all statistical tests of significance were two-tailed.

Hypothesis testing

This section will test four hypotheses relating to the extent to which health-enhancing behaviours were practised and the magnitude of health behavioural change. They are:

**H1.1:** Smoking behaviour (any self-reported smoking at time of AMI or in the one month preceding the AMI) will be less at the 6-month follow-up than at the time of the initial cardiac event.

**H1.2:** For survivors with a BMI greater than 25 kg/m² at the time of the initial cardiac event, BMI will return to within the normal range (18.6 to 24.9 kg/m²) by the time of the 6-month follow-up.

**H1.3:** Participation in adequate physical activity (at least five times and at least 2½ hours per week of moderate or vigorous intensity) will increase by the time of the 6-month follow-up compared to at the time of the initial cardiac event.

**H1.4:** Saturated fat diet (<7% saturated fat) will be less at the time of the 6-month follow-up compared to at the time of the initial cardiac event.

Table 6.6 (p.104) shows there was significant overall improvement in three of the four health-enhancing behaviours: non-smoking behaviour (18.9% increase), adequate physical activity (28.3% increase) and low dietary fat intake (52.8% increase). However, there was wide variation amongst the four health-enhancing behaviours reported by the survivors at the 6-month follow-up. Normal BMI and adequate level of physical activity were only reported in less than half of the survivors at the 6-month follow-up. Nearly 90% were non-smokers and 80.2% reported to be on a low fat diet.
Approximately 29% (n=30) of survivors smoked at baseline, with 64.5% of these no longer smoking at the 6-month follow-up (Table 6.6, p.104). However, there was only a small increase (2.8%) in the number of survivors with normal BMIs (i.e. BMI: 18.5-24.9 kg/m²) at the 6-month follow-up. This small change in weight loss was not statistically significant (p=0.607). However, further examination of only those who were overweight or obese (BMI ≥ 25 kg/m²) at baseline revealed that 55.9% lost at least 1 kg or more. A non-significant mean weight loss of 2.9 kg in overweight or obese survivors (n = 68) at the 6-month follow-up was observed in this study. Health benefits and reduction of health risk as well as improvement in the quality of life can be achieved with moderate weight loss of 5-10% in those who are overweight and obese. In this study, 5% of the mean body weight of overweight or obese survivors is 4.8 kg. Using this as the cut-off, 31% of overweight or obese survivors reported a clinically significant weight loss (i.e. 5% or more of weight loss) at the 6-month follow-up, which again was not statistically significant.

Adequate physical activity which had the lowest participation rate at baseline, however, was 28.3% higher at the 6-month follow-up (Table 6.6, p.104). The health behaviour that had the greatest magnitude of change at the 6-month follow-up was low dietary fat intake, with more than a 50% increase in reported low dietary fat intake at the 6-month follow-up.

Self-reported medication adherence also demonstrated a high level of adherence. Eighty-eight percent of the survivors reported strict adherence to the prescribed medication regimen at the 6-month follow-up.
Table 6.6  Magnitude of health behavioural change at baseline and follow-up

<table>
<thead>
<tr>
<th>Health-enhancing behaviours</th>
<th>Baseline (n=106) n (%)</th>
<th>Follow-up (n=106) n (%)</th>
<th>Difference n (%)</th>
<th>p-value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-smoking for at least one month</td>
<td>75 (70.8)</td>
<td>95 (89.6)</td>
<td>20 (18.9)</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Normal body weight (BMI: 18.5 to 24.9 kg/m²)</td>
<td>34 (32.1)</td>
<td>37 (34.9)</td>
<td>3 (2.8)</td>
<td>p=0.607</td>
</tr>
<tr>
<td>Adequate physical activity (at least five times per week and at least 2½ hours per week)</td>
<td>13 (12.3)</td>
<td>43 (40.6)</td>
<td>30 (28.3)</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Low fat intake (&lt;20% total fat; &lt;7% saturated fat)</td>
<td>29 (27.4)</td>
<td>85 (80.2)</td>
<td>56 (52.8)</td>
<td>p&lt;0.001</td>
</tr>
</tbody>
</table>

*Comparison test – McNemar’s chi-squared test (Two-tailed)

H1.1, H1.3, H1.4, which relate to the significant increase in non-smoking behaviour, increased physical activity level, and reduction in dietary fat intake at the 6-month follow-up were supported by these findings. However, H1.2, relating to the significant increase in weight normalisation of survivors at the 6-month follow-up was not supported in this study.

6.3.6 Change in the number of health-enhancing behaviours

Hypothesis testing

The hypothesis tested in this section is:

H1.5: There will be an overall increase in the number of health-enhancing behaviours at the time of the 6-month follow-up compared to at the time of the initial cardiac event.

Whilst the maintenance and adoption of all four health-enhancing behaviours would have been beneficial to all first AMI survivors, not all health-enhancing behaviours were engaged by all survivors. A total of the health-enhancing behaviours practised at baseline and at the 6-month follow-up would provide an overview on how survivors performed across all four health-enhancing behaviours computed as shown in Table 6.2 (p.95).
Overall, there was an increase in the median (from 2 to 3) in the number of health-enhancing behaviours at the 6-month follow-up (Figure 6.1). Applying the Wilcoxon signed-rank test, a statistically significant difference in the two scores was obtained ($Z = 6.389$, $p < 0.0001$). This indicates that there was a significant increase in the number of health-enhancing behaviours being undertaken by the survivors over the 6-month period. Nevertheless, only a small number ($n=15$) of survivors were engaging in all four health-enhancing behaviours at the 6-month follow-up.

![Bar chart showing number of health-enhancing behaviours](image)

<table>
<thead>
<tr>
<th>Number of health-enhancing behaviours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10%</td>
</tr>
<tr>
<td>1</td>
<td>20%</td>
</tr>
<tr>
<td>2</td>
<td>30%</td>
</tr>
<tr>
<td>3</td>
<td>25%</td>
</tr>
<tr>
<td>4</td>
<td>15%</td>
</tr>
</tbody>
</table>

Median at baseline: 2
Median at 6-month follow-up: 3

**Figure 6.1** Number of health-enhancing behaviours practised by each participant at baseline and at the 6-month follow-up

**H1.6**, which relates to the overall increase in the number of health-enhancing behaviours at the 6-month follow-up, was also supported by this study.

### 6.4 Discussion

The purpose of this chapter was to examine the magnitude of health behavioural change following the first AMI and the extent to which all or some of these health-enhancing behaviours were practised. There was an increase in individual and overall health-enhancing behaviours reported by the sample during the 6-month follow-up. All of these increases were statistically significant, except for weight normalisation.
The response rate to the 6-month follow-up was 77%. This level of response has been considered satisfactory for mail surveys. Except for age, there were no differences in the sociodemographic, clinical or psychosocial characteristics between respondents and non-respondents to the 6-month follow-up. The examination of attendees and non-attendees at an outpatient cardiac rehabilitation program revealed that attendees had a more positive perception of their health and health behaviour at the 6-month follow-up, even though there were no significant differences between these two groups at baseline. In addition, attendees were significantly more likely to adhere to a low fat diet at the 6-month follow-up.

6.4.1 Magnitude of improvement in health-enhancing behaviours

Smoking cessation
An increase in the proportion of smokers who gave up smoking at the 6-month follow-up, was established (p<0.001), thus supporting H1.1, relating to smoking behaviour. More than half (67.7%) of the smokers at baseline had stopped smoking at the 6-month follow-up. It is widely agreed that smoking is the single most important risk factor to control after an AMI; hence a target of a 100% cessation rate among smokers. Continued smoking in first AMI survivors more than doubles the rate of subsequent infarction and death. However, the 67.7% (20 of the 31 first AMI survivors who were smokers stopped smoking at follow-up) cessation rate in this study is comparable to the cessation rate of other studies that varied from 55% to 74%.

Weight loss and normal BMI
There were no differences in the proportion of participant’s BMIs within the normal range between baseline and the 6-month follow-up; therefore H1.2 was not supported (p=0.607). However, there was an overall increase (2.8%) in the proportion of survivors who reported BMIs within the normal range.

In this study, there was only a small overall rise in the proportion of participant’s BMIs within the normal range, totalling only 34.9% at the 6-month follow-up. It could be that the sample size was too small in this study. Perhaps six months was too short a time period to achieve weight normalisation in survivors who were overweight or obese. However, 55.9% of the overweight or obese reported a weight loss of 1 kg or more and 31% of overweight or obese survivors reported a significant

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weight loss (i.e. 5% or more of weight loss) at the 6-month follow-up. Any weight reduction could be argued as a positive change, particularly in this cultural setting where more than 60% of the population are overweight or obese.\textsuperscript{179}

A mean weight loss of 2.9 kg in overweight or obese survivors at the 6-month follow-up was observed in this study and is comparable to the results of other non-intervention studies into weight loss, but much less when compared to the weight loss intervention studies, where weight loss of about five to nine kg over a 6-month period was reported.\textsuperscript{657-659} These findings suggest that weight loss interventions for AMI survivors who are overweight or obese are worthwhile and will result in greater weight loss.

Although the National Heart Foundation of Australia recommends a BMI target of <25 kg/m\(^2\), to date, no intervention study has shown that weight normalisation in overweight or obese AMI survivors is an achievable goal. A number of studies on weight loss have demonstrated significant reduction of hypertension, triglycerides and hyperglycaemia were achieved with weight loss of 5-10% in overweight or obese survivors.\textsuperscript{23, 649, 650, 660} In this study, a 5% weight loss target was achieved by 31% of overweight or obese survivors.

With a number of studies reiterating the low success rate of weight loss and weight loss maintenance,\textsuperscript{661-664} the achievement of BMI within the normal range is perhaps unrealistic and over-ambitious for all overweight and obese AMI survivors. Nevertheless, the importance and benefits of a weight loss of 5-10% should still be emphasised.

**Adequate physical activity**

There was an increase in the proportion of survivors who adopted adequate physical activity level at the 6-month follow-up (p<0.001), thus supporting hypothesis H1.3. This is encouraging as pooled results of randomised trials of rehabilitation with exercise after AMI revealed an overall reduction in mortality of 20% during the first year after AMI and possibly for 2-3 years.\textsuperscript{167, 665}

Despite an impressive increase (28.3% improvement) in the participation of this health-enhancing behaviour, less than half (40.6%) reported adequate physical activity levels at the 6-month follow-up. The remarkable improvement in physical activity level may have been contributed to by health professionals’ emphasis on the
importance of exercise following a coronary event, an activity pivotal in most cardiac rehabilitation programs. 666-669 Another explanation could be that there was ample room for improvement in this health behaviour, as 88% of the survivors were not participating in adequate physical activity at baseline. Although major gains were made in this area, the overall participation rate at six months falls well short of the ideal of 100% of survivors achieving adequate exercise.

**Medication adherence**

Non-adherence to cardiovascular medications has been shown to increase the risk of death by 2.6 times within a year following the AMI. 570 The significant reduction in mortality for those individuals who adhered closely to prescribed medications in AMI patients has been demonstrated in other studies. 494, 671 A self-reported medication adherence rate of 88% demonstrated in this study is comparable to the adherence rate reported in other studies, 672 and is slightly less than the ideal benchmark of 100%.

**Dietary fat intake**

An increase in the proportion of survivors who reported low dietary fat intake at the 6-month follow-up was found (p<0.001), thus supporting hypothesis H1.4. The 52.8% increase in this health-enhancing behaviour was the largest improvement of the four health-enhancing behaviours examined at baseline and at the 6-month follow-up.

This result is encouraging as in the Nurses' Health Study, each 5% increase of energy intake from saturated fat was associated with a 17% increase in the risk of coronary disease. 158 Secondary prevention trials have shown the benefits of low dietary fat in slowing the progression of coronary vessel lesion. 673, 674

In this study, the majority of respondents at the 6-month follow-up (80.2%) consumed less than 20% total dietary fat. Despite the non-intervention design of this study, this high rate of self-reported low dietary fat adherence was similar to that reported in two randomised, controlled intervention studies. 170, 675 Other follow-up studies reported adherence rates varying from 25% to 63%. 26, 676-678 Although the majority of first AMI survivors in this study met the “low dietary fat target score” (i.e. <20% total dietary fat) criterion, an overly optimistic under-estimation by respondents about their dietary fat intake cannot be discounted. Nevertheless, self-
report of dietary fat has previously been found to have a high correlation with observations made by researchers. 26

6.4.2 Increase in number of health-enhancing behaviours
There was an overall increase in the number of health-enhancing behaviours practised at the 6-month follow-up. This demonstrates that survivors did modify their lifestyle and a significant proportion adopted health-enhancing behaviours after the AMI. The trend of increasing health-enhancing behaviour following an AMI has also been reported in other follow-up studies. 675, 679 In light of the multiplicative benefit of increasing health-enhancing behaviour, this is a positive finding. However, only 15 (14%) survivors were practising all four health-enhancing behaviours. This suggests that survivors are selective about what behaviours they change and perhaps the importance of undertaking all health-enhancing behaviours need to be emphasised by health professionals, in both the acute hospital settings as well as in outpatient cardiac rehabilitation programs.

6.5 Limitations
Although the overall response rate was good and there were no significant differences in baseline characteristics of respondents and non-respondents (except for age), it is recognised that survivors with poor health-behaviours are less likely to respond to a follow-up survey. The potential for exaggeration by the respondents and over-reporting of health-enhancing behaviour is also acknowledged. Completing self-report surveys relies on the ability of respondents to retrospectively recall, which presents another potential source of inaccuracy. Self-report data might be contaminated by common method variance. Common method variance can be considered as an artefact of measurement that biases results, because both measures come from the same source. 580, 681 All variables were based upon one source of information, the respondents, and self-reported health-enhancing behaviours may not always indicate actual health practices. 682 However, in general, a high level of consistency between self-report and other methods (e.g. observed or biochemical assessment) of assessing health behaviours has been reported. 516, 683-685
6.6 Summary
This chapter has examined change in health-enhancing behaviour with substantial change being found in three of the four behaviours. However some health-enhancing behaviours appear more difficult to change than others. Health-enhancing behaviours such as non-smoking behaviour and low dietary fat intake, which carry significant risk for subsequent morbidity and mortality, were significantly improved. However, there was only a small increase in weight normalisation at the 6-month follow-up. Similarly, there is evidence of first AMI survivors increasingly taking up more health-enhancing behaviours. The examination of which factors contribute to engagement in these health-enhancing behaviours, as well as medication adherence, is the focus of Chapter 7.
Chapter 7
Factors directly associated with engagement in health-enhancing behaviours

7.1 Introduction
The previous chapter demonstrated that despite the overall increase in survivors’ engagement in health-enhancing behaviours at the 6-month follow-up, there was wide variation in participation rates, across the five health-enhancing behaviours (non-smoking behaviour, weight normalisation, adequate physical activity, medication adherence and low dietary fat intake). Given the variation in the participation rates of health-enhancing behaviours, the influence of selected psychosocial and sociodemographic factors, initially identified in the literature as promoting healthy behaviour, may not be uniform across all five health-enhancing behaviours. For example, sociodemographic factors such as higher education may facilitate the adoption of certain health-enhancing behaviours, but not others. Psychosocial factors, like optimism, may also facilitate, or even hinder, the engagement of certain health-enhancing behaviours. Likewise, attendance at an outpatient cardiac rehabilitation program might also have contributed to the practice of some, or all, of the health-enhancing behaviours at the 6-month follow-up.

This supports the need for close examination of the selected psychosocial and sociodemographic factors in relation to each of the health-enhancing behaviours. The focus of this chapter therefore, is to investigate the direct associations between selected psychosocial and sociodemographic factors, as well as attendance at outpatient cardiac rehabilitation, on engagement in the five health-enhancing behaviours critical to first AMI survivors.
For the purpose of these analyses, health-enhancing behaviours are defined as: non-smoking behaviour, body weight management (BMI: 18.5 to 24.9 kg/m²), adequate physical activity (at least five times and at least 2½ hours per week of moderate or vigorous intensity), medication adherence and low dietary fat intake (<20% total fat, <7% saturated fat). These five specific goals of health behaviours are recommended by the American Heart Association or the National Heart Foundation of Australia\textsuperscript{30, 31, 33, 179, 182} and form the outcome variables examined in the following series of hypotheses (H2.1 to H2.6).

**Hypothesis testing**

The following is a listing of potential predictors of health-enhancing behaviours, as well as the methods of measurement, when a scaled instrument was used to measure these predictors: attendance at outpatient cardiac rehabilitation, psychosocial factors (perceived stress, {as measured by the Perceived Stress Scale}, optimism {as measured by the Life Orientation Test-Revised}, sense of coherence {as measured by the Orientation to Life Questionnaire}, perceived social support {as measured by the Multidimensional Perceived Social Support Scale}) and sociodemographic factors (age, gender, living with partner and educational achievement). Hence, hypotheses related to this section are:

**H2.1** Non-smoking behaviour (self-reported non-smoking at least one month preceding the 6-month follow-up survey) in first AMI survivors at the 6-month follow-up will be associated with attendance at an outpatient cardiac rehabilitation program, psychosocial and sociodemographic factors.

**H2.2** Weight normalisation (BMI: 18.5 to 24.9 kg/m²) in first AMI survivors at the 6-month follow-up will be associated with attendance at an outpatient cardiac rehabilitation program, psychosocial and sociodemographic factors.

**H2.3** Adequate physical activity (at least five times and at least 2½ hours per week of moderate or vigorous intensity) in first AMI survivors at the 6-month follow-up will be associated with attendance at an outpatient cardiac rehabilitation program, psychosocial and sociodemographic factors.
H2.4 Strict medication adherence (measured by a single-item response, “taking medication strictly as ordered by the doctor”) in first AMI survivors at the 6-month follow-up will be associated with attendance at an outpatient cardiac rehabilitation program, psychosocial and sociodemographic factors.

H2.5 Low dietary fat intake (<20% total fat, <7% saturated fat {measured by the 17-item Short Fat Questionnaire as having a score of less than 20}) in first AMI survivors at the 6-month follow-up will be associated with attendance at an outpatient cardiac rehabilitation program, psychosocial and sociodemographic factors.

H2.6 The engagement of more than three health-enhancing behaviours in first AMI survivors at the 6-month follow-up will be positively associated with attendance at an outpatient cardiac rehabilitation program, sociodemographic and psychosocial factors.

7.2 Methods
The design, sample characteristics and instruments have been previously described in Sections 4.2 to 4.6 in Chapter 4 and in Section 6.3 in Chapter 6. All predictors of health-enhancing behaviours at the 6-month follow-up were collected at baseline, except for information about attendance at an outpatient cardiac rehabilitation program.

7.2.1 Outcome variables
Health-enhancing behaviour for each of the five behaviours was coded as:

a) Non-smoking behaviour (Never smoked or have stopped smoking for at least one month before = 1, still smoke = 0)

b) Normal BMI (BMI: 18.5 to 24.9 kg/m2 = 1, BMI <18.5 or ≥ 25 kg/m2 = 0)

c) Adequate physical activity level (at least five times per week and at least 2½ hours per week of moderate or vigorous intensity physical activity = 1, less than five times per week or less than 2½ hours per week = 0)

d) Strict adherence to prescribed medications (strict adherence {100% of medications taken as directed} = 1, less than strict adherence = 0)

e) Low dietary fat intake (score <30 on the SFQ which is equivalent to <20% total fat, <7% saturated fat = 1, score ≥ 30 on the SFQ = 0).
In addition to the exploration of the five separate behaviours, a final hypothesis combines all five behaviours and also examines the direct associations between selected factors and attendance at outpatient cardiac rehabilitation in relation to the total number of health-enhancing behaviours being undertaken by the subjects.

7.2.2 Independent variables

Independent variables are classified as attendance at an outpatient cardiac rehabilitation program, psychosocial and sociodemographic variables. As previously reviewed in Chapter 2, cardiac rehabilitation has been shown to have a positive impact on health behaviour following an AMI.\textsuperscript{186, 193, 686, 687} Of the four psychosocial variables selected for exploration in this study, stress and social support have also been repeatedly reported to influence health-related behaviours.\textsuperscript{291-295, 298-300, 304, 420-428} However, the evidence linking the other two psychosocial factors, sense of coherence and dispositional optimism to health-related behaviours is scanty and hence, their inclusion for exploration in this study. The four sociodemographic factors discussed in Chapter 2, age, gender, marital status and educational achievement, have also been shown to be associated with health-related behaviours.\textsuperscript{206-218, 220-231} Highest educational achievement was selected as the measure of socioeconomic status because regardless of employment status, education has high reliability and validity and is generally stable after adulthood.\textsuperscript{220, 688} It is also commonly used as a surrogate measure of socioeconomic status.\textsuperscript{219}

In a procedure similar to two recent logistic regression studies which categorised independent variables, the median value of each of the independent variables was used as the cut-off.\textsuperscript{689, 690} This resulted in the categorisation of these independent variables into two groups, as shown in Table 7.1 (p. 115). These recoded variables were entered in all six logistic regression models, to be discussed in Section 7.3. The recoding of continuous variables was performed because the odds ratio of continuous independent variables is less informative than the odds ratio associated with larger units of change.\textsuperscript{588}
<table>
<thead>
<tr>
<th>Variable</th>
<th>Initial Units of Measure</th>
<th>Recode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance at an outpatient rehabilitation program</td>
<td>Yes or No</td>
<td>Yes: 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No: 0</td>
</tr>
<tr>
<td><strong>Psychosocial</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispositional optimism</td>
<td>Range of scores: 5 to 24</td>
<td>Otherwise: 5 to 15: 0</td>
</tr>
<tr>
<td>Sense of coherence (SOC)</td>
<td>Range of scores: 65 to 188</td>
<td>High optimism: 16 to 24: 1</td>
</tr>
<tr>
<td></td>
<td>Median: 148</td>
<td></td>
</tr>
<tr>
<td>Perceived social support</td>
<td>Range of scores: 14 to 84</td>
<td>Otherwise: 14 to 74: 0</td>
</tr>
<tr>
<td></td>
<td>Median: 74</td>
<td>High social support: 75 to 84: 1</td>
</tr>
<tr>
<td>Perceived stress</td>
<td>Range of scores: 0 to 36</td>
<td>Otherwise: 0 to 17: 0</td>
</tr>
<tr>
<td></td>
<td>Median: 17</td>
<td>High stress: 17 to 36: 1</td>
</tr>
<tr>
<td><strong>Sociodemographic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Range of scores: 32 to 80</td>
<td>Otherwise: 32 to 58: 0</td>
</tr>
<tr>
<td></td>
<td>Median: 58</td>
<td>Older age: 59 to 80: 1</td>
</tr>
<tr>
<td>Gender</td>
<td>-</td>
<td>Not male: 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male: 1</td>
</tr>
<tr>
<td>Marital status</td>
<td>-</td>
<td>Not living with partner: 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Living with partner: 1</td>
</tr>
<tr>
<td>Highest educational achievement</td>
<td>-</td>
<td>Otherwise: 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primary or some secondary schooling only: 1</td>
</tr>
</tbody>
</table>


7.3 Analysis

The SPSS Version 10\textsuperscript{588} computer software was used for data analysis. SPSS will calculate the exact correlation regardless of whether variables are continuous or dichotomous.\textsuperscript{588}

Logistic regression was used to estimate the probability of the presence or absence of each of the health-enhancing behaviours, based on the nine predictors or independent variables listed in Table 7.1 (p.115). Five of the six logistic regression analyses on health-enhancing behaviours at the 6-month follow-up were adjusted for the particular baseline health-enhancing behaviour that was being examined (non-smoking behaviour, normal BMI, adequate physical activity, low dietary fat intake and having more than three health-enhancing behaviours). This adjustment was performed for the specific health-enhancing behaviour because survivors who were engaging in the particular health-enhancing behaviour (e.g. non-smoking behaviour) at baseline were more likely to continue to practise that health-enhancing behaviour at the 6-month follow-up.

A logistic regression model is expressed in terms of the odds of an event occurring, in this case, the engagement of the specific health-enhancing behaviour based on the values of the set of predictor variables in the model. For a single independent variable, the logistic regression model can be expressed as:

\[
\text{Probability of health-enhancing behaviour} = \frac{e^{B_0 + B_1 X}}{1 + e^{B_0 + B_1 X}}
\]

where \(B_0\) and \(B_1\) are coefficients estimated from the data, \(X\) is the independent variable, and \(e\) is the base of the natural logarithm, approximately 2.718.\textsuperscript{588} Parameter estimates, \((B\text{ coefficients})\), represent the likelihood of obtaining the observed results in the logistic regression model and are estimated using the maximum-likelihood method.\textsuperscript{588} The estimated precision of the coefficient is expressed as standard error (SE).\textsuperscript{691}
The odds ratio represents the likelihood of a participant engaging in a particular health-enhancing behaviour for each unit change in the predictor variable with all of the other variables in the model held constant.\textsuperscript{691-693} It is computed by exponentiating the parameter estimate ($B$) for each dichotomous independent variable\textsuperscript{694} and is reported here as the adjusted odds ratio. An odds ratio that is close to 1.0 suggests that there is no change due to the predictor variable. An odds ratio above 1 indicates an increase in the odds of the event occurring and an odds ratio below 1 indicates a decrease in the odds of the event occurring.\textsuperscript{588} In this case, the event is the engagement in a particular health-enhancing behaviour. The strength of the association is presented by the odds ratio and a 95% confidence interval (CI) is also presented.

All of the independent variables were simultaneously entered into the equation using the direct logistic regression procedure as described in Tabachnick and Fidell, (p.618).\textsuperscript{695} This regression procedure estimates the independent contribution of each variable by simultaneously taking into account the other variables in the model. The direct logistic regression procedure enables all variables of interest to be forced into the model, which in this instance are cardiac rehabilitation attendance, psychosocial and sociodemographic variables. Statistical significance was based on $p<0.05$ to identify independent variables of potential clinical relevance.

The Hosmer and Lemeshow's goodness-of-fit test statistic was used to test model fit. It evaluates the goodness-of-fit by creating 10 ordered groups of survivors and then compares the number actually in each group (observed) to the number predicted by the logistic regression model (predicted). Thus, the test statistic is a chi-square statistic with a desirable outcome of non-significance, indicating that the model prediction does not significantly differ from that observed.\textsuperscript{696} A $p$-value of $>0.05$ indicates no difference between the observed and model-predicted values, and hence, acceptable fit of the data to the model.\textsuperscript{588}

The results will proceed from presenting an initial correlation matrix, displaying the correlations between the independent variables, followed by six logistic regression models.
7.4 Results

7.4.1 Correlations of independent variables

Correlation coefficients are shown in Table 7.2 using a formula adjusted for dichotomous variables and representing phi coefficients. As can be seen, many of the independent variables are weakly correlated (r = 0.0 to 0.46). Because the highest bivariate relationships between independent variables was only 0.46, there was no evidence of potential multicollinearity resulting from strongly correlated independent variables. The two personality traits examined in this study, dispositional optimism and sense of coherence were positively correlated and both of these personality traits were inversely correlated with perceived stress. This inverse correlation between perceived stress and each of these personality traits has previously been reported\(^\text{367, 561, 632, 697}\) and are sometimes referred to as stress-resistant personality traits.\(^\text{698}\)

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Outpatient cardiac rehabilitation attendance</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 High dispositional optimism (Scores: &gt; 15)</td>
<td>0.09</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 High sense of coherence (Scores: &gt; 148)</td>
<td>-0.05</td>
<td>0.42**</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 High perceived stress (Scores: &gt; 17)</td>
<td>0.06</td>
<td>-0.37**</td>
<td>-0.46**</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 High perceived social support (Scores: &gt; 75)</td>
<td>-0.08</td>
<td>0.21**</td>
<td>0.23*</td>
<td>-0.06</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Age (Years: &gt; 58)</td>
<td>-0.05</td>
<td>0.15</td>
<td>0.32**</td>
<td>-0.23*</td>
<td>0.15</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Gender (Male)</td>
<td>0.02</td>
<td>0.08</td>
<td>-0.01</td>
<td>-0.16</td>
<td>0.00</td>
<td>-0.18</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Living with partner</td>
<td>0.19*</td>
<td>0.08</td>
<td>-0.10</td>
<td>0.06</td>
<td>0.17</td>
<td>-0.18</td>
<td>0.21*</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>9 Primary or some secondary schooling only</td>
<td>-0.05</td>
<td>-0.14</td>
<td>-0.09</td>
<td>0.06</td>
<td>0.04</td>
<td>-0.02</td>
<td>-0.10</td>
<td>-0.06</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Phi coefficient test
* = p<.05 level (2-tailed)
** = p<.01 level (2-tailed)

7.4.2 Factors associated with the engagement of health-enhancing behaviours at the 6-month follow-up

Six regression models were computed to uncover predictors of the following: i) non-smoking behaviour; ii) normal BMI; iii) adequate physical activity; iv) medication adherence; v) low dietary fat intake; and vi) engaging in more than three health-enhancing behaviours.
Predictors of non-smoking behaviour at the 6-month follow-up

In this multivariate logistic regression model, the association between non-smoking behaviour at the 6-month follow-up was examined with cardiac rehabilitation attendance, psychosocial factors and sociodemographic factors, adjusting for non-smoking behaviour at baseline, thus testing H2.1.

Table 7.3 shows that after adjusting for baseline non-smoking behaviour, as well as all other variables in this model, outpatient cardiac rehabilitation was the only significant predictor of non-smoking behaviour at the 6-month follow-up (P = 0.034). Survivors who attended an outpatient cardiac rehabilitation program were over 12 times more likely to report non-smoking behaviour at the 6-month follow-up (adjusted odds ratio {AOR}, 12.64; 95% confidence interval {CI}, 1.21-131.93) than survivors who did not attend an outpatient cardiac rehabilitation program. None of the other variables examined was significantly associated (p < 0.05) with non-smoking behaviour at the 6-month follow-up, thus not supporting H2.1, except as stated above. The Hosmer-Lemeshow goodness-of-fit statistic demonstrates that the model predicted does not differ significantly from that observed (p = 0.906).

Table 7.3 Adjusted odds ratios* for non-smoking behaviour at the 6-month follow-up (n = 106)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient (B)</th>
<th>Standard error (SE)</th>
<th>Adjusted Odds Ratio (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended outpatient cardiac rehabilitation program</td>
<td>2.54</td>
<td>1.20</td>
<td>12.64 (1.21 to 131.93)</td>
<td>0.034</td>
</tr>
<tr>
<td>Psychosocial factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High optimism (Scores&gt;15)</td>
<td>-0.87</td>
<td>1.07</td>
<td>0.42 (0.05 to 3.38)</td>
<td>0.415</td>
</tr>
<tr>
<td>High sense of coherence (Scores&gt;148)</td>
<td>-0.73</td>
<td>1.22</td>
<td>0.48 (0.04 to 5.28)</td>
<td>0.549</td>
</tr>
<tr>
<td>High perceived social support (Scores&gt;75)</td>
<td>1.02</td>
<td>0.99</td>
<td>2.78 (0.40 to 19.20)</td>
<td>0.299</td>
</tr>
<tr>
<td>High baseline perceived stress (Scores&gt;17)</td>
<td>-1.29</td>
<td>1.19</td>
<td>0.28 (0.03 to 2.62)</td>
<td>0.277</td>
</tr>
<tr>
<td>Sociodemographic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older age (&gt;55 years old)</td>
<td>-0.39</td>
<td>1.12</td>
<td>0.68 (0.08 to 6.08)</td>
<td>0.729</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>-0.46</td>
<td>1.09</td>
<td>0.63 (0.08 to 5.34)</td>
<td>0.676</td>
</tr>
<tr>
<td>Living with spouse</td>
<td>-2.75</td>
<td>1.58</td>
<td>0.06 (0.03 to 1.41)</td>
<td>0.081</td>
</tr>
<tr>
<td>Primary or some secondary schooling only</td>
<td>0.02</td>
<td>1.11</td>
<td>1.02 (0.12 to 9.07)</td>
<td>0.985</td>
</tr>
</tbody>
</table>

Hosmer-Lemeshow goodness of fit for the model, chi-square = 3.41, 8 df (P = 0.906). CI denotes confidence interval.

* Odds ratio adjusted for baseline non-smoking behaviour and all other variables in the model.
Predictors of normal BMI at the 6-month follow-up

In this multivariate logistic regression model, the association between BMI within normal range (weight normalisation) at the 6-month follow-up was examined with cardiac rehabilitation attendance, psychosocial factors and sociodemographic factors, adjusting for normal BMI at baseline, thus testing H2.2.

Table 7.4 shows that survivors with high baseline stress were less likely to have a BMI that was within the normal range at the 6-month follow-up. However, the likelihood of survivors with high stress achieving normal BMI at the 6-month follow-up did not reach statistical significance (\(P = 0.056\)). Overall, not one of the variables examined emerged as a significant predictor of normal BMI at the 6-month follow-up (Table 7.4), thus failing to support H2.2. The Hosmer-Lemeshow goodness-of-fit statistic demonstrates that the model predicted does not differ significantly from that observed (\(P = 0.218\)).

### Table 7.4 Adjusted odds ratio* for having a BMI within normal range† at the 6-month follow-up (n = 106)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient (B)</th>
<th>Standard error (SE)</th>
<th>Adjusted Odds Ratio (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended outpatient cardiac rehabilitation program</td>
<td>-0.19</td>
<td>0.59</td>
<td>0.82 (0.23 to 2.92)</td>
<td>0.784</td>
</tr>
<tr>
<td><strong>Psychosocial factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High optimism (Scores&gt;15)</td>
<td>0.99</td>
<td>0.71</td>
<td>2.89 (0.67 to 10.75)</td>
<td>0.161</td>
</tr>
<tr>
<td>High sense of coherence (Scores&gt;148)</td>
<td>-1.07</td>
<td>0.73</td>
<td>0.34 (0.08 to 1.43)</td>
<td>0.142</td>
</tr>
<tr>
<td>High perceived social support (Scores&gt;75)</td>
<td>0.14</td>
<td>0.66</td>
<td>1.15 (0.31 to 4.23)</td>
<td>0.834</td>
</tr>
<tr>
<td>High baseline perceived stress (Scores&gt;17)</td>
<td>-1.54</td>
<td>0.81</td>
<td>0.21 (0.04 to 1.04)</td>
<td>0.056</td>
</tr>
<tr>
<td><strong>Sociodemographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older age (&gt;58 years old)</td>
<td>-0.03</td>
<td>0.67</td>
<td>0.97 (0.26 to 3.58)</td>
<td>0.964</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>-1.11</td>
<td>0.72</td>
<td>0.33 (0.08 to 1.36)</td>
<td>0.126</td>
</tr>
<tr>
<td>Living with spouse</td>
<td>-0.23</td>
<td>0.80</td>
<td>0.97 (0.21 to 4.64)</td>
<td>0.974</td>
</tr>
<tr>
<td>Primary or some secondary schooling only</td>
<td>0.70</td>
<td>0.64</td>
<td>2.01 (0.57 to 7.10)</td>
<td>0.278</td>
</tr>
</tbody>
</table>

Hosmer-Lemeshow goodness of fit for the model, chi-square = 10.73, 8 df (\(P = 0.218\)). CI denotes confidence interval.

* Odds ratio adjusted for baseline BMI within normal range and all other variables in the model.

† BMI within normal range (body mass index from 18.5 to 24.9 kg/m²).
Predictors of adequate physical activity at the 6-month follow-up

In this multivariate logistic regression model, the association between adequate physical activity level at the 6-month follow-up was examined with cardiac rehabilitation attendance, psychosocial factors and sociodemographic factors, adjusting for adequate physical activity level at baseline, thus testing H2.3.

Table 7.5 provides the logistic regression model of adequate physical activity at the 6-month follow-up, adjusting for adequate physical activity at baseline, as well as all other variables entered into this model. None of the variables examined approached statistical significance (i.e. $p < 0.05$). Hence, no variable could be considered as a potential predictor of adequate physical activity at the 6-month follow-up (Table 7.5), thus failing to support H2.3. The Hosmer-Lemeshow goodness-of-fit statistic demonstrates that the model predicted does not differ significantly from that observed ($p = 0.289$).

Table 7.5 Adjusted odds ratio* for adequate physical activity† at the 6-month follow-up (n = 106)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient (B)</th>
<th>Standard error (SE)</th>
<th>Adjusted Odds Ratio (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended outpatient cardiac rehabilitation program</td>
<td>0.09</td>
<td>0.43</td>
<td>1.09 (0.47 to 2.51)</td>
<td>0.841</td>
</tr>
<tr>
<td>Psychosocial factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High optimism (Scores &gt;15)</td>
<td>0.19</td>
<td>0.48</td>
<td>1.21 (0.48 to 3.07)</td>
<td>0.692</td>
</tr>
<tr>
<td>High sense of coherence (Scores &gt;148)</td>
<td>0.28</td>
<td>0.50</td>
<td>1.32 (0.49 to 3.51)</td>
<td>0.583</td>
</tr>
<tr>
<td>High perceived social support (Scores &gt;75)</td>
<td>-0.34</td>
<td>0.43</td>
<td>0.72 (0.31 to 1.67)</td>
<td>0.440</td>
</tr>
<tr>
<td>High baseline perceived stress (Scores &gt;17)</td>
<td>0.23</td>
<td>0.48</td>
<td>1.26 (0.49 to 3.24)</td>
<td>0.634</td>
</tr>
<tr>
<td>Sociodemographic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older age (&gt;58 years old)</td>
<td>-0.16</td>
<td>0.45</td>
<td>0.85 (0.35 to 2.06)</td>
<td>0.716</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>-0.32</td>
<td>0.47</td>
<td>0.73 (0.29 to 1.83)</td>
<td>0.502</td>
</tr>
<tr>
<td>Living with spouse</td>
<td>-0.09</td>
<td>0.48</td>
<td>0.92 (0.36 to 2.35)</td>
<td>0.855</td>
</tr>
<tr>
<td>Primary or some secondary schooling only</td>
<td>0.20</td>
<td>0.42</td>
<td>1.22 (0.54 to 2.78)</td>
<td>0.632</td>
</tr>
</tbody>
</table>

Hosmer-Lemeshow goodness of fit for the model, chi-square = 9.67, 8 df ($p = 0.289$). CI denotes confidence interval.

* Odds ratio adjusted for baseline adequate physical activity and all other variables in the model.

† Adequate physical activity: at least five times per week and at least 2½ hours total per week.
Predictors of medication adherence at the 6-month follow-up

In this multivariate logistic regression model, the association between medication adherence at the 6-month follow-up was examined with cardiac rehabilitation attendance, psychosocial factors and sociodemographic factors, thus testing H2.4.

Table 7.6 shows that after adjusting for all other variables in the model, high sense of coherence had a negative effect on medication adherence at the 6-month follow-up (P < 0.028). Survivors with high sense of coherence (scores >148) were less likely to report medication adherence at the 6-month follow-up (AOR, 0.17; 95% CI, 0.03 - 0.82). Another way of expressing this odds ratio is that survivors who reported medication non-adherence were 5.98 times more likely to also have high sense of coherence (Table 7.6). None of the other variables examined was significantly associated (p < 0.05) with medication adherence at the 6-month follow-up, thus not supporting H2.4, except for the association of high sense of coherence. The Hosmer-Lemeshow goodness-of-fit statistic demonstrates that the model predicted does not differ significantly from that observed (p = 0.556).

Table 7.6  Adjusted odds ratio for medication adherence* at the 6-month follow-up (n = 106)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient (B)</th>
<th>Standard error (SE)</th>
<th>Adjusted Odds Ratio (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended outpatient cardiac rehabilitation program</td>
<td>-0.41</td>
<td>0.68</td>
<td>0.66 (0.18 to 2.49)</td>
<td>0.543</td>
</tr>
<tr>
<td><strong>Psychosocial factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High optimism (Scores &gt;15)</td>
<td>-0.06</td>
<td>0.72</td>
<td>0.94 (0.23 to 3.84)</td>
<td>0.933</td>
</tr>
<tr>
<td>High sense of coherence (Scores &gt;148)</td>
<td>-0.179</td>
<td>0.81</td>
<td>0.17 (0.03 to 0.82)</td>
<td>0.028</td>
</tr>
<tr>
<td>High perceived social support (Scores &gt;75)</td>
<td>1.31</td>
<td>0.70</td>
<td>3.69 (0.93 to 14.61)</td>
<td>0.063</td>
</tr>
<tr>
<td>High baseline perceived stress (Scores &gt;17)</td>
<td>-0.33</td>
<td>0.71</td>
<td>0.72 (0.18 to 2.92)</td>
<td>0.648</td>
</tr>
<tr>
<td><strong>Sociodemographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older age (&gt;58 years old)</td>
<td>0.86</td>
<td>0.71</td>
<td>2.36 (0.59 to 9.48)</td>
<td>0.224</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>-1.85</td>
<td>1.12</td>
<td>0.16 (0.02 to 1.41)</td>
<td>0.099</td>
</tr>
<tr>
<td>Living with spouse</td>
<td>-0.23</td>
<td>0.80</td>
<td>0.80 (0.17 to 3.80)</td>
<td>0.775</td>
</tr>
<tr>
<td>Primary or some secondary schooling only</td>
<td>-0.41</td>
<td>0.64</td>
<td>0.67 (0.19 to 2.31)</td>
<td>0.522</td>
</tr>
</tbody>
</table>

*Odds ratio adjusted for all other variables in the model.
†An alternate expression for the odds ratio of high sense of coherence (scores >148):

\[
\text{Medication non-adherence} = \frac{1}{0.17} \div \frac{1}{0.03}, \frac{1}{0.82}
\]

\[
= \frac{1}{0.17} \times \frac{0.03}{0.82}
\]

\[
= 5.98 \text{ (95% CI 1.21 to 29.41)}
\]
Predictors of low dietary fat intake at the 6-month follow-up

In this multivariate logistic regression model, the association between low dietary fat intake at the 6-month follow-up was examined with cardiac rehabilitation attendance, psychosocial factors and sociodemographic factors, adjusting for low dietary fat intake at baseline, thus testing H2.5.

Table 7.7 provides the logistic regression model of low dietary fat intake at the 6-month follow-up, adjusting for low dietary fat intake at baseline, as well as all the other variables entered into this model. The table shows that survivors who attended cardiac rehabilitation were over five times more likely to report a low dietary fat intake at the 6-month follow-up, after adjusting for baseline low dietary fat intake, as well as all other variables in the model (AOR, 5.31; 95% CI, 1.54 - 18.34). None of the other variables examined was significantly associated (P < 0.05) with low dietary fat intake at the 6-month follow-up, thus not supporting H2.5 except for attendance at cardiac rehabilitation programs. The Hosmer-Lemeshow goodness-of-fit statistic demonstrates that the model predicted does not differ significantly from that observed (p = 0.969).

Table 7.7  Adjusted odds ratio* for low dietary fat intake† at the 6-month follow-up (n = 106)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient (B)</th>
<th>Standard error (SE)</th>
<th>Adjusted Odds Ratio (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended outpatient cardiac rehabilitation program</td>
<td>1.67</td>
<td>0.63</td>
<td>5.31 (1.54 to 18.34)</td>
<td>0.008</td>
</tr>
<tr>
<td><strong>Psychosocial factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High optimism (Scores &gt; 15)</td>
<td>-0.64</td>
<td>0.73</td>
<td>0.53 (0.13 to 2.22)</td>
<td>0.384</td>
</tr>
<tr>
<td>High sense of coherence (Scores &gt; 148)</td>
<td>1.22</td>
<td>0.77</td>
<td>3.40 (0.76 to 15.31)</td>
<td>0.111</td>
</tr>
<tr>
<td>High perceived social support (Scores &gt; 75)</td>
<td>0.60</td>
<td>0.64</td>
<td>1.83 (0.53 to 6.35)</td>
<td>0.341</td>
</tr>
<tr>
<td>High baseline perceived stress (Scores &gt; 17)</td>
<td>0.06</td>
<td>0.68</td>
<td>1.06 (0.28 to 4.03)</td>
<td>0.928</td>
</tr>
<tr>
<td><strong>Sociodemographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older age (&gt;58 years old)</td>
<td>0.88</td>
<td>0.54</td>
<td>2.42 (0.69 to 8.45)</td>
<td>0.167</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>-1.21</td>
<td>0.78</td>
<td>0.30 (0.07 to 1.36)</td>
<td>0.119</td>
</tr>
<tr>
<td>Living with spouse</td>
<td>0.48</td>
<td>0.69</td>
<td>1.62 (0.41 to 6.31)</td>
<td>0.491</td>
</tr>
<tr>
<td>Primary or some secondary schooling only</td>
<td>-0.41</td>
<td>0.61</td>
<td>0.66 (0.20 to 2.18)</td>
<td>0.496</td>
</tr>
</tbody>
</table>

Hosmer-Lemeshow goodness of fit for the model, chi-square = 2.34, 8 df (P = 0.969). CI denotes confidence interval.

* Odds ratio adjusted for baseline low dietary fat intake and all other variables in the model.

† Low dietary fat intake (< 7% saturated dietary fat intake).
Predictors of more than three health-enhancing behaviours at the 6-month follow-up

In this multivariate logistic regression model, the association between engaging in more than three health-enhancing behaviours at the 6-month follow-up was examined with cardiac rehabilitation attendance, psychosocial factors and sociodemographic factors, adjusting for participating in more than three health-enhancing behaviours at baseline, thus testing H2.6.

Table 7.8 provides the logistic regression model of having more than three health-enhancing health behaviours at the 6-month follow-up. This table shows that survivors who attended cardiac rehabilitation were over four times more likely to have engaged in more than three health-enhancing behaviours at the 6-month follow-up, after adjusting for more than three health-enhancing behaviours at baseline, as well as other variables in the model (AOR, 4.44; 95% CI, 1.34 - 14.71). None of the other variables examined was significantly associated (P < 0.05) with more than three health-enhancing behaviours at the 6-month follow-up, thus not supporting H2.6 except for attendance at cardiac rehabilitation. The Hosmer-Lemeshow goodness-of-fit statistic demonstrates that the model predicted does not differ significantly from that observed (p = 0.323).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient (β)</th>
<th>Standard error (SE)</th>
<th>Adjusted Odds Ratio (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended outpatient cardiac rehabilitation program</td>
<td>1.49</td>
<td>0.61</td>
<td>4.44 (1.34 to 14.71)</td>
<td>0.015</td>
</tr>
<tr>
<td><strong>Psychosocial factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High optimism</td>
<td>0.19</td>
<td>0.57</td>
<td>1.21 (0.40 to 3.40)</td>
<td>0.739</td>
</tr>
<tr>
<td>(Scores &gt; 15)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High sense of coherence</td>
<td>-0.07</td>
<td>0.59</td>
<td>1.21 (0.40 to 3.70)</td>
<td>0.903</td>
</tr>
<tr>
<td>(Scores &gt; 148)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High perceived social support</td>
<td>0.54</td>
<td>0.52</td>
<td>1.89 (1.06 to 5.24)</td>
<td>0.223</td>
</tr>
<tr>
<td>(Scores &gt; 75)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High baseline perceived stress</td>
<td>0.36</td>
<td>0.58</td>
<td>1.43 (0.46 to 4.45)</td>
<td>0.540</td>
</tr>
<tr>
<td>(Scores &gt; 17)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sociodemographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older age (&gt;58 years old)</td>
<td>0.73</td>
<td>0.51</td>
<td>2.07 (0.77 to 5.59)</td>
<td>0.152</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>-0.71</td>
<td>0.55</td>
<td>0.49 (0.17 to 1.45)</td>
<td>0.196</td>
</tr>
<tr>
<td>Living with spouse</td>
<td>-0.62</td>
<td>0.58</td>
<td>0.54 (0.17 to 1.45)</td>
<td>0.290</td>
</tr>
<tr>
<td>Primary or some secondary schooling only</td>
<td>0.21</td>
<td>0.49</td>
<td>1.24 (0.48 to 3.20)</td>
<td>0.684</td>
</tr>
</tbody>
</table>

Hosmer-Lemeshow goodness of fit for the model, chi-square = 9.23, 8 df (P = 0.323). CI denotes confidence interval.

* Odds ratio adjusted for having more than three health-enhancing behaviours at baseline and all other variables in the model.
7.5 Discussion: predictors of health-enhancing behaviours at the 6-month follow-up

As previously identified, there was wide variation in the participation rates of first AMI survivors in the five health-enhancing behaviours at the 6-month follow-up. Therefore, this chapter explored the influence of cardiac rehabilitation attendance, psychosocial and sociodemographic factors on the engagement of survivors within each of these five health-enhancing behaviours and also for more than three health-enhancing behaviours.

Preliminary examination of relationships between the nine independent variables, demonstrated a moderate positive association between sense of coherence and dispositional optimism. Sense of coherence also had a moderate inverse association with perceived stress. However, none of these associations exceeded the level of 0.65 as recommended by Burns and Grove,\textsuperscript{536} thus presenting no evidence of multicollinearity.

Six separate logistic regression models of health-enhancing behaviour at the 6-month follow-up were performed using the direct regression method, ensuring all independent variables of interest (attendance at an outpatient cardiac rehabilitation program, four psychosocial variables, four sociodemographic variables, as well as the specific baseline health-enhancing behaviour) were included in each model (non-smoking behaviour, weight normalisation, adequate physical activity, low dietary fat intake and engaging in more than three health-enhancing behaviours). Although none of the variables emerged as a consistent independent predictor in all six logistic regression models, the attendance at an outpatient cardiac rehabilitation program was a significant independent predictor in three of these regression models. All six models were shown to fit the data well, as demonstrated by the Hosmer-Lemeshow goodness-of-fit statistic, which examines the difference between the observed frequency and the expected frequency for groups of survivors, all six models had $P$-values that were large ($P>0.05$). This provided evidence that the models were well calibrated and fitted well to the data, even when some of the variables included in the models had no predictive power.\textsuperscript{699} The relationship between the findings and contemporary literature is described further.
7.5.1. Non-smoking behaviour

After adjusting for baseline non-smoking behaviour and all other variables in the model, attendance at an outpatient cardiac rehabilitation program was the only significant predictor of smoking cessation at the 6-month follow-up, thus not supporting H2.1, except for this factor. Attendees were over 12 times more likely to quit smoking compared to non-attendees.

The effectiveness of cardiac rehabilitation in promoting smoking cessation has previously been reported.686, 700, 701 One study revealed that a longer stay in hospital after an AMI, where patients were more likely to have received help on smoking cessation, was the only predictor of smoking cessation at follow-up.702 These findings suggest that information and assistance from health professionals, provided at outpatient cardiac rehabilitation education programs, is an important factor in promoting smoking cessation following an AMI.

Previous studies have found an association between certain psychosocial factors and smoking cessation. For instance, personality factors, like hostility, have been implicated in failure to quit smoking.703 Likewise, anxiety and depression are also linked to unsuccessful smoking cessation.704, 705 Stress is often blamed for failure to quit smoking.626, 706-708 However, the association between psychosocial factors (high optimism, high sense of coherence, high perceived social support and high baseline perceived stress) and smoking cessation was not borne out in this current study.

Similarly, no significant association was uncovered between any of the sociodemographic factors (older age {>58 years}, being male, living with spouse and primary education only) and smoking cessation. In particular, gender was not an influential factor, unlike an earlier study showing that men were more likely to quit smoking than females following an AMI.626
Normal BMI

H2.2 was not supported, as no predictors of normal BMI at the 6-month follow-up were uncovered in this study, after adjusting for all other variables in the model, including the attendance at an outpatient cardiac rehabilitation program at the 6-month follow-up. This finding is not surprising, considering that traditional cardiac rehabilitation programs have been shown to be effective in facilitating only a 2% weight loss in obese patients after three months of interventions.⁷⁰⁹

As before, no significant association was uncovered between any of the sociodemographic factors (older age {>58 years}, being male, living with spouse, and primary education only) and weight normalisation.

Physical activity

Exercise training is an integral part of a number of outpatient cardiac rehabilitation programs and was emphasised in all four cardiac rehabilitation programs attended by survivors in this study. Hence, it is not surprising that increased performance of physical activity is often reported following cardiac rehabilitation.¹⁹²,⁷¹⁰-⁷¹³ In contrast to other studies, this current study found no significant association between cardiac rehabilitation attendance and physical activity, or any of the other variables explored as potential predictors of adequate physical activity at the 6-month follow-up, thus not supporting H2.3.

There are a number of possible explanations for this finding. First, unlike previously reported cardiac rehabilitation studies, in two of the four hospitals included in this study, exercise training was not included in the outpatient cardiac rehabilitation programs. Second, the study failed to exclude those who were unable to exercise in the study design (e.g. survivors with peripheral vascular disease). These individuals could not have increased their exercise participation, with or without cardiac rehabilitation. Third, the cutoff used in this study to define adequate physical activity, (at least five times and at least 2½ hours per week of moderate or vigorous intensity) was possibly more stringent than some of the other studies. However, analysis of results on a lower cut-off (3 times and at least 1½ hours per week of moderate or vigorous intensity) which was similar to the definition of regular exercise in the SHIP study,⁷¹⁴ also failed to uncover any significant predictor of adequate physical activity.
There was no association between psychosocial factors (high optimism, high sense of coherence, high perceived social support and baseline perceived stress) and subsequent survivors’ engagement in adequate physical activity. Similarly, no significant association was uncovered between any of the sociodemographic factors (older age {58 years}, being male, living with spouse, and primary education only) and engagement in adequate physical activity.

**Medication adherence**

Medication adherence at the 6-month follow-up was high (88%) and the adherence rate was comparable to similar studies on medication adherence.\textsuperscript{715, 716} Although knowledge and understanding about the medication regimen has been posited to affect medication adherence,\textsuperscript{717-719} a number of studies have not found this association.\textsuperscript{720, 721} Attendance at an outpatient cardiac rehabilitation program was not associated with medication adherence at the 6-month follow-up.

Like the other hypotheses examined H2.4 was also not fully supported. The only psychosocial factor that was significantly and inversely associated with medication adherence, adjusting for all other variables in the model, was the presence of a high sense of coherence. This result is notable, given that the opposite relationship has been found in other studies: that high sense of coherence is a factor that has been associated with health maintenance\textsuperscript{389, 391-393} and coping.\textsuperscript{387} However, it could also be that AMI survivors with high sense of coherence might be over-confident and felt more in control, thus were more comfortable to miss the occasional medication dose. This study showed that high sense of coherence (scores of >148), a health-enhancing personality trait, could also have a negative impact on adherence behaviour, in this case, medication adherence.

No other psychosocial factors explored (high optimism, high perceived social support or high baseline perceived stress) in this study were significantly associated with medication adherence at the 0.05 level. Although social support has been shown to be important with medication adherence in patients with HIV/AIDS and adolescents with diabetes,\textsuperscript{722-724} this link has not been established in CHD patients. However, the p value of 0.063 found in this study suggests that replication of this study with a larger sample size may result in an association being confirmed at the 0.05 level. It is important to note that the adjusted odds ratio was 3.69 (CI: 0.93 to 14.61, p = 0.063) inferring that subjects would be 3.69 times more likely to engage in
medication adherence when they have high levels of social support, supporting the proposed direction of association.

Similarly, no sociodemographic factor was significantly associated with medication adherence. Currently, the link between sociodemographic factors and medication adherence is uncertain. For example, age and gender are two sociodemographic factors with conflicting findings about medication adherence. Women have been shown to be less compliant to antihyperlipidaemic medications, but were more compliant with medications for rheumatoid arthritis. The older age group were reported to have better medication adherence in some studies, while other studies reported lower adherence in older age groups. Hence, it is not unexpected that no significant association was revealed between any of the sociodemographic factors (older age, being male, living with a spouse, and Primary or some secondary schooling only) and medication adherence in the current study.

**Low dietary fat intake**

H2.5 was also not fully supported, although the study showed that low dietary fat intake was strongly associated with outpatient cardiac rehabilitation attendance, after adjusting for all other variables in the model. This is consistent with previous studies showing the favourable effect of cardiac rehabilitation in promoting low dietary fat intake adherence.

None of the psychosocial factors (high optimism, high sense of coherence, high perceived social support and baseline perceived stress) were directly associated with engaging in a low dietary fat intake. Similarly, none of the sociodemographic factors (older age (>58 years), being male, living with a spouse, and primary education only) were directly associated with engaging in a low dietary fat intake.

**Engagement in more than three health-enhancing behaviours**

Similarly, H2.6 was not supported because only one of the variables included in the model was a significant predictor of engaging in more than three health-enhancing behaviours at the 6-month follow-up. Taking into account the practice of more than three health-enhancing behaviours at baseline, as well as all other variables in the model, the only significant predictor of practising more than three health-enhancing behaviours at the 6-month follow-up was having attended an outpatient cardiac rehabilitation program. However, this single finding does support the importance of
these programs encouraging a range of health-enhancing behaviours thus supporting
the proposed multiplicative benefit of engaging in several behaviours.

The use of median scores as a point of splitting into dichotomous variables for
independent variables has been somewhat arbitrary. The reader should note that the
analyses were also conducted using continuous forms of relevant variables with no
substantive difference in the findings.

In summary, this examination of the direct association between selected psychosocial
and sociodemographic factors, and attendance at outpatient cardiac rehabilitation
programs and engaging in health-enhancing behaviours, has confirmed the existence
of only one factor — the attendance at outpatient cardiac rehabilitation program, as
being directly associated with two separate behaviours and also the total number of
health-enhancing behaviours (more than 3) engaged by survivors at the 6-month
follow-up. This lack of direct association between the selected psychosocial and
sociodemographic factors (with the exception of high sense of coherence), requires
further exploration through the examination of potential indirect associations
between these factors and engagement in health-enhancing behaviours. This further
investigation of indirect associations is part of the emphasis of Chapter 8.
Chapter 8
Towards an integrated model of health-enhancing behaviours

8.1 Introduction
Whilst in the previous chapter, each of the health-enhancing behaviours was examined separately, this chapter attempts to uncover an integrated model (including direct and indirect relationships between various psychosocial factors) that could explain the engagement in a number of health-enhancing behaviours in first AMI survivors at the 6-month follow-up.

The proposed model developed to investigate the direct and indirect relationships of personality traits, other psychosocial factors and health-enhancing behaviours is based on Antonovsky’s hypothesis on stress and coping. In particular, this study explores whether engaging in any or all health-enhancing behaviours, a reflection of adaptive coping, is demonstrated by certain personality traits as adaptation to existing stress. When encountering a stressful event like an AMI, individuals who display these personality traits (in this case dispositional optimism and sense of coherence) would be more able to draw upon personal and social resources to cope with negative events and exhibit adaptive coping behaviour. This chapter will examine one aspect of adaptive coping in first AMI survivors, the engagement in health-enhancing behaviours at the 6-month follow-up.

This proposed model includes the reasoning that individuals with low perceived stress at the time of first AMI are more likely to be engaging in health-enhancing behaviours at the 6-month follow-up. Antonovsky postulated that individuals with a strong sense of coherence (SOC) have lower levels of perceived stress, as they are able to mobilise coping resources, also called generalised resistance resources. The generalised resistance resources included in this model are social support and higher educational achievement. Age is also included in this proposed model because age has been shown to be positively associated with SOC. In addition to SOC,
the model also includes another personality trait, dispositional optimism. Both personality traits are purported to be stress-buffering, as well as health-enhancing.\textsuperscript{367, 371, 595, 614, 632, 697} These two personality traits have not previously been compared for their ability to account for the variance in stress. This omission will be addressed in the proposed integrated model. The model postulates that high perceived stress is negatively associated with the engagement of health-enhancing behaviours in first AMI survivors six months after the acute coronary event. The same definitions of health-enhancing behaviours are used in this chapter as in the previous chapters, which are: non-smoking behaviour, body weight management (BMI: 18.5 to 24.9 kg/m\textsuperscript{2}), adequate physical activity (at least five times and at least 2½ hours per week of moderate or vigorous intensity), medication adherence and low dietary fat intake (<20% total fat, <7% saturated fat). However, in this study, the total number of health-enhancing behaviours is being used as the representation of coping in first AMI survivors. The rationale for the derivation of this conceptual model (Figure 8.1, p. 133) was previously included in Section 2.8 (pp.43-44) and Chapter 3 (pp.51-52).
Figure 8.1  Integrated health-enhancing behaviour model (same as Figure 2.1, p.45, based on Antonovsky’s hypothesis on stress and coping)
8.1.1 **Hypothesis testing**

Model testing was conducted in this study to evaluate direction and strength of the relationships between the variables and ultimately the explanatory power of generalised resistance resources, health-enhancing personality traits, psychological response at baseline (stress) and subsequent engagement in a number of health-enhancing behaviours at the 6-month follow-up. The following three hypotheses derived from the model were tested:

**H3.1** Generalised resistance resources (i.e. perceived social support {as measured by the *Multidimensional Perceived Social Support Scale*} and educational achievement) and age are positively associated with health-enhancing personality traits (i.e. dispositional optimism {as measured by the *Life Orientation Test-Revised*} and sense of coherence {as measured by the *Orientation to Life Questionnaire*}).

**H3.2** Health-enhancing personality traits (i.e. dispositional optimism {as measured by the *Life Orientation Test-Revised*} and sense of coherence {as measured by the *Orientation to Life Questionnaire*}) are negatively associated with perceived stress (as measured by the *Perceived Stress Scale*).

**H3.3** Perceived stress at baseline (as measured by the *Perceived Stress Scale*) is negatively associated with engagement in a number of health-enhancing behaviours at the 6-month follow-up (indicated by: non-smoking behaviour, body weight management {BMI: 18.5 to 24.9 kg/m²}, adequate physical activity {at least five times and at least 2½ hours per week of moderate or vigorous intensity}, medication adherence and low dietary fat intake {<20% total fat, <7% saturated fat}}).
8.2 Methods
This has been previously described in Sections 4.2 to 4.6 in Chapter 4. All 5-health-enhancing behaviours in the model were measured at the 6-month follow-up whilst data for the other variables were collected at baseline.

In order to test the hypotheses listed, the study adopted the structural equation modelling (SEM) technique using the software package Analysis of Moment Structures (AMOS) Version 4.0\textsuperscript{777}.

8.3 Analysis

8.3.1 Advantages of the SEM technique
According to Chou and Bentler,\textsuperscript{733} SEM procedures are used to ‘evaluate a substantive theory with empirical data through a hypothesised model’ (p.42). In this study, Antonovsky’s theoretical relationship between stress and coping was tested through three hypotheses in a sample of first AMI survivors. All three hypotheses listed previously was tested simultaneously using SEM procedures.

Traditional path analysis, using multi-step regression, lacks the statistical mechanisms to test the fit between the hypothesised path model and observed data.\textsuperscript{734} Although the main objective of this chapter is to determine the relative size of the standardised factor loadings rather than the overall model fit, a variety of fit indices are used to test the adequacy of the model. As discussed earlier in Section 5.5 (p.70), the chi-square statistic indicates a good fit or suggests that only minor differences exist between the matrix of the data and the matrix of the model. If the goodness-of-fit measures are adequate, then it can be argued that the model is plausible, and the analyses support the validity of the hypothesised relationships among the variables. Other comparative goodness-of-fit indices also inform the model fit: Root Mean Square Error of Approximation (RMSEA) within an acceptable range (0.05-0.08) and Goodness-of-Fit Index (GFI), Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI) above the 0.90 cut-off, all indicate good fit of the model to the data. The rationales for selecting these goodness-of-fit indices were also discussed in Section 5.5 (p.70).
Traditional path analysis has been criticised because it assumes all variables are measured without errors. Furthermore, traditional path analysis can only estimate causal relations among observed variables and is not capable of dealing with several observed variables simultaneously.\textsuperscript{734, 735} Therefore, SEM was used to test the proposed integrated health-enhancing behaviour model. Results from this measurement model formed the basis for deriving a respecified model, often referred to as post hoc modifications.

\textbf{8.3.2 Sample size in SEM}

For SEM testing to be valid, the sample size should be sufficiently large.\textsuperscript{734} Boomsma\textsuperscript{570} suggested a sample size of 200 as some kind of minimum number for using the SEM technique. In clinical investigations, including the current study, which recruit only survivors with particular health conditions, it is often difficult to reach a sample size of 200. A brief search of peer-reviewed journals uncovered numerous manuscripts on model testing using SEM that did not reach the 200 sample size target. At least 10 clinical studies of this nature, with sample sizes of between 100 and 200, have been published in the last three years.\textsuperscript{736-746} In a review of improper solutions in SEM with small samples, Chen and colleagues focus their analyses on sample sizes below 100 because according to them, improper solutions were rare in sample sizes at or above 100.\textsuperscript{747} Instead of sample size per se, Floyd and Widaman\textsuperscript{748} emphasised that the complexity of the model may be far more indicative of the required sample size and suggested five to 10 subjects for each parameter to be estimated. In the current study, the first, and more complex model (Figure 8.1, p. 133), has 16 parameters to be estimated, hence, a sample size of 106 meets the minimum requirement of five to 10 survivors per estimated parameter.

\textbf{8.3.3 Data requirements and model estimation}

Three variables (age, perceived social support and educational achievement) formed the exogenous variables for both personality traits included in the model, sense of coherence and dispositional optimism. These two variables were also the exogenous variables for baseline perceived stress. Perceived stress was the exogenous variable for the health-enhancing behaviour endogenous variable, which is composed of five health-enhancing behaviours. Except for two variables, educational achievement and health-enhancing behaviours, all variables included in this model were continuous.
variables. A sample covariance matrix was used as input, and a Maximum Likelihood solution was sought.

Ordinal scale type variables, like the measurement of the number of the five health-enhancing behaviours, presents some methodological problem in structural equation modelling. According to Bollen, SEM with nonnormal continuous or ordinal variables can lead to biased parameter estimates and invalid statistical tests. A number of remedies have been developed to circumvent these statistical problems while retaining the advantage of SEM. Although most SEM studies purported to have adhered to the normal distribution continuous variable requirements, a number of studies using the SEM techniques have been performed on both dichotomous dependent variables, as well as ordinal dependent variables, which do not fulfill the requirements of normally distributed continuous data. One remedy that has been recommended is to use an alternative parameter estimation procedure instead of the default Maximum Likelihood (ML) method. One such estimation method is the Generalised Least-Squares (GLS) estimator.

However, recent research by Olsson and his colleagues suggests that GLS underperforms relative to ML in the following key areas: a) GLS accepts incorrect models more often than ML; and b) GLS returns inaccurate parameter estimates more often than ML. Hence, the GLS estimator was not explored as the preferred estimator method in this study. The second option is the Asymptotic Distribution Free (ADF) estimator, available in the SEM software package LISREL and AMOS. Unfortunately, the use of ADF requires sample sizes that exceed at least 1000 cases, not the finite sample sizes often used in clinical practice, such as in this study. The third option that could be used is the weighted least squares (WLS) estimator. However, WLS also requires moderate to large sample sizes (at least 500-1000 cases) for dependable results. Moreover, even when WLS is theoretically called for, empirical studies suggest WLS typically leads to similar fit statistics as maximum likelihood estimation and to no differences in interpretation.

Hence, the standard ML estimator was used to fit the model to the data, taking into consideration that this method assumes normally and continuously distributed data. However, the ML test statistic has been reported to be robust to the violation of normality in symmetric distribution (i.e. no skew) and platykurtic distributions (i.e. with small tails), or nonsymmetric and zero kurtotic distributions, even in small to
moderate sample size,\textsuperscript{761} such as the case of this study. It has also been suggested that when Likert scales are used, the use of ML estimation is justified if the number of categories is four or higher and skew and kurtosis are within normal limits.\textsuperscript{762, 763} Therefore, all variables (ordinal as well as continuous) in the proposed model were screened for the presence of nonnormal distribution.

The estimates that are presented are: standardised factor loadings, standard errors, critical ratios and p value. Critical ratio tests the hypothesis that the parameter estimate is different from zero.\textsuperscript{577, 764} Critical ratios greater than 1.96 demonstrate significance at p < 0.05.\textsuperscript{764}

\subsection*{8.3.4 Testing for nonnormal distribution: ordinal variables and continuous variables}

Of the seven variables included in this integrated model of health-enhancing behaviours at the 6-month follow-up, two were ordinal variables and the other five were continuous variables. The two ordinal variables included in this SEM analysis of the conceptual model (Figure 8.1, p. 133) were highest educational achievement and total number of health-enhancing behaviours. Both of these had five categories each as presented in Figures 8.2 and 8.3.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure8_2.png}
\caption{Distribution of the highest educational achievement}
\end{figure}
Figure 8.3  Distribution of total number of health-enhancing behaviours at the 6-month follow-up

A ratio of kurtosis to its standard error, that is within the ± 2 range, is an indicator of normality. Likewise, a ratio of skewness to its standard error that is within the ± 2 range is also an indicator or normal distribution. Skewness and kurtosis ratios for both highest educational achievement and total number of health-enhancing behaviours at the 6-month follow-up demonstrated no significant skewness or kurtosis, thus satisfying the requirement for normal distribution of both variables.

Non-normal distribution was detected in only 1 of the five continuous variables included in the conceptual model, the scores of perceived social support. Moderate negative skewness was detected in the scores of this variable, hence, it was transformed to produce normality using the procedure recommended by Tabachnick & Fidell in the following manner: Transformed data = -[(square root (37 – raw data)) where 37 is the largest score +1].

8.3.5  Fit indices reporting of SEM

Bivariate correlations were initially used to evaluate simple correlations. Model testing was done using AMOS 4.01. The same goodness-of-fit indices used in Chapter 5 (p. 70) were also used in this chapter. These indices were chi-square/degrees of freedom ratio (Normed Chi-square), Root Mean Square Error of Approximation (RMSEA), Goodness-of-Fit Index (GFI), Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI). A p value of < 0.05 level of significance was used for all analyses, indicating no difference in the correlation matrix and the standardised path coefficients of the models.
8.4 Results

Pearson correlation coefficients were used to estimate the correlation between variables, both between continuous variables, as well as between continuous and ordinal variables in the model. Pearson correlation can underestimate the correlation between continuous variables and ordinal variables. Polyserial correlation is the preferred procedure for estimation of correlation coefficients between continuous and ordinal variables. However, SAS, SPSS or other statistical softwares at this investigator’s disposal, do not compute polyserial correlations. Therefore, it was elected to present results based on the Pearson correlations with the understanding that the path coefficients may be underestimated.

The Pearson product moment correlation coefficients and matrix (Table 8.1 p. 141) shows the degree of relationship among the variables in the proposed integrated model of health-enhancing behaviours. Survivors who were older, who had higher perceived social support and higher sense of coherence engaged in more of health-enhancing behaviours at the 6-month follow-up.

All variables included in the model were significantly associated with sense of coherence. Survivors who had a higher sense of coherence were older, had higher educational achievement, higher perceived social support, were more optimistic, and were engaging in more health-enhancing behaviours at the 6-month follow-up. They also had lower perceived stress scores ($r = -0.641, p < 0.01$). In contrast, the other stress-buffering variable included in this model, dispositional optimism, was only significantly associated with two variables in the model, although the associations in both instances were moderately strong. As expected, dispositional optimism is positively correlated with sense of coherence ($r = 0.579$). Although both sense of coherence and dispositional optimism were inversely correlated to perceived stress, sense of coherence had a stronger negative correlation with stress ($r = -0.641$) than did dispositional optimism ($r = -0.439$). Perceived stress was also lower among the older age group. However, the correlation matrix did not reveal a significant relationship between perceived stress and the total number of health-enhancing behaviours at the 6-month follow-up, although a negative association was evident.
Table 8.1  Correlations, means and standard deviations among exogenous and endogenous variables in the initial model (n = 106)

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived social support</td>
<td>0.204*</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational achievement†</td>
<td>-0.132</td>
<td>-0.137</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispositional optimism</td>
<td>0.177</td>
<td>0.176</td>
<td>0.164</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sense of coherence</td>
<td>0.341***</td>
<td>0.257**</td>
<td>0.196*</td>
<td>0.579***</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived stress at baseline</td>
<td>-0.261**</td>
<td>-0.089</td>
<td>-0.063</td>
<td>-0.439***</td>
<td>-0.641***</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Total number of health-enhancing</td>
<td>0.352***</td>
<td>0.200*</td>
<td>0.008</td>
<td>0.086</td>
<td>0.207*</td>
<td>-0.158</td>
<td>1.0</td>
</tr>
<tr>
<td>behaviours at 6-month follow-up†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean  
58.58  3.05  15.18  146.37  17.28

SD  
10.94  1.28  3.75  27.60  8.63

* = p < 0.05 level (2-tailed)
** = p < 0.01 level (2-tailed)
*** = p < 0.001 level (2-tailed)
† possible underestimation, Pearson correlations underestimate the correlations between continuous and ordinal variables (ordinal variables: educational achievement and total number of health-enhancing behaviours at 6-month follow-up).

8.4.1  Testing of integrated health-enhancing behaviour model

The hypotheses to be tested were that there was a direct effect of age, perceived social support and educational achievement on both of the personality traits, sense of coherence and dispositional optimism. In turn, both of these personality traits influenced perceived stress, which then had a direct effect on the number of health-enhancing behaviours engaged at the 6-month follow-up. This structural model is shown in Figure 8.1 (p. 133).

Table 8.2 (p. 142) presents the direct effects of age, perceived social support and educational achievement on sense of coherence and dispositional optimism. The direct effects of sense of coherence and dispositional optimism on perceived stress, and the direct effect of perceived stress on health-enhancing behaviours are also presented.
Table 8.2 Standardised path coefficients for the integrated health-enhancing behaviour model (n=106)

<table>
<thead>
<tr>
<th>Model variable</th>
<th>Standardised path coefficient</th>
<th>Standard error</th>
<th>Critical ratio</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense of coherence, direct effects of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>age</td>
<td>0.33</td>
<td>0.22</td>
<td>3.84</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>perceived social support</td>
<td>0.23</td>
<td>1.86</td>
<td>2.64</td>
<td>0.008</td>
</tr>
<tr>
<td>educational achievement</td>
<td>0.27</td>
<td>2.53</td>
<td>3.15</td>
<td>0.002</td>
</tr>
<tr>
<td>Dispositional optimism, direct effects of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>age</td>
<td>0.17</td>
<td>0.03</td>
<td>1.82</td>
<td>0.068</td>
</tr>
<tr>
<td>perceived social support</td>
<td>0.17</td>
<td>0.27</td>
<td>1.83</td>
<td>0.067</td>
</tr>
<tr>
<td>educational achievement</td>
<td>0.21</td>
<td>0.37</td>
<td>2.25</td>
<td>0.024</td>
</tr>
<tr>
<td>Perceived stress, direct effects of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sense of coherence</td>
<td>-0.60</td>
<td>0.02</td>
<td>-7.77</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>dispositional optimism</td>
<td>-0.11</td>
<td>0.17</td>
<td>-1.36</td>
<td>0.174</td>
</tr>
<tr>
<td>Number of health-enhancing behaviours,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>direct effects of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>perceived stress</td>
<td>-0.15</td>
<td>0.01</td>
<td>-1.64</td>
<td>0.100</td>
</tr>
</tbody>
</table>

The standardised path coefficients (also called standardised parameter estimates) and squared multiple correlations of the proposed integrated health-enhancing behaviour model are provided in Figure 8.4 (p. 143). Of the nine hypothesised paths in the model, only five were significant. All three generalised resistance resource variables selected in this study (age, educational achievement and perceived social support) were significantly associated with sense of coherence, accounting for 23% of the variance in sense of coherence. Educational achievement was the only generalised resistance resource that was significantly associated with dispositional optimism, and in combination with age and perceived social support, accounted for 10% of the variance in dispositional optimism. Sense of coherence, but not dispositional optimism, was significantly associated with perceived stress, accounting for 39% of the variance in perceived stress at baseline. However, perceived stress was not found to be significantly associated (p = 0.100) with the number of health-enhancing behaviours engaged at the 6-month follow-up (Figure 8.4, p. 143).
Figure 8.4  Integrated health-enhancing behaviour model with path coefficients and squared multiple correlations

*P < 0.05,  **P < 0.01,  ***P < 0.001

Note: E1 to E7 and D1 to D4 are error terms in the estimation of this model.
Model Fit

The goodness-of-fit indices indicate poor fit of the integrated health-enhancing behaviour model to the data, as shown in Table 8.3. The normed chi-square value was significant at the 0.05 level ($p < 0.001$). All other fit indices GFI, TLI and CFI were < 0.90, whilst RMSEA was > 0.08. The results on this data indicate insufficient support for the integrated health-enhancing behaviour model.

<table>
<thead>
<tr>
<th>Model</th>
<th>Normed $\chi^2$ ($p$ value)</th>
<th>GFI</th>
<th>RMSEA</th>
<th>TLI</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesised full model</td>
<td>4.86 ($&lt;0.001$)</td>
<td>0.87</td>
<td>0.19</td>
<td>0.39</td>
<td>0.65</td>
</tr>
</tbody>
</table>

In an attempt to test a more parsimonious model, nonsignificant paths were removed and a revised model was developed. One of the most significant criticisms with the use of SEM has been over the misuse of post hoc modifications in order to yield a model that provides a better fit to the data.\textsuperscript{618} Researchers using SEM are advised to base decisions of model modifications on conceptual issues, with only guidance from empirical indices.\textsuperscript{568} This recommendation is followed in the revision of the integrated health-enhancing behaviour model.

Instead of grouping all five health-enhancing behaviours as a unique variable (i.e. number of health-enhancing behaviour at the 6-month follow-up), each of the health behaviours (non-smoking behaviour, BMI, amount of physical activity, medication adherence and amount of dietary fat intake) was considered as a separate variable. Three of the five variables were originally measured as continuous variables (BMI, amount of physical activity and amount of dietary fat intake). In two of these continuous variables (BMI and dietary fat), the total scores of these variables were reversed in the following manner: $(\text{Maximum score} + 1) - x$ where $x$ is the raw score of the variable. This is to ensure that all increasing scores of health behaviour variables indicated more of that health behaviour and decreasing scores indicated less of that health behaviour, that is, the amount of low dietary fat. This computation is consistent with the definition that health behaviours are activities that convey health
benefits or otherwise protect individuals from diseases.\textsuperscript{767} Otherwise, the characteristics of the continuous variables were preserved as SEM analysis is best performed on continuous normally distributed data. These variables were tested for normal distribution and all fulfilled the one-sample Kolmogorov-Smirnov test of normality.

**Post-hoc model modification**

In the integrated health-enhancing behaviour model, perceived stress was not significantly associated with the number of five health-enhancing behaviours engaged at the 6-month follow-up. However, other components of the integrated model were related to stress. The aim of the respecified model was to detect if, when the health behaviour variables were considered separately (as seen in Chapter 7), whether any of these health behaviours were significantly associated with perceived stress. This was performed with the view of including the ‘stress-adaptive coping’ explanation in the respecified model. In order to uncover this association, Pearson’s Product Moment Correlation Coefficients were determined between each of the specific health behaviours and perceived stress. The correlation matrix (Table 8.4, p.146) shows that only one of the health behaviours, the amount of low dietary fat intake at 6-month follow-up, was significantly associated with perceived stress at baseline. Survivors with higher perceived stress at baseline were less likely to report low dietary fat intake at the 6-month follow-up ($r = -0.311$). None of the other four health behaviours was significantly associated with perceived stress at baseline (Table 8.4, p. 146). Hence, the amount of low dietary fat intake at the 6-month follow-up was the only health behaviour variable that was included in the respecified trimmed model.
Table 8.4  Correlations of perceived stress and the five health behaviours at the 6-month follow-up (n = 106)

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived stress at baseline</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-smoking behaviour</td>
<td>-0.165</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI†</td>
<td>-0.004</td>
<td>-0.010</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of physical activity</td>
<td>-0.023</td>
<td>-0.011</td>
<td>-0.025</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medication adherence</td>
<td>0.064</td>
<td>0.039</td>
<td>-0.003</td>
<td>-0.029</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Amount of low dietary fat intake†</td>
<td>-0.31</td>
<td>0.337</td>
<td>0.108</td>
<td>0.252</td>
<td>0.158</td>
<td>1.0</td>
</tr>
</tbody>
</table>

* = p < 0.05 level (2-tailed)
** = p < 0.01 level (2-tailed)
*** = p < 0.001 level (2-tailed)
†Note: BMI and amount of low dietary fat intake scores were reversed to ensure that all increasing scores indicate increasing health behaviour

8.4.2 Testing of respecified trimmed model

Similarly, the hypotheses to be tested were those initially examined: that there was a direct effect of age, perceived social support and educational achievement on sense of coherence which would have a direct effect on perceived stress at baseline. Perceived stress at baseline would influence the amount of the amount of dietary fat intake at the 6-month follow-up.

Table 8.5 presents the direct effects of age, perceived social support and educational achievement on sense of coherence. The direct effect of sense of coherence on perceived stress and the direct effect of perceived stress on the amount of low dietary fat intake at the 6-month follow-up are also presented.

Table 8.5  Standardised path coefficients for the revised trimmed model (n=106)

<table>
<thead>
<tr>
<th>Model variable</th>
<th>Standardised path coefficient</th>
<th>Standard error</th>
<th>Critical ratio</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense of coherence, direct effects of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>age</td>
<td>0.33</td>
<td>0.22</td>
<td>3.84</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>perceived social support</td>
<td>0.23</td>
<td>1.86</td>
<td>2.64</td>
<td>0.008</td>
</tr>
<tr>
<td>educational achievement</td>
<td>0.27</td>
<td>2.53</td>
<td>3.15</td>
<td>0.002</td>
</tr>
<tr>
<td>Perceived stress, direct effects of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sense of coherence</td>
<td>-0.64</td>
<td>0.02</td>
<td>-8.60</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Amount of low dietary fat intake, direct effects of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>perceived stress</td>
<td>-0.31</td>
<td>0.07</td>
<td>3.36</td>
<td>0.001</td>
</tr>
</tbody>
</table>
The path coefficients of the respecified trimmed model indicate a significant improvement with all paths in this model being statistically significant at the 0.05 level with path coefficients ranging from $B = -0.64$ to 0.23. As before, all three generalised resistance resources were positively associated with sense of coherence. There was also a significant and strong inverse relationship ($B = -0.64$) between sense of coherence and perceived stress and there was a significant and negative association between baseline stress and the amount of low dietary fat intake at the 6-month follow-up, accounting for 10% of the variance in the amount of low dietary fat intake (Figure 8.5, p. 148). There was also support for the fit of the model to the data, as indicated by the fit indices provided in Table 8.6 (p. 149).
Figure 8.5 Respecified trimmed model: Amount of low dietary fat intake model at the 6-month follow-up in first AMI survivors

\*P < 0.05, \ **P < 0.01, \ ***P < 0.001

Note: E1 to E4 and D1 to D3 are error terms in the estimation of this model.
Model fit

Table 8.6 Goodness-of-fit: Chi-square index and other fit indices of the respecified trimmed model

<table>
<thead>
<tr>
<th>Model</th>
<th>Normed χ² (p value)</th>
<th>GFI</th>
<th>RMSEA</th>
<th>TLI</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesised full model</td>
<td>1.41 (0.166)</td>
<td>0.96</td>
<td>0.06</td>
<td>0.93</td>
<td>0.96</td>
</tr>
</tbody>
</table>

The overall fit indices for the respecified trimmed model demonstrate good fit. The normed chi-square was within the 1.0 to 3.0 range with a p value of 0.166, GFI, TLI and CFI were > 0.90 and RMSEA was < 0.08, which indicates sufficient support for this model.

8.5 Discussion

The three generalised resistance resources included in the model, age, perceived social support and educational achievement were positively associated with one of the health-enhancing/stress-buffering personality traits, sense of coherence.

Educational achievement was significantly associated with the other health-enhancing/stress-buffering personality trait, dispositional optimism. These findings partially support H3.1, which predicted that the three generalised resistance resources would all be positively associated with both personality traits examined, sense of coherence and dispositional optimism.

Although previous findings have uncovered the stress-buffering effects of the dispositional optimism trait,\textsuperscript{367, 371, 632} this study failed to confirm previous findings in this sample of first AMI survivors. One possible explanation for this finding could be the lack of reliability of the instrument, LOT-R, that was used to measure this construct. Cronbach’s alpha was only 0.63 which is below the 0.70 criterion for adequate internal consistency.\textsuperscript{633} There was a strong and negative association between sense of coherence and perceived stress (standardised path coefficients: -0.6 in the integrated health-enhancing model and -0.65 in the revised trimmed model), which is consistent with the findings of previous studies.\textsuperscript{595, 599, 612-614} These findings partially support H3.2, which predicted a significant and negative association between dispositional optimism, sense of coherence and perceived stress. In the proposed integrated model, the indirect relationships between various factors and the subsequent engagement in several health-enhancing behaviours have been supported.
However, this study failed to uncover a significant association between perceived stress and the number of health-enhancing behaviours engaged by AMI survivors at the 6-month follow-up (an indicator of adaptive coping based on Antonovsky’s hypothesis on stress and coping).\textsuperscript{387, 390} Hence, H3.3, which predicted a significant and negative association between perceived stress at baseline and the engagement in a number of health-enhancing behaviours, was not supported. The application of the integrated model based on the relationship between stress and adaptive behaviour has not been substantiated in this sample of first AMI survivors in relation to a number of behaviours.

Perceived stress at baseline was not a significant predictor of the number of health-enhancing behaviours engaged by first AMI survivors at the 6-month follow-up (Figure 8.4, p. 143) whereas perceived stress at baseline explained 10% of the variance in the amount of low dietary fat intake at the 6-month follow-up (Figure 8.5, p.148). The finding in the respecified trimmed model is consistent with similar studies linking stress and poor eating habits.\textsuperscript{298, 299, 768} Dispositional optimism failed to emerge as a significant predictor of perceived stress for a number of the health behaviours or a specific behaviour (low dietary fat intake) in this study. This finding is also consistent with a previous study exploring the relationship between dispositional optimism and health behaviours in undergraduate students.\textsuperscript{769} However, the lack of association between dispositional optimism and stress could also have been contributed to by the low reliability of the LOT-R instrument used to measure the dispositional optimism variable.

The results of this study showed a significant but inverse relationship between sense of coherence and perceived stress. Restated, higher SOC was associated with lower perceived stress, which is consistent with studies of other health behaviours in other clinical groups.\textsuperscript{595, 604, 607, 614, 697, 770, 771} The positive relationship between age and sense of coherence was possibly a characteristic specific to a sample of first AMI survivors. The association between sense of coherence and health and well-being is well established.\textsuperscript{388, 390, 478, 480, 481} Hence, it is highly possible that the high sense of coherence in older survivors may have contributed to the delay of the first AMI in these survivors.
However, the study did not uncover an integrated explanatory model that explained engagement in a number of health-enhancing behaviours. Instead, an explanatory model based on Antonovsky’s hypothesis on stress and coping has explained to some extent direct and indirect dietary fat factors that influence dietary fat intake for first AMI survivors six months after infarction.

No significant indirect relationship was uncovered between either of the personality traits and the number of health-enhancing behaviours at the 6-month follow-up. However, an indirect relationship between one of the health-enhancing personality traits, sense of coherence, and one of the health behaviours, the amount of low dietary fat intake, through perceived stress was supported in this study. Higher sense of coherence was related to a greater reduction in perceived stress, which increased the likelihood of low dietary fat intake.

This study indicates that psychosocial factors such as perceived stress, perceived social support and sense of coherence are important constructs in the understanding of dietary fat intake. The assessment of these three psychosocial constructs could provide useful information in facilitating this health behaviour change in cardiac rehabilitation programs. Patients with high perceived stress can be targeted to lower their stress levels, as they are more at risk of failure to adopt low dietary fat intake after their first AMI.

8.5.1 Limitations

Despite the adequacy of sample size for the number of parameters estimated in both models tested, as previously addressed in the analysis section of this chapter (Section 8.3, pp.136-140), the small sample size of this study may have implications for the reliability of the model, especially with the inclusion of ordinal variables. Thus, the study warrants replication and further testing in a larger sample.

Another limitation of the study is the cause and effect relationships hypothesised by the models, which cannot be identified with confidence from a nonexperimental, survey design study, which is heavily reliant on self-report measures. It must be noted that this practice is by no means unique in the SEM literature where there is a plethora of publications using self-report measures in cross-sectional design studies. The inclusion of the 6-month follow-up in the current study which focused on understanding events at two points in time (also called autoregressive modelling) adds confidence to the cause and effect relationships.
The lack of consensus over strict guidelines for the acceptance of SEM models has led to many models being judged as acceptable.\textsuperscript{568} The integrated health-enhancing behaviour model in this chapter is an example of one of these models that may have been rejected if stricter guidelines were applied. Hence, the reader should be cautious about rejecting path coefficients in models where ordinal data was used in small sample studies because the results of the path coefficients may be attenuated.\textsuperscript{579} Nevertheless, path coefficient results from the testing of both models (integrated health-enhancing behaviour model and the revised trimmed model) were consistent in both the direction and strength of relationships between the variables included in both models.

In summary, Antonovsky’s theoretical associations between stress and coping have been applied to the clinical context of first AMI survivors, and found to be an explanatory model for one health-enhancing behaviour, low dietary fat intake. However, the explanatory power was only modest (10% of the variance associated between stress and dietary fat intake) for that behaviour. Nonetheless, the direction and strength of the associations between the constructs has been confirmed within this important clinical group. The following chapter will combine all three separate analytical approaches of the data and provide further interpretation and implications for practice and research.
Chapter 9
Discussion and conclusion

9.1 Introduction

Health behaviours such as smoking cessation, weight loss in individuals who are overweight and obese, regular moderate intensity exercise, medication adherence and low dietary fat intake are considered vital in preventing a recurrent coronary event after an AMI.\textsuperscript{772} Whilst it is well documented that change in health behaviour following a near fatal event such as an AMI does occur,\textsuperscript{106, 293, 655, 671, 675, 676} this study uncovered that the magnitude of behavioural change in first AMI survivors varies across the five health-enhancing behaviours. In addition, certain sociodemographic and psychosocial factors were found to not only influence the engagement of particular health-enhancing behaviours, but also the number of health-enhancing behaviours practised by first AMI survivors. The study also explored direct and indirect influences upon health-enhancing behaviours using a conceptual model based on Antonovsky’s hypothesis on stress and coping.

This chapter will discuss and compare the findings from this study with previously published findings. Each of the five health-enhancing behaviours will be discussed individually and globally. The sequence of issues to be discussed is as follows: (a) the practice of health-enhancing behaviour at baseline; (b) the magnitude of change; (c) factors that are directly associated with the practice of health-enhancing behaviour; (d) factors that are directly and indirectly associated with health-enhancing behaviour; and (e) comparison of the explanatory power of the integrated model with other health behaviour models that have previously been used to explain the engagement of health behaviours. Pivotal in this integrated model is the perceived stress and health-enhancing behaviour relationship. This chapter will examine this relationship for each of the health-enhancing behaviours, as well as all five health-enhancing behaviours collectively. The effects of cardiac rehabilitation attendance on health-enhancing behaviours will also be addressed in this chapter.
Finally, this chapter will discuss study limitations followed by conclusions, which include implications for clinical practice and recommendations for further research.

9.2 Non-smoking behaviour

Non-smoking behaviour was the most common health-enhancing behaviour reported by first AMI survivors at baseline, with nearly three-quarters of the study sample (70.8%) reporting this health-enhancing behaviour. This figure is not dissimilar to the general population, with approximately 75% of SWASAHS residents and Australian adults being documented as non-smokers.\textsuperscript{534, 773} It would appear then that although smoking may be the most important influence on recurrent AMI and survival,\textsuperscript{22, 100, 102} the issue of smoking is actually irrelevant to nearly three-quarters of first AMI survivors. Whilst a high prevalence of non-smoking behaviour was measured at baseline, an 18.9% increase in this health-enhancing behaviour suggests that it is still amenable to change. Hence, it was the health-enhancing behaviour of highest prevalence (89.6%) at the 6-month follow-up.

Study survivors who attended an outpatient cardiac program were also more than 12 times more likely to report non-smoking behaviour at the 6-month follow-up, which may be a reflection of the emphasis on this health-enhancing behaviour in outpatient cardiac rehabilitation programs. Nevertheless, non-cardiac rehabilitation attendees also reported about a 13% (from 71.7% to 84.8%) increase in non-smoking behaviour at the 6-month follow-up compared with a nearly 23% (70.7% to 93.1%) increase in the attendees. This 13% increase of non-smoking behaviour in the non-attendee group is approximately double the 7% reported on unassisted smoking cessation rate in the general population,\textsuperscript{774} which suggests that suffering an acute AMI was a crucial motivator in smoking cessation. The 93.1% non-smoking behaviour reported by cardiac rehabilitation attendees indicated that traditional cardiac rehabilitation attendance could not achieve the ideal benchmark of 100% non-smoking behaviour. This leaves room for improvement in cardiac rehabilitation programs in facilitating smoking cessation among first AMI patients, and highlights the importance of a multicomponent intervention program that includes behavioural counselling, which has been shown to result in the highest smoking cessation rates for AMI survivors.\textsuperscript{775, 776}
9.2.1 Explanatory models of non-smoking behaviour

The only direct factor to influence non-smoking behaviour was attendance at cardiac rehabilitation programs as noted previously. Although there was an inverse relationship between perceived stress at baseline and non-smoking behaviour at the 6-month follow-up, the relationship was weak \( r = -0.165 \). Whilst some studies demonstrated an association between stress and failure to stop smoking, others have shown that stress plays a minor role as a determinant of successful smoking cessation. The weak relationship between stress and non-smoking behaviour in this study was the reason for the failure of this stress-adaptive coping model to explain non-smoking behaviour.

A number of health models have more adequately (better explanatory power) predicted smoking cessation. Some of these are social cognition models that have been well reported in the health behaviour research whilst other models were developed specifically for the particular study. Three of the latter studies included self-efficacy as one of the predictor variables when examining smoking cessation and revealed that self-efficacy (perceived ability to stop smoking) was a significant independent predictor of smoking cessation at follow-up. The duration of smoking habit, number of daily cigarettes consumed or living with a partner who smoked, were all factors that have been previously shown to be key determinants of successful smoking cessation. This suggests that specific pre-existing behaviour, or ability to change behaviour, is indicative of subsequent smoking patterns. Specific smoking habits were not examined in this study.

Among the social cognition models widely used by psychologists, the Health Belief Model has not been shown to be a good explanatory model for smoking cessation, and neither was the Theory of Planned Behaviour. Although one study professed that Pender’s Health Promotion Model was a good explanatory model of non-smoking behaviour, this conclusion was based on a cross-sectional study. The health behaviour model that has consistently been shown to predict smoking cessation is the transtheoretical model (TTM). This popular health behaviour model has been acclaimed as ‘the most important theoretical health promotion development of the decade’ and was initially applied to assist smoking cessation. It is now most widely used to examine the problem of substance use and misuse.
In addition to the stage of change construct, the transtheoretical model of behavioural change integrates core constructs from other health behaviour theories, self-efficacy and decisional balance (pros & cons of the health behaviour) to explain and predict health behaviour.\textsuperscript{454}

The TTM, which consists of three constructs (six stages of changes, decision balance and self-efficacy) is the dominant model in the investigation of smoking cessation\textsuperscript{787} and has been shown to account for between 40 to 80\% of the variance in smoking status.\textsuperscript{455,790} However, an addiction model which includes variables such as combined daily versus occasional smoking, cigarettes-per-day smoked, frequency of life-time quits of at least a year, and quitting for more than five days in the previous year was a better predictor of smoking cessation than the stages of change model (69.3\% vs 55.1\%).\textsuperscript{791} In the current study, these key variables were not taken into account in the integrated health-enhancing model where non-smoking behaviours was one of the health-enhancing behaviours considered. The failure to consider these key predictors probably contributed to the poor explanatory power of this model.

It can be concluded from this study and its inability to explain smoking behaviour, and other studies described, that the best possible approach to enhancing smoking cessation in first AMI survivors involves taking a history of smoking behaviour, frequency of life-time quits consideration of the stages of change, decisional balance and self-efficacy (components of the TTM and other models) of the patient. Assessment of these factors by health professionals could greatly inform and thus identify optimal intervention strategies to facilitate smoking cessation in first AMI survivors. Further research testing these notions in first AMI survivors will confirm or refute this assertion.
9.3 Weight loss and normal BMI

Only about one-third of study survivors reported BMI that was within the normal range and approximately 61% were overweight or obese at baseline. This was higher in comparison to the approximately 40% of SWSAHS residents and 50% of Australian adults who are considered overweight or obese. This was also the health-enhancing behaviour that had the lowest magnitude of change (2.8% increase) and the lowest prevalence (34.9%) at the 6-month follow-up. As previously discussed in Section 6.4 (p. 107), there is little supporting evidence for setting weight normalisation as the optimal target for all AMI patients.

The results from the Nurses’ Health Study and the Harvard Alumni Study suggest that optimal leanness is very lean, with a BMI of approximately 20 to 22 kg/m². However, unlike middle-aged populations, data demonstrate that the BMI associated with the lowest total mortality may be higher at 26 to 27 kg/m² in the elderly. In overweight and obese patients, most studies reported beneficial health benefits from modest weight loss and exercise. A 10% weight loss has been shown to significantly improve CHD risk in healthy obese men as well as overweight and obese adults. In a 1-year follow-up study on AMI patients, weight loss, not necessarily weight normalisation, was associated with improved blood lipoprotein profiles, and a reduced morbidity and mortality after one year.

Although the National Heart Foundation of Australia suggests that “intermediate achievable goals” be set for BMI, the ultimate goal is to achieve a BMI of less than 25. The American Heart Association (AHA) recommends about 0.5 to 1 kg weight loss/week in the first six months in overweight or obese patients. In survivors who were overweight or obese, the mean weight loss in this study at the 6-month follow-up was 2.9 kg, which is markedly less than the weight loss recommended by the AHA. However, 31% of overweight or obese survivors reported at least a 5% weight loss at the 6-month follow-up, even though the majority failed to achieve weight normalisation during the 6-month follow-up period.
Perhaps there is a need to revise the current recommendation of weight normalisation in all overweight or obese individuals with established CHD. The generally poor long-term success of weight reduction\(^797\) is well documented. The more realistic and achievable goal of 5% to 10% weight loss should be set, as this has been shown to result in significant health benefits.\(^{26, 497, 795}\) In addition, long-term weight loss and weight maintenance, which can be achieved with a reduction in fat and energy intake\(^798\) and regular physical activity,\(^799\) could be emphasised.

### 9.3.1 Explanatory models of weight normalisation

In this study, none of the sociodemographic and psychosocial factors examined, nor the attendance at a cardiac rehabilitation program was significantly associated with weight normalisation. Although stress management is often deemed as an important component of any weight reduction and weight management program,\(^800-802\) this study did not find a significant association between perceived stress and weight normalisation. Likewise, both sense of coherence and dispositional optimism were not significantly associated with weight normalisation. This result is consistent with the findings of Ponston and colleagues, who also failed to uncover an association between weight loss and personality traits.\(^803\)

In a number of follow-up studies on healthy survivors, physiological factors such as insulin resistance, hyperinsulinaemia and poor physical health were found to be significantly associated with weight loss.\(^804, 805\) In addition, two health behaviours, physical activity and the reduction in dietary fat and sugar intake,\(^806-808\) were found to be significant predictors of weight loss. One of these studies reported dietary intake and physical activity accounted for 29% of the variance in weight loss.\(^808\)

One of the few health behaviour models that has been used to study weight loss is the TTM, which has demonstrated some success in explaining weight loss,\(^809, 810\) although these findings are not consistent.\(^811\)

Weight loss and weight normalisation is a health behaviour strongly influenced by environmental, genetic and metabolic factors.\(^812\) Previous longitudinal studies suggest that psychosocial factors are not likely to be a key factor in determining successful weight loss and weight normalisation,\(^805, 813, 814\) which could be the reason for the lack of association between stress and weight normalisation uncovered in the current study.
The intertwining of other behaviours such as physical activity, dietary fat and high energy food intake with weight normalisation may require consideration as to the exact nature of the relationships (mediating and reciprocal) between these three behaviours in future analyses. Due to sample limitations this is beyond the scope of this study, and further to this no significant relationships were found between normal BMI and adequate exercise, and dietary fat intake. However, there was a weak significant relationship between adequate exercise and dietary fat intake.

The use of social cognition models, including the TTM, may not be the best approach in understanding and explaining weight loss and weight normalisation because these behaviours are strongly influenced by metabolic factors (e.g. insulin resistance), as well as other health behavioural factors (dietary intake and physical activity). The quest for a suitable model that could be applied within or beyond cardiac rehabilitation programs, that could best explain weight loss and weight normalisation is still in its infancy, as demonstrated by this study and other contemporary studies. Beyond the quest for weight normalisation, is the need for setting appropriate weight loss goals for overweight or obese AMI survivors that focus on realistic weight loss and reflect sustainable change rather than the short-term gains evident within a 6-month period.

9.4 Adequate physical activity

Approximately 86% of the sample did not undertake adequate physical activity at baseline, which is similar to the proportion reported in SWSAHS residents\textsuperscript{534} but higher than the 69% reported by the Australian Bureau of Statistics in the 1995 National Health Survey.\textsuperscript{815} This was the health-enhancing behaviour with the lowest participation rate at baseline (12.3%). However, at the 6-month follow-up, this was the health-enhancing behaviour which ranked second in terms of magnitude of positive change.

Exercise training programs in cardiac rehabilitation have been shown to have beneficial effects on plasma lipids, obesity indices, exercise capacity, peak oxygen consumption, behaviour characteristics (e.g. depression and hostility), and quality of life.\textsuperscript{669,709} Physical activity may not be as influential as non-smoking behaviour in preventing recurrent coronary events however, physical activity attenuates other risk factors both directly or indirectly (e.g. by reducing serum cholesterol levels,
hypertension or promoting weight loss.\textsuperscript{123,816} Although there is a dose response relationship between physical activity and the reduction in CHD risk,\textsuperscript{817} physical benefits of exercise training are equally well achieved in light exercise training after AMI.\textsuperscript{818,819}

There is widespread consensus on the recommended minimum level of physical activity by different international guidelines, which is low to moderate intensity (40\% to 60\% of maximum capacity) for 30 to 60 minutes, three to six times weekly.\textsuperscript{182,667,820} Adequate physical activity in this study was defined using the range recommended by these international guidelines.

Despite an impressive increase (28.3\% improvement) in the participation of this health-enhancing behaviour, less than half (40.6\%) reported adequate physical activity levels at the 6-month follow-up. The remarkable improvement in physical activity level may have been contributed to by health professionals’ emphasis on the importance of exercise following a coronary event, an activity pivotal in most cardiac rehabilitation programs.\textsuperscript{666-669} Another explanation could be that there was ample room for improvement in this health behaviour, as a high percentage of survivors were not participating in adequate physical activity at baseline. Although major gains were made in this area, the overall participation rate at six months falls well short of the ideal of 100\% of survivors achieving adequate exercise.

\subsection*{9.4.1 Explanatory models of adequate physical activity}
In contrast to this study, other studies have identified a number of influencing factors of regular physical activity. Of these, self-efficacy, the perception about one’s capabilities to undertake regular exercise, has been shown to be one of the strongest, mutable predictors of exercise behaviour.\textsuperscript{349,821-823}

Of the commonly used health behaviour models, the Theory of Planned Behaviour, Self-efficacy Theory and the TTM successfully explained exercise behaviour.\textsuperscript{821,824,826} The TTM, which has been extensively used to explain exercise behaviour, has been reported to account for 20\% to 80\% in the variance in exercise behaviour.\textsuperscript{825,827,828} However, there are also studies which have only found modest support for the effectiveness of the Transtheoretical Model in describing physical activity behaviour over time.\textsuperscript{829,830} Nevertheless, not all elements of the TTM contributed significantly in the explanation of exercise behaviour,\textsuperscript{831}. Inclusion of a measure of self-efficacy
appropriate for first AMI survivors in future studies is recommended. From the results of this study and the review of more successful models, assessment of self-efficacy and stages of change, in addition to other limiting physical factors, may be important factors to consider in cardiac rehabilitation programs when promoting the adoption of adequate physical activity amongst first AMI survivors.

9.5 Medication adherence

Adherence to prescribed medications is integral in the prevention of recurrent AMI. Evidence from several clinical trials has demonstrated that four types of cardioprotective drugs, aspirin, beta-blockers, angiotensin-converting enzyme inhibitors and lipid-lowering agents are associated with a 12% to 30% reduction in mortality and a 12 to 24% reduction in recurrent coronary events.\textsuperscript{75,132-151} Therefore, clinical guidelines in the secondary prevention of AMI promote the prescription of these medications as part of a comprehensive risk reduction interventions for AMI survivors.\textsuperscript{28-30, 76, 493, 832, 833} Inherent in these guidelines is the assumption of high medication adherence rate among CHD patients.

Medication adherence was the only health-enhancing behaviour that was measured at the 6-month follow-up, and hence can only be discussed in terms of prevalence rather than in terms of magnitude of change. The 88% medication adherence rate reported by survivors at the 6-month follow-up was higher than the 50% to 75% adherence rates that have been reported in patients with cardiovascular disorders.\textsuperscript{834, 835} Medication adherence ranked second after smoking cessation in health-enhancing behaviours most frequently practised by first AMI survivors at the 6-month follow-up. This high level of participation rate could be a reflection of the ease in adopting this health-enhancing behaviour, compared to the other four health-enhancing behaviours critical to cardiac health. The emphasis of health professionals on the importance of medication adherence probably contributed to the high level of engagement of this health-enhancing behaviour. The issue of over-reporting of medication adherence also needs to be considered, as it has been shown that self-report measures of medication adherence over-estimate adherence by about 17%.\textsuperscript{836}
9.5.1 Explanatory model of medication adherence

No direct or indirect predictors of medication adherence were uncovered in this study. Unlike a previous study which found that significant stress had a negative impact on medication adherence,\(^{837}\) this study found no association between stress and medication adherence \((r = 0.064)\). However, in contrast to the current study which used a prospective, follow-up design to measure stress at two points in time, the previous study used a retrospective, cross-sectional design, which does not add confidence to conclusions drawn in a study of a cause and effect relationship between stress and medication adherence.

Compared to the other health behaviours, medication adherence is not often studied as an individual health behaviour.\(^{716}\) Amongst the theoretical models, the health belief model (HBM) has been most widely used to elucidate the medication adherence phenomenon. In these studies, the HBM accounts for 0-43% of the variance in adherence behaviour, with most reporting only a modest support for the model.\(^{838-841}\) Cohen\(^{840}\) suggests that the determinants of medication compliance are not subsumed under the HBM. However, to date, the determinants of medication adherence remain elusive and warrant further investigations.

Although this study and others have failed to convincingly highlight how to best encourage medication adherence, this study does suggest that the current practices of health professionals and first AMI survivors have resulted in most survivors adhering to their medications, even when the explanation for the engagement of this behaviour has been limited.

9.6 Low dietary fat intake

Only about one-quarter of the survivors reported low dietary fat intake (<20% total fat; <7% saturated fat). This was similar to the percentage reported by the rest of the NSW population (29.1%).\(^{498}\) However, in contrast to weight normalisation, low dietary fat intake had the highest magnitude of change (52.8% increase) and ranked third in prevalence among the five health-enhancing behaviours (80.2%) practised by AMI survivors at the 6-month follow-up. Although magnitude of change is encouraging, current evidence lends little support for the sole emphasis on dietary fat intake in AMI patients.
Although a vegetarian diet with 10% or less in total fat is effective in CHD regression, this dietary prescription is possibly unpalatable for most CHD patients, as evidenced by the Lifestyle Heart Trial; most of the survivors opted out of the trial after one year. In contrast, most patients in the intervention group of the Lyon Diet Heart Study, who were prescribed the Mediterranean diet, were still following this diet closely at the 4-year follow-up.\textsuperscript{161}

The total fat intake in the AHA Step II diet is less than 20% (of which less than 7% is saturated fat) and is possibly slightly more palatable than the Lifestyle Heart Trial dietary regimen. This study used the AHA Step II diet as the criterion to define low dietary fat intake. This level of dietary fat intake was promoted as cardioprotective by the ACC/AHA Consensus Panel\textsuperscript{11} and was supported by studies that have shown regression or reduction in CHD progression.\textsuperscript{25, 122, 673} Dietary changes with this level of saturated fat are needed to achieve sufficient reduction of serum cholesterol, but may still be impractical for most individuals with CHD.\textsuperscript{147} Ulbricht and Southgate\textsuperscript{842} highlighted that the diet and coronary heart disease relationship is more complex than the lipid hypothesis. They identified seven major dietary factors that have an effect on CHD.\textsuperscript{842} With the dramatic beneficial effects of the Mediterranean diet, de Lorgeril and colleagues\textsuperscript{843} have advocated new dietary advice for individuals with CHD. This dietary advice includes: reduce total fat intake (≤ 30% fat as total energy intake, <10% saturated fat) with an increase in omega-3 fatty acids consumption, increased intake of natural antioxidants and maintain sufficient intake of fish and vegetable proteins.\textsuperscript{843} The 1999 dietary recommendation by the National Heart Foundation of Australia for individuals with established CHD is based on the Mediterranean diet principle. In October 2000, the AHA also followed suit and published their revised dietary guidelines based on the Mediterranean diet principle. In addition to a low saturated fat intake of <10%, AHA dietary guidelines now include two fish servings per week, a variety of fruits and vegetables, legumes and grain products.\textsuperscript{796}

This study did not use the new dietary guideline as one of the benchmarks of health-enhancing behaviour because at the time when this study was conducted, this dietary guideline was not widely advocated for AMI patients. The other added problem was that a validated instrument to measure adherence to the Mediterranean diet was not yet available for use in AMI patients.
9.6.1 **Explanatory model of low dietary fat intake**

Perceived stress was the only psychosocial variable examined that was directly associated with low dietary fat intake. This finding is consistent with previous studies, which found that high stress levels were associated with increased food intake,\cite{298,300} disordered eating behaviours\cite{301} and failure to adhere to a dietary regimen.\cite{302,303} The ability of stress to adversely affect individuals attempting to lower dietary fat intake has important implication for patients with CHD. Whilst previous studies on CHD patients have focused on the effects of stress on coronary recurrence and mortality, no studies have considered the effects of stress and health behavioural change in this group of patients. Frasure-Smith et al\cite{286} found the adverse effects of psychological stress after an AMI increased reinfarction over a 5-year period. In the 7-year follow-up of the Ischemic Heart Life Stress Monitoring Program, the rate of AMI recurrences was lower in the group of patients who had stress management.\cite{844} Another randomised controlled trial on CHD patients reported similar findings.\cite{5} One explanation for this beneficial effect of stress management in CHD patients is that psychosocial treatments ameliorate some of the biological coronary risk factors.\cite{290} This study strengthens the argument for the implementation of psychological interventions, such as stress management, in cardiac rehabilitation programs. This is particularly true for those patients who may also be required to modify their dietary fat intake.

Compared to other models that have been tested on dietary behaviours, results in this study provided modest support for Antonovsky’s stress-adaptive coping relationship with the revised trimmed dietary fat model accounting for only 10% of the variance in the amount of low dietary fat intake. Using the Protective Motivation Theory, Plotnikoff and colleagues\cite{445} were able to explain 39% of the variance in dietary fat behaviour. Similarly, the TTM had some success in explaining dietary fat intake.\cite{845,847} However, there is still some question as to the extent to which these models are actually predictive of dietary change. These studies are predominantly cross-sectional designs and longitudinal designs are required to appropriately test the predictive power of these models to explain dietary behaviour.
From the review of other contemporary models that have been used to explain dietary fat intake behaviour, the Protection Motivation Theory, with the following components - severity, vulnerability, response efficacy and self-efficacy, remains the best explanatory model for possible consideration in cardiac rehabilitation programs. Once again, although this study has not extensively explained which factors influenced dietary fat intake, stress has been identified as an important factor for assessment and management of dietary fat intake in first AMI survivors.

9.7 Number of health-enhancing behaviours

Although there is evidence of the benefits of survivors of first AMI to change behaviour or take up health-enhancing behaviours, there is also a suggestion that there may be a multiplicative benefit of engaging in several of the health-enhancing behaviours (multifactorial risk factors altered by multifactorial improvement in behaviour). This suggestion has led to the investigator to explore direct and indirect factors that influence engagement in the number of health-enhancing behaviours.

Four health-enhancing behaviours that were measured at baseline were again measured at the 6-month follow-up in this study. Medication adherence was the only health-enhancing behaviour measured only once, at the 6-month follow-up. At the 6-month follow-up, there was an overall increase in the total number of health-enhancing behaviours reported by these first AMI survivors. However, only 14% of the survivors were engaged in all five health-enhancing behaviours. This low participation rate for all five health-enhancing behaviours at the 6-month follow-up is of concern.
Attendance at an outpatient cardiac rehabilitation program emerged as the only significant predictor of engagement in more than three health-enhancing behaviours. Two possible explanations for this finding are: i) the attendance at an outpatient cardiac rehabilitation program has equipped attendees to adopt health-enhancing behaviours; and ii) attendees at a cardiac rehabilitation program are a self-selected group of highly motivated individuals. Prior to cardiac rehabilitation attendances, they might already been more motivated to engage in health-enhancing behaviours, hence, were more likely to engage in more than three health-enhancing behaviours at the 6-month follow-up. However, literature tends to support that cardiac rehabilitation attendance is pivotal in increasing the number of health-enhancing behaviours at follow-up. This study’s findings would support this assertion; attendance at cardiac rehabilitation programs was more likely to result in first AMI survivors engaging in more than three health-enhancing behaviours.

This study uncovered a wide variation in the proportion of survivors practising each of the health behaviours at baseline (ranging from 12.3% for adequate physical activity to 70.8% for non-smoking behaviour). There was also a vast difference in the adoption rates for each of the health behaviours at the 6-month follow-up (ranging from 34.9% for BMI within normal range to 89.6% for non-smoking behaviour). The results suggest that survivors may be more successful in adopting certain health behaviours (medication adherence and low dietary fat intake) but are less likely to be successful in adopting other health behaviours (weight loss and adequate physical activity) following an acute coronary event.

This trend of health behavioural change is consistent with studies that have examined multiple behavioural modifications of cardiovascular risk factors. In the Southampton Heart Integrated Care Project (SHIP) intervention trial, three health behaviours were measured at the 4-month follow-up. The vast majority of survivors reported healthy lifestyles. Non-smoking was the most prevalent health behaviour (89% in the control group and 92% in the intervention group) followed by healthy eating (84% in the control group and 90% in the intervention group) and regular exercise (67% in the control group and 73% in the intervention group). In another follow-up study which examined four health behaviours (smoking cessation, alcohol consumption, weight loss and the amount of exercise taken), dietary change had the highest magnitude in positive health behavioural change, a trend that was also
reported in the current study. The small improvement in BMI compared to other health behaviours uncovered in the current study has also been observed in a 2-year follow-up health promotion study on a group of 4316 men who were at high risk of CHD.

9.7.1 *Explanatory model of increasing number of health-enhancing behaviours*

No consistent sociodemographic or psychosocial factors examined emerged as a consistent predictor of all of the health-enhancing behaviours suggesting the heterogenous nature of these health-enhancing behaviours with multifactorial key influences on each of these behaviours.

It is thus not unexpected that the integrated health-enhancing model derived from Antonovsky’s stress and adaptive coping hypothesis lacks explanatory power for most of the health-enhancing behaviours considered in this study. Where there was a significant association between stress and the particular health behaviour, namely low dietary fat intake, the use of a model derived from Antonovsky’s stress and adaptive coping hypothesis was successful in predicting the health behaviour although the variance explained was small. However, the study did not uncover a strong association between perceived stress and the other health-enhancing behaviours explored.

This study was an attempt to derive an integrated model that could explain all five health-enhancing behaviours critical to the health of AMI survivors. There are at least two reasons for the lack of explanatory power of this integrated health-enhancing behaviour model. First, these five health-enhancing behaviours are different, reflected by the wide variation in participation rates. Second, there are dissimilar determinants for each of these behaviours; perceived stress was an influencing factor in only one of the health-enhancing behaviours. This study demonstrates the ineffectiveness of a simplistic explanatory model that could explain all health-enhancing behaviours pertinent to AMI survivors. Findings from this study re-emphasise the need to tailor more specific and effective intervention programs to patients’ individual needs and specific health-enhancing behaviours.
9.8 Cardiac rehabilitation attendance

Although none of the predictor variables in the study was a significant predictor for all five health-enhancing behaviours, the attendance at a cardiac rehabilitation program was the most consistent predictor of subsequent engagement in health-enhancing behaviours. Cardiac rehabilitation attendance was a significant predictor for the engagement in non-smoking behaviour, low dietary fat intake, as well as the engagement in more than three health-enhancing behaviours. However, it would be presumptuous to attribute the engagement in these health-enhancing behaviours to the attendance of an outpatient cardiac rehabilitation program. Current recruitment procedures into cardiac rehabilitation programs favour the highly motivated patients with possibly more knowledge about cardiovascular risk reduction.\textsuperscript{194, 855, 856} In these programs, there may be a reasonable amount of self-selection, attracting those who are more likely to adopt health-enhancing behaviours, and at the same time, failing to reach the ones who need this service most.

The importance of a flexible approach to cardiac rehabilitation has been emphasised, taking into account sociodemographic factors and differences in individual circumstances.\textsuperscript{857} There is an urgent need to identify the profile of eligible patients who would benefit most from different modes of delivery of cardiac rehabilitation. Getting away from the “one size fits all approach” of a highly structured and sequential cardiac rehabilitation program would allow for flexible delivery which takes into account the individual needs of patients.

This study also identified the “typical” patient to be a “young, male, white patient suffering their first, uncomplicated AMI”, a group who typify those who have the most access to cardiac rehabilitation.\textsuperscript{857-859} Nevertheless, only about half of the sample attended the outpatient cardiac rehabilitation. Thus, in addition to encouraging more AMI survivors to attend cardiac rehabilitation programs, there is also an urgent need to explore other options for these individuals to receive help without having to attend cardiac rehabilitation programs.

An example of a program that is responsive to the need for individualised programs with appropriate goal setting is the Heart Manual, a 6-week, self-help rehabilitation program for AMI survivors.\textsuperscript{860} It is based on a cognitive-behaviour model and can be used as a stand-alone program or in combination with the hospital-based program.
This low cost home-based rehabilitation program is introduced to AMI survivors by a trained facilitator prior to discharge. Survivors receive four brief visits by a specially trained community nurse and at the final visit, an assessment of their blood pressure, adherence to medication, BMI, physical activity level, other lifestyle characteristics and psychological adjustment are recorded. The results of this information are used to triage the patient into one of three groups:

1. Patients who have changed their lifestyle and adjusted psychologically to the acute coronary event are introduced to the nearest gym and patient self-help group;

2. Patients with one or two discrete problems are refereed to the General Practitioner;

3. Patients who have made little progress with lifestyle change, or with multiple needs are referred to one of the pre-existing outpatient rehabilitation programs.

This model adopts the principle that health messages should be tailored to each individual patient taking into account the risk profile of the patient and where the individual is in the change continuum. Health Risk Appraisal (HRA), a procedure using epidemiological and vital statistics data, can provide individuals with projections of their personalised mortality risk with recommendations for reducing that risk.\textsuperscript{197} Health education messages should be tailored specifically to individual needs based on their readiness to change their lifestyle practices. These messages should also be relevant to the individual’s risk profile focusing only on the key health areas that require interventions.\textsuperscript{198,857} For instance, a “how to quit smoking” session is irrelevant and may de-motivate the attendance of non-smokers.

Realism in goal setting for each individual patient is essential. It is important for both patients and health professionals to monitor and recognise what is a “realistic change” at a given time.\textsuperscript{861} It has been said: “\textit{Nothing kills the change process better than the setting of unrealistic, unachievable goals.}”\textsuperscript{861} (p.80). In facilitating health-enhancing behaviour, health professionals should inform patients that some health behaviours are easier to implement than others, and it may increase the likelihood of success if they start out by focusing on the “easier” health behaviours.
The argument for this is especially strong in the case of weight normalisation. Although normal BMI would be the optimum for all patients, it is perhaps unrealistic to set this as a target for all patients attending a cardiac rehabilitation program. It should be recognised that certain health-enhancing behaviours are easier to adopt compared to other health-enhancing behaviours, as reflected by this study and previous studies. It has been said that weight loss is the single most difficult health behaviour anyone can undertake with a long-term success rate varying from 5% to 10%,\textsuperscript{862} compared to a success rate of 23% to 42% for smoking cessation.\textsuperscript{863-865} Hence, it is vital to take it slowly, one step at a time for health behaviours such as weight loss and weight normalisation in overweight and obese patients.

9.9 Limitations of the study

9.9.1 Measurement error

The validity of the findings in this study may be affected by bias inherent in self-report measures. Four main sources of inaccuracies, associated with the use of self-report measures (which may potentially under or overestimate the parameters examined in this study), have been identified in this study.

The first source of inaccuracy from self-report measures is misinformation provided by the survivors, wittingly or unwittingly. This study relied on self-report data from survivors, which was not validated with other sources of information. For example, in studying smoking cessation, two studies that used other sources of data (such as carbon monoxide, thiocyanate or nicotine determinations) to confirm self-report information, demonstrated a deception rate ranging from 8.8%\textsuperscript{866} to 13%.\textsuperscript{516} Nutrition surveys have demonstrated underreporting of total dietary intake\textsuperscript{867} and obese individuals are more likely to underreport the intake of fatty foods.\textsuperscript{868} Hence, the sole reliance on self-report measures and not controlling for possible deception in assessing health behaviour may have affected the findings in this study.

The second source of inaccuracy relating to self-report is recall bias. Recall bias has been demonstrated in AMI patients with the use of self-report measures, and it is generally accepted that this is not simply a problem of over or underreporting in some subgroups.\textsuperscript{869}
The third limitation of using self-report measures in this study is common method variance or bias. Common method bias, first described by Campbell and Fiske,\textsuperscript{870} can occur if the same person provides data at the same time. In this study, both predictor and outcome measures were assessed via self-report, at baseline and at the 6-month follow-up. There was a likelihood of overestimation of the true relationship because both measures share method variance.\textsuperscript{681} This may pose problems for survey research that relies solely on self-reported data, such as the design selected for this study. Common method variance artificially inflates observed relationships between variables.\textsuperscript{871} Although a number of related variables were measured at the same time at baseline, two of these variables, perceived stress and sense of coherence, were highly correlated. The Harman’s one-factor test was performed\textsuperscript{681} on these two highly correlated variables and did not uncover any common method variance. Nevertheless, common method bias could still have existed between other self-report measures that were measured simultaneously, at baseline or at the 6-month follow-up.

The fourth source of inaccuracy related to the use of self-report measures is social desirability bias. This form of systematic error in self-report measures results from the desire of respondents to avoid embarrassment and project a favourable image to others by selecting the “correct” or socially acceptable response.\textsuperscript{872} Social desirability has been found to occur in virtually all types of self-report measures across a wide spectrum of social science literature.\textsuperscript{873-876}

Social desirability bias was of particular concern in the measurement of personality\textsuperscript{871} as well as health behaviours.\textsuperscript{875, 877} A number of techniques have been suggested to mitigate the effects of social desirability bias, including indirect questioning. Indirect questioning asks survivors to answer structured questions from the perspective of another person or group, “to describe their own feelings behind the façade of impersonality.”\textsuperscript{878} This is thought to reduce the social desirability bias. However, indirect questioning or other techniques of data collection were not used in this study.
9.9.2 Sample size

Another limitation of the present study includes low power because of the relatively small sample size (106 respondents at the 6-month follow-up). What constitutes an adequate sample size is open to debate. For example, in regression analysis, although 10 survivors for each predictor is suggested by Nunnally and Bernstein,\textsuperscript{635} Tabachnick and Fidell recommended $50 + (8 \times n)$, where $n$ is the ‘number of predictors’.\textsuperscript{695} Other authors have suggested a range from 15 to 40 survivors per predictor.\textsuperscript{879, 880} This study examined 10 predictors and hence met the 10 survivors per predictor requirement, but not the other more stringent sample size guidelines. Power analysis revealed the number of survivors needed to produce a power of 0.80 with alpha = 0.05 for medium effect size of 0.3, with 10 predictor variables was about 130, the same sample size as recommended by Tabachnick and Fidell.\textsuperscript{695} Hence, a sample size of 106 survivors would have had low power and could not detect a medium effect size, and possibly missed predictors which may have had a more subtle impact on health behaviours. Of the four health-enhancing behaviours examined at baseline and at the 6-month follow-up, only one of the health-enhancing behaviours (dietary fat intake) had an effect size of greater than 0.3.

Sample size is also another important requirement when using Structural Equation Modelling (SEM). One potential criticism against this study is whether a sample size of 106 was adequate for SEM. Whilst there appears to be no consensus on exactly what constitutes a minimum sample,\textsuperscript{568, 569} it is agreed that SEM is not an appropriate statistical test for small samples. In a recent review of approximately 500 publications using SEM, about 18% of the studies reviewed used samples of fewer than 100 cases.\textsuperscript{618} Boomsma\textsuperscript{570} showed using maximum likelihood estimation (MLE) in that SEM was unstable in samples of less than 100 and suggested as a general rule that sample size should be at least 200. Gerbing and Anderson\textsuperscript{571} also used MLE to study samples ranging in size from 50 to 300 cases. Their findings support Boomsma’s conclusion for sample sizes of less than 100 cases. However, they also found that fairly robust estimates could be achieved with sample sizes of more than 100, which was the case for this study.
9.9.3 Problems with external validity

This study aimed only to investigate first AMI survivors who had not been previously confronted with a health condition that would require them to also make changes to their health behaviours. For this reason, patients with diabetes were excluded from the study sample. This was to avoid confounding factors if diabetics and recurrent AMI patients were included, as they were likely to have made significant health behavioural changes or, may have been more resistant to health behavioural change. In narrowing the inclusion criteria, one of the losses was that the results of the study could not be generalised to recurrent AMI patients or AMI patients with diabetes. Hence, it is not possible to generalise the findings in this study to AMI patients who are also diabetics.

Perhaps a more important threat to external validity was the exclusion of non-English speaking survivors in the study sample. The survey design adopted in this study made it necessary for survivors who were recruited to be literate in English. The proportion of non-English speaking background (NESB) residents in SWSAHS (South Western Sydney Area Health Service) where this study was conducted, is 26.3%. Although migrants, particularly those who are non-English speaking, have lower CHD mortality and lower prevalence of AMI, there are certain migrant groups (e.g. migrants from the Indian subcontinent) that have an increased risk of CHD. Hence, this study has limited generalisability to the SWSAHS because a sizable proportion of AMI survivors from a NESB were excluded. Generalisability of the results is confined to first AMI patients who have no previous history of diabetes and who are English speaking. Replicating the study that is not restricted to the current survey design would strengthen the external validity of the study.

One of the major limitations of this study is that the focus has at all times been on outcomes and standards for health behaviour. This has resulted in limited exploration of the processes (e.g. attendance at cardiac rehabilitation) that enhance or diminish the change process; rather it has focussed on the outcomes of final change in behaviour at a defined point in time in the recovery period of first AMI survivors.
9.10 Conclusions

The relationship between stress and low dietary fat intake suggests that the assessment and participation of AMI survivors in stress management programs is likely to result in improved levels of engagement of this health-enhancing behaviour. However, the applicability of stress management to the other health-enhancing behaviours explored in this current study (non-smoking, normal BMI, adequate physical activity and medication adherence) is not supported. Hence, the theoretical framework derived from Antonovsky’s hypothesis on stress and coping has limited usefulness in explaining health-enhancing behaviours of AMI survivors.

Alternate models for promoting behavioural change such as the TTM for non-smoking behaviour or Protective Motivation Theory for low dietary fat intake may be more appropriate for first AMI survivors. However, further research applying these models will confirm this suggestion. Future investigators are encouraged to comprehensively evaluate not only the health behaviour outcome of AMI survivors but also the change processes undertaken to achieve such outcome.

The quest for a behaviour model that addresses all five health-enhancing behaviours for first AMI survivors may be best approached by a focus on the change process in addition to the outcome, and may only be applicable at best, to a couple of the behaviours rather than all behaviours.

9.10.1 Implications for clinical practice

Findings presented in this study are important for enhancing our understanding of health behavioural change, and the psychosocial factors that may affect this change, following an AMI. Five key findings in this study have potential clinical implications. First, although the study showed an overall increase in health-enhancing behaviours at the 6-month follow-up, the study also revealed that some health behaviours were possibly easier to change than others: stopping smoking, adhering to medication regimens, and reducing dietary fat intake are more likely to be achieved than engaging in adequate physical activity and weight normalisation. In order to undertake an adequate level of physical activity, patients have to invest a significant amount of time each day to exercise. Regular exercise can reduce the burden on the damaged heart by increasing the efficiency of oxygen use in the skeletal muscle while facilitating weight control and improving lipid profiles.
Thus, clinicians and cardiac rehabilitation personnel need to raise the awareness of patients and the community regarding the importance and benefits of this investment. There is also a need to be realistic when setting BMI targets that can be achieved by overweight and obese AMI patients.

Second, critical behaviours such as smoking require health professionals and AMI survivors to continually strive for a zero rate in smoking behaviour or at least ensure that those who want to stop smoking are provided with all possible assistance in smoking cessation.

Third, the study highlighted that attendance at a cardiac rehabilitation program is worthwhile in facilitating the adoption of health-enhancing behaviours and therefore should continue to be promoted. However, in addition to the hospital-based cardiac rehabilitation programs, other modes of cardiac rehabilitation programs should also be considered so that more AMI survivors can reap the benefits of cardiac rehabilitation. There is also a need to address each of the five critical health behaviours as separate and distinctly different behaviours which are likely to require potentially different approaches in cardiac rehabilitation programs, and suggestions have been about existing models.

Fourth, the study highlights the importance of lowering stress in order to be successful in health behavioural change. Cardiac rehabilitation health care personnel can no longer ignore perceived stress of AMI patients in their attempt to facilitate health behavioural change. In order to do this, clinicians must firstly assess the stress level of cardiac patients. It is apparent from this study that using a simple and self-report measure of perceived stress is useful in predicting dietary fat intake following an AMI. Currently, it is not common practice to measure patients’ perceived stress in the cardiac rehabilitation setting.

Finally, in addition to assessing perceived stress, this study also suggests the need to recognise patients’ readiness to change. Findings from this study suggest that AMI patients are very likely to be at different stages of change for different health behaviours, as demonstrated by the variation in the magnitude of each health behavioural change at the 6-month follow-up. There is a need to tailor interventions to the degree of readiness to change in each of the health behaviours. In general, interventions become more intensive with increasing readiness to change.\(^\text{887}\)
A behavioural approach is pivotal in the secondary prevention of recurrent coronary events and reducing mortality among AMI survivors. It has been proposed to be just as effective, most cost-effective and complementary to conventional surgical and pharmacological cardiac interventions. For first AMI survivors, the initial insult of the acute medical emergency soon passes and what remains is the need to change behaviour, to engage in health-enhancing behaviours that may already be present or may be very unfamiliar to some AMI survivors. The adoption of one health-enhancing behaviour is a courageous act for both the AMI survivor and the health professionals supporting such change. Within this context, first AMI survivors may be required to change five distinct and diverse health-enhancing behaviours. This study has highlighted that these are five very different behaviours, most likely to need several different approaches requiring health professionals to have a repertoire of approaches to understand, support or enhance the change process.

9.10.2 **Implications for further research**

As the study relied mainly on self-report measures, cross-validation research is necessary, using multiple measures and methods for assessing health behaviours. It is unclear if the failure to identify psychosocial predictors of weight loss, physical activity and medication adherence is a genuine phenomenon or whether it is the result of the self-report measures used in the study. A more detailed measure of physical activity, that takes into account those who are incapable of performing moderate intensity exercise (e.g. elderly patients with comorbid health problems) would be useful. A more comprehensive measure of medication adherence is also necessary in future research.
A replication study with a larger sample size, which includes both recurrent AMI and diabetic patients, is likely to enhance generalisability since it would be more representative of the normal AMI population commonly encountered in the clinical setting. Depending on the findings of such a study, recurrent AMI and diabetic patients may need to be studied separately.

A small percentage of AMI survivors continued to smoke, failed to adhere to their medication regimen and continued to consume high dietary fat suggesting that health professionals may need to identify patients that are likely to be unable to engage in any health behavioural change. Research that focuses on these ‘high-risk’ individuals to identify any factors that assist behavioural change is urgently required.

There is also a critical need to examine behavioural changes in NESB patients following an AMI. Traditionally, NESB patients are not well studied because of the difficulty and expense in eliciting valid information from this group of patients due to the language barrier and the need for culturally appropriate instruments. Nevertheless, NESB patients represent up to a quarter of all residents in certain metropolitan regions of Australia and require more research attention.

In addition to a 6-month follow-up, a 2- to 3-year follow-up would be worthwhile. A longer-term follow-up would enable the exploration of factors associated with relapses in health behaviour and would also allow the identification of those who lose weight over a 2- to 3-year period.

Comprehensive exploration of the exact nature of the relationship between the five behaviours and the factors that influence the specific behaviour or behaviours is warranted in a very large sample.
9.11 Summary and recommendations

1. There is a need to promote the guidelines recommended by the National Heart Foundation of Australia (NHFA), which are consistent with the American Heart Association guidelines, except for weight normalisation. Weight normalisation target of less than 25 kg/m² recommended by the NHFA is unrealistic for most overweight or obese AMI survivors, a 5% to 10% weight loss would be a more achievable goal.

2. It remains important for health professionals to target behaviours that are critical to survival (e.g. smoking) and behaviours that influence other behaviours (e.g. physical activity and weight loss) whilst supporting the client’s preference to change for the other behaviours.

3. There is also a need for health professionals to target those at greater risk due to global inability to change behaviours. The smaller percentage of AMI survivors; who continued to smoke, failed to adhere to their medication regimen and continued to consume high dietary fats need special attention.

4. Patient attendance at an outpatient cardiac rehabilitation program is beneficial in promoting the engagement of health-enhancing behaviours and needs to be promoted. However, in addition to the hospital-based cardiac rehabilitation programs, other modes of cardiac rehabilitation programs should be considered so that more AMI survivors can reap the benefits of cardiac rehabilitation.

5. AMI patients who are enrolled in cardiac rehabilitation programs need to be aware of the target health behaviours listed in the NHFA guidelines and the latest evidence regarding weight loss and the cardiac protective properties of the Cretan Mediterranean diet.

6. There is a continued need for individualised programs that target and tailor health behavioural intervention programs to meet individual needs. Each of the five critical health behaviours need to be addressed as separate and distinctly different behaviours requiring potentially different approaches for successful adoption of that health-enhancing behaviour.
7. There is a need for assessment of selected psychosocial factors such as perceived stress during hospitalisation as it will help identify individuals who are at risk of failure to adopt health-enhancing behaviours and hence, may require additional support and interventions (e.g. stress management).

8. Cardiac rehabilitation needs to focus on realistic individual targets, particularly in relation to weight loss. Weight loss need to be tempered by sustainable weight loss with realistic time frames where goals are negotiated with the participant – e.g. 5% to 10% weight loss may be all that is achievable and realistic for some individuals with CHD. It is also important to emphasise a gradual and steady weight loss, 0.5 kg to 1 kg weight loss/week until the achievement of weight normalisation.

9. Cardiac rehabilitation educators need to consider a repertoire of health behaviour models that may be applicable to each of the behaviours with particular strengths evident (from other studies) in the Transtheoretical Model for reducing smoking behaviour and for increasing physical activity, and Protection Motivation Theory model for reducing dietary fat intake. Models that focus on the change process rather than just the outcome may have merit.

CHD, a so-called lifestyle disease, remains the most common cause of death among Australians. Although survival following an AMI is greatly improved by altering key behaviours, transforming these behaviours into health-enhancing behaviours remains one of the major challenges ahead for survivors and health care personnels such as cardiac rehabilitation educators. This challenge goes beyond simply having the courage to change. It requires tools or strategies to understand, initiate, support and sustain change in the everyday life for AMI survivors.
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Appendix 1
Ethics clearance

Ms. Y. Salamonson,
47 Clarence Road,
GLEN ALPINE NSW 2560

Dear Ms. Salamonson,

Project No: 97/29 - Predictors of cardiac health behaviours in patients following the first heart attack.

Thank you for your correspondence dated 9th May, 1997, regarding the above project. Please accept my apologies for the delay in replying.

The SWSAHS Research Ethics Committee wishes to acknowledge receipt of:

(i) A copy of the amended Patient Information Sheet; and
(ii) A copy of the standard SWSAHS Consent Form to be used for this project.

Formal approval has now been granted for this project to proceed.

Ethics clearance is granted for periods of up to twelve months. This project will be due for renewal on 28th April, 1998. Enclosed is a Progress Report Form which must be completed and submitted close to this date if an extension of ethics clearance is required. Should this project be completed within the first twelve months, please forward a final report to the Committee.

Your attention is drawn to the attached document Guidelines for Investigators which sets out not only the principles under which research should be conducted, but also the conditions under which Ethics approval is granted by the Committee. Also enclosed for your information, is a copy of the document Guidelines for Responsible Practice in Research and dealing with Problems of Research Misconduct.

Would you please quote the above project number in all future correspondence relating to this project.

Yours sincerely,

EMERITUS PROFESSOR A. LYKKE,
Chairperson,
SWSAHS Research Ethics Committee.

for: Mr. Ken Brown,
Chief Executive Officer.

cc: General Manager, Liverpool Health Service.

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ETHICS REVIEW COMMITTEE
(HUMAN SUBJECTS)

CERTIFICATE OF APPROVAL

Date: 24 April, 1997
To: Yenna Salamonson

Telephone:
Fax:

Project Title: Predictors of cardiac health behaviours in patients following the first myocardial infarction

Protocol No.: 97/22

The Ethics Review Committee (Human Subjects) at its meeting of 9th April 1997 approved the above protocol.

The Principal Investigator is required
a) to provide an Annual report on matters including
   * security of records
   * compliance with approved consent procedures and documentation

b) to report to the Committee immediately anything that might affect ethical acceptance of the protocol, including
   * adverse effects on subjects/participants
   * proposed changes in the protocol
   * unforeseen events that might affect continued ethical acceptability of the project.

The protocol is approved until 9th April 1998 subject to the protocol complying with the above.

It should be noted that it is the responsibility of the first-named investigator for ensuring ethical practice in research and for compliance with the above.

The above Protocol number must be quoted in all future correspondence regarding this protocol.

Mr. Harry Mayfield
CHAIR,
ETHICS REVIEW COMMITTEE (HUMAN SUBJECTS)
Ms. Yenna Salamonsen,
47 Claremont Circuit,
GLBN ALPINE NSW 2560

Dear Ms. Salamonsen,

Project No: 97/29 - Predictors of cardiac health behaviours in patients following the first heart attack.

The SWSAHS Research Ethics Committee wishes to acknowledge receipt of your correspondence regarding the above project.

The Committee have noted from your progress report that recruitment has been slow, and in this regard an extension of ethics clearance has been granted to 30th June, 1999.

The Committee also raised no objections to you collecting data from Liverpool Hospital in view of the fact that you have obtained approval from the General Manager, Liverpool Health Service.

Thank you for keeping the Committee informed with regard to the progress of this project.

Yours sincerely,

EMERITUS PROFESSOR A. LYKKE
Chairperson,
SWSAHS Research Ethics Committee.

For: Mr. Ken Brown,
Chief Executive Officer.

23/7/99

SHAPING A HEALTHIER FUTURE
ETHICS REVIEW COMMITTEE (HUMAN SUBJECTS)

Date: 23 March, 1998
To: Yenna Salamonson
    Faculty of Health
    UNSW - Campbelltown
    Telephone: (02) 4620 3322
    Fax: [blank]

Project Title: Predictors of cardiac health behaviours following the first myocardial infarction
Protocol No: 97/22

The Ethics Review Committee (Human Subjects) has approved the extension of ethics clearance for the above protocol and a Certificate of Approval is attached.

Please note that approval for the above protocol expires on 11 March 1999.

Yours sincerely

[Signature]
Kokita de Souza
Ethics Officer
Tel: (02) 46203641
Fax: (02) 46272406
Email: kokita.desilva@uws.edu.au
Appendix 2
Patient information and consent form

SOUTH WESTERN SYDNEY AREA HEALTH SERVICE

PATIENTS’ INFORMATION
An invitation to participate in Research Study

LIFESTYLE PRACTICES AFTER A HEART ATTACK

I am a Registered Nurse working in the Intensive Care/Coronary Care Unit of Campbelltown Hospital. I am also a nursing lecturer working at the Faculty of Health, University of Western Sydney Macarthur. Currently, I am enrolled in a Doctor of Philosophy (PhD) degree investigating the factors associated with lifestyle changes in cardiac patients admitted to Coronary Care Units. In order to meet part of the requirement of my PhD thesis, I am conducting a study examining patient’s lifestyle after their heart attack.

The aims of the study are to investigate the extent of lifestyle changes in cardiac patients and the factors that are linked to lifestyle changes.

WHY ME?
You have just been admitted to hospital after a heart attack. I need your help to identify areas which could be improved (both in hospital and after discharge) when caring for patients who have had a heart attack.

IF I SAY “YES” WHAT WILL HAPPEN?
You will be asked to complete a set of questions during this admission period. They are concerned with how you feel about life generally, your health beliefs, your intentions to make lifestyle changes and your current lifestyle.

About six months later, you will receive in the mail another set of questions. You will be asked to complete these and return them in a self-addressed, stamped envelope. These questions will ask you about lifestyle changes, your perception about your health and the care you received in hospital.

IF I SAY “NO” WHAT WILL HAPPEN?
There is no problem if you say NO, that is your right. You will continue to receive optimal care regardless of whether you decide to participate or not. If you decide to participate you are free to change your mind and withdraw at any time. If you withdraw from participation there will be no effect on future treatment, or your relationship with any person or service in the South Western Sydney Area Health Service.

SHAPING A HEALTHIER FUTURE

LOCKED BAG No. 17, LIVERPOOL, NSW 2170 • TELEPHONE (02) 828 5700 • FAX (02) 828 5789

Appendix 2: Patient information & consent form
WHAT ABOUT MY PRIVACY?

ANONYMITY
Your name address and phone number will be known to the researcher, only for the purpose of the follow up and obtaining your responses to the next round of questions. The forms you complete will only have a number code.

CONFIDENTIALITY
No one individual will be identified in the written reports related to the project. Only the researcher will see the completed questionnaire.

ARE THERE ANY RISKS FOR ME?
There are no risks of any sort to participants in the study.

WHAT DO I GET OUT OF IT?
1. The researcher is a Registered Nurse with a particular interest in heart disease. I would always be interested and understanding about your concerns.
2. You will be making a valuable contribution to health research and eventually improved methods of care.
3. The general results of the project could be made available to you if you are interested.

HOW CAN I GET MORE INFORMATION?
The researcher is:
Yenna Salamonson RN, BSc, CCU Cert, GDNE, MA
ICU/CCU Department
Campbelltown Health Service
P. O. Box 149
Campbelltown 2560
Phone no: (02) 46203322
Fax no: (02) 46254252

WHAT NOW?
After you have finished reading this information sheet and the consent form, tell the person who provided these forms whether you want to participate or not, or, if you want more information.
I would deeply appreciate your participation in this study, which seeks to improve the quality of care following a heart attack.

THANK YOU

This research project has been approved by the University of Western Sydney Macarthur Ethics Review Committee (Human Subjects). Any complaints or reservations about this research may be directed to the Ethics Committee through the Executive Officer, phone (048) 203 641. All complaints will be treated in confidence.

This project has also been approved by the South Western Sydney Area Health Service Ethics Committee.
SOUTHWESTERN SYDNEY AREA HEALTH SERVICE

Researcher:
Yenna Salamone RN, BSc, CCU Cert, MA
ICU/CCU Department
Campbelltown Health Service
P. O. Box 149
Campbelltown 2560
Phone no: (02) 46203322
Fax no: (02) 46254252

LIFESTYLE PRACTICES OF PATIENTS AFTER A HEART ATTACK

CONSENT FORM

I, ............................................. ......... have read and understood the Information Sheet and this Consent Form. I understand that my decision whether or not to participate in, or subsequently withdraw from, this study will not affect any current or future treatment or my relationship with the South Western Sydney Area Health Service or any institution co-operating in this study or any person treating me.

I understand the purpose of the study and what is being asked of me, and that I can stop participating at any time. With this understanding, I agree to take part in this research.

NAME: ..................................................

SIGNATURE: ........................................... DATE: ..................................................

Witness’s Name: ..........................................

Witness’s Signature: ..........................................

SHAPING A HEALTHIER FUTURE

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PRINTED ON RECYCLED PAPER

Appendix 2: Patient information & consent form 235
Appendix 3
Baseline survey questionnaire

Name of patient: ............................................ Telephone: ............................................
Address: ................................................................ MRN: ............................................

1. Age: .....................

2. Gender
   Male ........................................... □ 1
   Female........................................... □ 2

3. Marital Status
   Single........................................... □ 1
   Married........................................... □ 2
   Defacto........................................... □ 3
   Separated....................................... □ 4
   Divorced........................................... □ 5
   Widowed........................................... □ 6

4. Current occupation
   ....................................................

5. Highest educational qualification attained
   Some primary........................................... □ 1
   Completed Primary............................... □ 2
   Some high school............................... □ 3
   Completed high school........................ □ 4
   (Year 12 or equivalent)
   University, C.A.E. or............ □ 5
   other tertiary institution

6. Peak creatinine kinase
   ....................................................

7. Killip class (on admission)
   No failure □ 1
   Mild to moderate failure □ 2
   Acute pulmonary oedema □ 3
   Cardiogenic shock □ 4

8. Current medications:
   ....................................................
   ....................................................
   ....................................................

9. Past medical history
   (please tick relevant boxes)
   None relevant. ............. □ 1
   Ex-smoker............................... □ 2
   Smoker........................................... □ 3
   Past history of CHD..... □ 4
   High cholesterol.............. □ 5
   Family history of CHD. □ 6
   Hypertension..................... □ 7
   Other (please specify)... □ 8
**ORIENTATION TO LIFE (OLQ)**

Here is a series of questions relating to various aspects of our lives. Each question has seven (7) possible answers. Please mark the number which expresses your answer, with numbers 1 and 7 being the extreme answers. If the words beside 1 are right for you, circle 1; if the words beside 7 are right for you, circle 7. If you feel differently, circle the number which best expresses your feeling. Please give only one answer to each question.

1. When you talk to people, do you have the feeling that they don't understand you?
   - Never have this feeling 1 2 3 4 5 6 7
   - Always have this feeling

2. In the past, when you had to do something which depended upon cooperation with others, did you have the feeling that it:
   - Surely wouldn't get done 1 2 3 4 5 6 7
   - Surely would get done

3. Think of the people with whom you come into contact daily, aside from the ones to whom you feel closest. How well do you know most of them?
   - You feel that they're strangers 1 2 3 4 5 6 7
   - You know them very well

4. Do you have the feeling that you don't really care about what goes on around you?
   - Very seldom or never 1 2 3 4 5 6 7
   - Very often

5. Has it happened in the past that you were surprised by the behaviour of people whom you thought you knew well?
   - Never happened 1 2 3 4 5 6 7
   - Always happened

6. Has it happened that people whom you counted on disappointed you?
   - Never happened 1 2 3 4 5 6 7
   - Always happened

7. Life is:
   - Full of interest 1 2 3 4 5 6 7
   - Completely routine

Appendix 3: Baseline survey questionnaire 237
Until now your life has had:

no clear goals 1 2 3 4 5 6 7 very clear goals and purpose
purpose at all

Do you have the feeling that you're being treated unfairly?

very often 1 2 3 4 5 6 7 very seldom or never

In the past ten years your life has been:

full of changes completely consistent and
without your clear
knowing what will
happen next

Most of the things you do in the future will probably be:

completely deadly
fascinating 1 2 3 4 5 6 7 boring

Do you have the feeling that you are in an unfamiliar situation and don't know what to do?

very often 1 2 3 4 5 6 7 very seldom or never

What best describes how you see life:

one can always find a solution there is no
to painful things solution to
in life painful things
in life

When you think about your life, you very often:

feel how good it is to be alive 1 2 3 4 5 6 7 ask yourself why you exist at all

When you face a difficult problem, the choice of a solution is:

always confusing and hard to find 1 2 3 4 5 6 7 always complete clear
16. Doing the things you do every day is:
   a source of deep pleasure and satisfaction
   a source of pain and boredom

   1 2 3 4 5 6 7

17. Your life in the future will probably be:
   full of changes without your knowing what will happen next
   completely consistent and clear

   1 2 3 4 5 6 7

18. When something unpleasant happened in the past your tendency was:
   “to eat yourself up” about it
   to say “ok, that’s that, I have to live with it,” and go on

   1 2 3 4 5 6 7

19. Do you have very mixed-up feelings and ideas?
   very often
   very seldom or never

   1 2 3 4 5 6 7

20. When you do something that gives you a good feeling:
   it’s certain that you’ll go on feeling good
   it’s certain that something will happen to spoil the feeling

   1 2 3 4 5 6 7

21. Does it happen that you have feelings inside you would rather not feel?
   very often
   very seldom or never

   1 2 3 4 5 6 7

22. You anticipate that your personal life in the future will be:
   totally without meaning or purpose
   full of meaning and purpose

   1 2 3 4 5 6 7

23. Do you think that there will always be people whom you’ll be able to count on in the future?
   You’re certain there will be
   you doubt there will be

   1 2 3 4 5 6 7
24. Does it happen that you have the feeling that you don't know exactly what's about to happen?

very often 1 2 3 4 5 6 7 very seldom or never

25. Many people, even those with a strong character, sometimes feel like losers in certain situations. How often have you felt this way in the past?

never 1 2 3 4 5 6 7 very often

26. When something happened, have you generally found that:

you overestimated or underestimated its importance 1 2 3 4 5 6 7 you saw things in the right proportion

27. When you think of difficulties you are likely to face in important aspects of your life, do you have the feeling that:

you will always succeed in overcoming the difficulties 1 2 3 4 5 6 7 you won't succeed in overcoming the difficulties

28. How often do you have the feeling that there's little meaning in the things you do in your daily life?

very often 1 2 3 4 5 6 7 very seldom or never

29. How often do you have feelings that you're not sure you can keep under control?

very often 1 2 3 4 5 6 7 very seldom or never
Life Orientation Test (LOT-R)

Instructions:
Please indicate the extent of your agreement using the following scale. Be as honest as you can throughout, and try not to let your response to one question influence your response to other questions. There are no right or wrong answers.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In uncertain times, I usually expect the best.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. It's easy for me to relax.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. If something can go wrong for me, it will.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. I'm always optimistic about my future.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. I enjoy my friends a lot.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. It's important for me to keep busy.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. I hardly ever expect things to go my way.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. I don't get upset too easily.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. I rarely count on good things happening to me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10. Overall, I expect more good things to happen to me than bad.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Perceived Stress Scale (PSS)

Instructions:
The questions in this scale ask you about your feelings and thoughts during the last month. In each case, please indicate how often you felt or thought a certain way.

<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>Almost never</th>
<th>Sometimes</th>
<th>Fairly often</th>
<th>Very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In the last month, how often have you been upset because of something that happened unexpectedly?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. In the last month, how often have you felt that you were unable to control the important things in your life?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. In the last month, how often have you felt nervous and “stressed”?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. In the last month, how often have you felt confident about your ability to handle your personal problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. In the last month, how often have you felt that things were going your way?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. In the last month, how often have you found that you could not cope with all the things that you had to do?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. In the last month, how often have you been able to control irritations in your life?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. In the last month, how often have you felt that you were on top of things?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. In the last month, how often have you been angered because of things that were outside of your control?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
**Perceived Social Support Scale (MSPSS)**

**Instructions:**

*Please indicate how you feel about the following statements.*

<table>
<thead>
<tr>
<th></th>
<th>Very strongly disagree</th>
<th>Strongly disagree</th>
<th>Mildly disagree</th>
<th>Neutral</th>
<th>Mildly agree</th>
<th>Strongly agree</th>
<th>Very strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There is a special person who is around when I am in need.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>2. There is a special person with whom I can share joys and sorrows.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3. My family really tries to help me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>4. I get the emotional help and support I need from my family.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>5. I have a special person who is a real source of comfort to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>6. My friends really try to help me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>7. I can count on my friends when things go wrong.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8. I can talk about my problems with my family.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>9. I have friends with whom I can share my joys and sorrows.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>10. There is a special person in my life who cares about my feelings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>11. My family is willing to help me make decisions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>12. I can talk about my problems with my friends.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
Exercise

Questions 1 to 4 are about the exercise you had during the PAST 2 WEEKS;
• For recreation, sport or health-fitness purposes,
• As part of your tasks at work and around the house.
Please distinguish between vigorous exercise which made you breathe harder or puff and pant, and less vigorous exercise.

RECREATION, SPORT OR HEALTH-FITNESS

1. In the PAST 2 WEEKS, did you engage in vigorous exercise - exercise which made you breathe harder or puff and pant? (e.g. vigorous sports such as football, netball, tennis, squash, athletics, jogging or running; keep fit exercises; vigorous swimming; etc.)
   No ............  □ 1
   Yes ............ □ 2

   If yes, how many sessions of vigorous exercise did you have over the 2 week period?
   ................................

   Please estimate the TOTAL TIME spent exercising vigorously during the PAST 2 WEEKS.
   _______ / _______
   hours   minutes

2. In the PAST 2 WEEKS, did you engage in less vigorous exercise for recreation, sport or health-fitness purposes which did not make you breathe harder or puff and pant?
   No ............  □ 1
   Yes ............ □ 2

   If yes, how many sessions of less vigorous exercise did you have over the 2 week period?
   ................................

3. In the PAST 2 WEEKS, did you walk for recreation or exercise?
   No ............  □ 1
   Yes ............ □ 2

   If yes, how many times? ........................................
VIGOROUS TASKS AT WORK AND AROUND THE HOUSE (Paid or unpaid work)

4. In the PAST 2 WEEKS, did you engage in vigorous activity, apart from exercise, which made you breathe harder or puff and pant? (e.g. carrying loads, heavy gardening, chopping wood, labouring - at home, during employment or anywhere else.)

No ............. ☐ 1
Yes ............. ☐ 2

If yes, how many sessions of these types of vigorous activity did you have over the 2 week period?

........................................

Please estimate the TOTAL TIME spent in these types of vigorous activity during the PAST 2 WEEKS.

_____________ / ____________
hours    minutes

Smoking

5. Have you ever smoked cigarettes, cigars or a pipe regularly?

Yes ............. ☐ 1
No ............. ☐ 2  → Go to Question 9

6. At what age did you start smoking regularly?
I started smoking regularly at ______ years of age.

7. Have you given up smoking?
Yes, I gave up smoking in ______ / 19 _____  → Go to Question 9

month  year

No, I still smoke ☐

If you CURRENTLY SMOKE please answer this question.

8. I currently smoke ______ manufactured cigarettes a day
   ______ grams “hand-rolled” cigarette tobacco per week
   ______ cigars per week
   ______ grams pipe tobacco per week

*NOTE: A 1¼ ounce pouch of cigarette tobacco equals 50 grams.
9. **Body Mass Index**

Your present height is ..................................................

Your present weight is ..................................................

10. Do you believe your present lifestyle is healthy?

Yes ............ □ 1

No ............ □ 2
### 17-item Short Fat Questionnaire (SFQ)

*Please tick (✓) only one number for each question. Tick the number which applies to your diet.*

1. **How often do you eat fried food with a batter or breadcrumb coating?**
   - Six or more times a week: 4
   - Three to five times a week: 3
   - Once or twice a week: 2
   - Less than once a week: 1
   - Never: 0

2. **How often do you eat gravy, cream sauces or cheese sauces?**
   - Six or more times a week: 4
   - Three to five times a week: 3
   - Once or twice a week: 2
   - Less than once a week: 1
   - Never: 0

3. **How often do you add butter, margarine, oil or sour cream to vegetables, cooked rice or spaghetti?**
   - Six or more times a week: 4
   - Three to five times a week: 3
   - Once or twice a week: 2
   - Less than once a week: 1
   - Never: 0

4. **How often do you eat vegetables that are fried or roasted with fat or oil?**
   - Six or more times a week: 4
   - Three to five times a week: 3
   - Once or twice a week: 2
   - Less than once a week: 1
   - Never: 0

5. **How is your meat usually cooked?**
   - Fried: 4
   - Stewed or goulash: 3
   - Grilled or roasted with added oil or fat: 2
   - Grilled or roasted without added oil or fat: 1
   - Eat meat occasionally or never: 0

6. **How many times a week do you eat sausages, devon, salamis, meat pies, hamburgers or bacon?**
   - Six or more times a week: 4
   - Three to five times a week: 3
   - Once or twice a week: 2
   - Less than once a week: 1
   - Never: 0
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
<th>Count</th>
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</thead>
<tbody>
<tr>
<td>7 How do you spread butter/margarine on your bread?</td>
<td>Thickly</td>
<td>3</td>
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<td></td>
<td>Medium</td>
<td>2</td>
</tr>
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<td></td>
<td>Thinly</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Don't use butter or margarine</td>
<td>0</td>
</tr>
<tr>
<td>8 How many times a week do you eat chips or French fries?</td>
<td>Six or more times a week</td>
<td>4</td>
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<td></td>
<td>Three to five times a week</td>
<td>3</td>
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<td></td>
<td>Once or twice a week</td>
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<td></td>
<td>Less than once a week</td>
<td>1</td>
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<td></td>
<td>Never</td>
<td>0</td>
</tr>
<tr>
<td>9 How often do you eat pastries, cakes, sweet biscuits or croissants?</td>
<td>Six or more times a week</td>
<td>4</td>
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<td></td>
<td>Three to five times a week</td>
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<td>Less than once a week</td>
<td>1</td>
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<td></td>
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<td></td>
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<td></td>
<td>Once or twice a week</td>
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<td></td>
<td>Less than once a week</td>
<td>1</td>
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<td></td>
<td>Never</td>
<td>0</td>
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<td>11 How many times a week do you eat potato crisps, corn chips or nuts?</td>
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<td></td>
<td>Three to five times a week</td>
<td>3</td>
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<td></td>
<td>Never</td>
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<tr>
<td>12 How often do you eat cream?</td>
<td>Six or more times a week</td>
<td>4</td>
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<td></td>
<td>Three to five times a week</td>
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<td>Once or twice a week</td>
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<td>Less than once a week</td>
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<td></td>
<td>Never</td>
<td>0</td>
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<tr>
<td>13 How often do you eat ice cream?</td>
<td>Six or more times a week</td>
<td>4</td>
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<td></td>
<td>Three to five times a week</td>
<td>3</td>
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<td></td>
<td>Once or twice a week</td>
<td>2</td>
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<td></td>
<td>Less than once a week</td>
<td>1</td>
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<td></td>
<td>Never</td>
<td>0</td>
</tr>
<tr>
<td>14 How many times a week do you eat cheddar, edam or other hard cheese, cream cheese or cheese like camembert?</td>
<td>Six or more times a week</td>
<td>4</td>
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<td></td>
<td>Three to five times a week</td>
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<td></td>
<td>Once or twice a week</td>
<td>2</td>
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<td></td>
<td>Less than once a week</td>
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<td></td>
<td>Never</td>
<td>0</td>
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<td>15</td>
<td>What type of milk do you drink or use in cooking or tea and coffee?</td>
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<td>----</td>
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<tr>
<td></td>
<td>Condensed</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Full-cream</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Full-cream and reduced fat</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Reduced fat</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Skim or none</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>16</th>
<th>How much of the skin on your chicken do you eat?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Most or all of the skin</td>
</tr>
<tr>
<td></td>
<td>Some of the skin</td>
</tr>
<tr>
<td></td>
<td>None of the skin/ I am a vegetarian</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17</th>
<th>How much of the fat on your meat do you eat?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Most or all of the fat</td>
</tr>
<tr>
<td></td>
<td>Some of the fat</td>
</tr>
<tr>
<td></td>
<td>None of the fat/ I am a vegetarian</td>
</tr>
</tbody>
</table>
Appendix 4
6-month follow-up survey

*Code number: ********

*Please tick ✓ in the bracket ( ) where appropriate.*

1. Did you receive any information about adopting a healthier lifestyle whilst in hospital with your first heart attack?
   
   Yes [ ]
   No [ ]
   If no, please go to question 3

2. How helpful was the information you received? *(Please circle your response)*
   
   1  2  3  4  5
   not helpful  very helpful

3. Since your first admission to Coronary Care Unit (CCU) with your first heart attack, did you attend an outpatient cardiac rehabilitation program?
   
   Yes ( )
   No ( )
   If no, please give reasons:

4. Which of the following best describes your perception about your current state of health. *(Please tick one answer only).*
   
   ( ) I feel healthier now compared to about 6 months ago *(ie just before my first heart attack)*
   ( ) I feel my health is worse now compared to about 6 months ago. *(ie. just before my first heart attack)*
   ( ) I feel my health is about the same now compared to about 6 months ago *(ie. just before my first heart attack)*

5. Do you feel that you have made significant lifestyle changes since your initial admission to hospital with chest pain?
   
   Yes ( )
   No ( )
Perceived Stress Scale (PSS)

Instructions:
The questions in this scale ask your about your feelings and thoughts during the last month. In each case, please indicate how often you felt or thought a certain way.

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Almost never</th>
<th>Sometimes</th>
<th>Fairly often</th>
<th>Very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In the last month, how often have you been upset because of something that happened unexpectedly?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. In the last month, how often have you felt that you were unable to control the important things in your life?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. In the last month, how often have you felt nervous and &quot;stressed&quot;?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. In the last month, how often have you felt confident about your ability to handle your personal problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. In the last month, how often have you felt that things were going your way?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. In the last month, how often have you found that you could not cope with all the things that you had to do?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. In the last month, how often have you been able to control irritations in your life?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. In the last month, how often have you felt that you were on top of things?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. In the last month, how often have you been angered because of things that were outside of your control?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Exercise

Questions 1 to 4 are about the exercise you had during the PAST 2 WEEKS;
- For recreation, sport or health-fitness purposes,
- As part of your tasks at work and around the house.
Please distinguish between vigorous exercise which made you breathe harder or puff and pant, and less vigorous exercise.

RECREATION, SPORT OR HEALTH-FITNESS

1. In the PAST 2 WEEKS, did you engage in vigorous exercise - exercise which made you breathe harder or puff and pant? (eg. vigorous sports such as football, netball, tennis, squash, athletics, jogging or running; keep fit exercises; vigorous swimming; etc.)
   No ............ 1
   Yes ............ 2
   If yes, how many sessions of vigorous exercise did you have over the 2 week period?
   ........................................
   Please estimate the TOTAL TIME spent exercising vigorously during the PAST 2 WEEKS.
   ______ / ______
   hours minutes

2. In the PAST 2 WEEKS, did you engage in less vigorous exercise for recreation, sport or health-fitness purposes which did not make you breathe harder or puff and pant?
   No ............ 1
   Yes ............ 2
   If yes, how many sessions of less vigorous exercise did you have over the 2 week period?
   ........................................

3. In the PAST 2 WEEKS, did you walk for recreation or exercise?
   No ............ 1
   Yes ............ 2
   If yes, how many times? ........................................
VIGOROUS TASK AT WORK AND AROUND THE HOUSE (Paid or unpaid work)

4. In the PAST 2 WEEKS, did you engage in vigorous activity, apart from exercise, which made you breathe harder or puff and pant? (e.g. carrying loads, heavy gardening, chopping wood, labouring - at home, during employment or anywhere else.)

   No ............ 1
   Yes ............ 2

If yes, how many sessions of these types of vigorous activity did you have over the 2 week period?

   ................................................................
   Please estimate the TOTAL TIME spent in these types of vigorous activity during the PAST 2 WEEKS. __________ / __________
   hours    minutes

Smoking

5. Have you ever smoked cigarettes, cigars or a pipe regularly?

   Yes ............ 1
   No ............ 2  \(\rightarrow \text{Go to Question 9}\)

6. At what age did you start smoking regularly?
   I started smoking regularly at _______ years of age.

7. Have you given up smoking?
   (a) Yes, I gave up smoking in _____ / 19____  \(\rightarrow \text{Go to Question 9}\)

   (b) No, I still smoke

If you CURRENTLY SMOKE please answer this question.

8. I currently smoke _______ manufactured cigarettes a day

   _____ grams “hand-rolled” cigarette tobacco per week

   _____ cigars per week

   _____ grams pipe tobacco per week

*NOTE: A 1¼ ounce pouch of cigarette tobacco equals 50 grams.*
9. **Body Mass Index**

Your present height is ....................................................

Your present weight is ....................................................

10. **Do you believe your present lifestyle is healthy?**

No ............ 1

Yes ............ 2

11. **Are you prescribed any medication which is to be taken regularly?**

No ............ 1

Yes ............ 2

If yes, do you take these medications?

Strictly as ordered by the doctor 3

Occasionally miss some dosages 2

Often miss some dosages 1
17-item Short Fat Questionnaire (SFQ)

Please tick (✓) only one number for each question. Tick the number which applies to your diet.

1. How often do you eat fried food with a batter or breadcrumb coating?
   - Six or more times a week 4
   - Three to five times a week 3
   - Once or twice a week 2
   - Less than once a week 1
   - Never 0

2. How often do you eat gravy, cream sauces or cheese sauces?
   - Six or more times a week 4
   - Three to five times a week 3
   - Once or twice a week 2
   - Less than once a week 1
   - Never 0

3. How often do you add butter, margarine, oil or sour cream to vegetables, cooked rice or spaghetti?
   - Six or more times a week 4
   - Three to five times a week 3
   - Once or twice a week 2
   - Less than once a week 1
   - Never 0

4. How often do you eat vegetables that are fried or roasted with fat or oil?
   - Six or more times a week 4
   - Three to five times a week 3
   - Once or twice a week 2
   - Less than once a week 1
   - Never 0

5. How is your meat usually cooked?
   - Fried 4
   - Stewed or goulash 3
   - Grilled or roasted with added oil or fat 2
   - Grilled or roasted without added oil or fat 1
   - Eat meat occasionally or never 0

6. How many times a week do you eat sausages, devon, salamis, meat pies, hamburgers or bacon?
   - Six or more times a week 4
   - Three to five times a week 3
   - Once or twice a week 2
   - Less than once a week 1
   - Never 0
<table>
<thead>
<tr>
<th>Question</th>
<th>Option</th>
<th>Count</th>
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</tr>
<tr>
<td></td>
<td>Medium</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Thinly</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Don’t use butter or margarine</td>
<td>0</td>
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<td></td>
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<td>1</td>
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<tr>
<td></td>
<td>Never</td>
<td>0</td>
</tr>
</tbody>
</table>
15 What type of milk do you drink or use in cooking or tea and coffee?
   Condensed  4
   Full-cream  3
   Full-cream and reduced fat  2
   Reduced fat  1
   Skim or none  0

16 How much of the skin on your chicken do you eat?
   Most or all of the skin  2
   Some of the skin  1
   None of the skin/ I am a vegetarian  0

17 How much of the fat on your meat do you eat?
   Most or all of the fat  2
   Some of the fat  1
   None of the fat/ I am a vegetarian  0
Appendix 5
Permission for use of standardised instruments

A5.1 Blumenthal's perceived social support scale

---

blume003@mc.duke.edu, 11:09 AM 6/10/96, Re: Permission to use the revl

From: blume003@mc.duke.edu
Date: Sun, 06 Oct 1996 11:09 -0400 (EDT)
Subject: Re: Permission to use the revised 12-item scale (Perceived S
To: y.salamonson@uws.edu.au
X-UIDL: 844635126.000

I am happy for you to use our Perceived Social Support Scale for your
research. Please consider this email as your permission. Also, I'd
appreciate your sending me a copy of results once your project is
completed. Good luck! Dr. James Blumenthal

---

Appendix 5: Permission to use standardised instruments
A5.2  Cohen's perceived stress scale

Carnegie Mellon University

Department of Psychology
Pittsburgh, PA 15213
Telephone: (412) 268-2336
Fax: (412) 268-3294

November 11, 1996

Yenna Salamonson
Lecturer
Faculty of Health
University of Western Sydney Macarthur
P.O. Box 555
Campbelltown 2560
AUSTRALIA

Dear Yenna Salamonson:

You have my permission to use the PSS in your study. I'd appreciate your letting me know how the work turns out. Good luck.

Sincerely,

[Blacked out]

Sheldon Cohen
Professor

SC/sk
A5.3 Dobson's 17-item short fat questionnaire

Annette Dobson, 11:32 AM 29/11/9, Re: Permission to use the Shor

Date: Fri, 29 Nov 1996 11:32:54 +1100
Date-warning: Date header was inserted by cc.newcastle.edu.au
From: Annette Dobson <stmonicaad@cc.newcastle.edu.au>
Subject: Re: Permission to use the Short fat questionnaire
X-Sender: stmonicaad@cc.newcastle.edu.au
To: y.salamonson@uws.edu.au (Yenna Salamonson)
X-UIDL: 849232366.000

Yes of course you may use it. Good luck with your project.
    Annette
A5.4 *Life Orientation Test-Revised*

Carnegie Mellon University

Department of Psychology
Carnegie Mellon University
Pittsburgh, Pennsylvania 15213-3890
Phone: (412) 268-3791
FAX: (412) 268-7810
Internet: msh@sandrew.cmu.edu

October 14, 1996

Yenna Salamonson RN, Lecturer
Division of Nursing
Faculty of Health
University of Western Sydney MacArthur
P.O. Box 555
Campbelltown 2560
New South Wales, Australia

Dear Yenna Salamonson:

Permission to use the Life Orientation Test (LOT) or its revision, the Life Orientation Test-Revised (LOT-R), for research purposes is hereby granted. If you publish any research using the scales, I'd like to receive a copy of the published work for my files. Thanks in advance for this courtesy.

Good luck with your project.

Sincerely,

Michael F. Scheier, Ph.D.
Professor of Psychology
A5.5 Email about questionnaire used to measure dimensions of the Health Belief Model

---

Brian Haynes, 05:58 PM 27/02/9, Re: Request for a copy of Stan

X-Sender: bhaynes@fhs.mcmaster.ca
Date: Thu, 27 Feb 1997 17:58:04 -0500
To: y.salamonson@uws.edu.au (Yenna Salamonson)
From: Brian Haynes <bhaynes@fhs.csu.McMaster.CA>
Subject: Re: Request for a copy of Standardized Compliance Questionnaire and permission to use the instrument
X-UIDL: 857089815.009

Thanks for your note. The standardized questionnaire was offered over 20 years ago in the hope that it would move the field forward. The q'aire was never assessed for reliability and validity and we don't advise using it. I don't believe that I could even find a copy.

Sorry, and good luck on your work!