FACTORS AFFECTING EXERCISE ADHERENCE IN NON-INSULIN DEPENDENT DIABETES MELLITUS SUFFERERS

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MAX W. SIMMONS

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

ABSTRACT

Persons with Non-Insulin Dependent Diabetes Mellitus (NIDDM) are usually middle aged, overweight and sedentary, and are unlikely to tolerate vigorous exercise regimes. Although there is evidence that moderate to vigorous physical activity may reduce blood-glucose and increase insulin sensitivity, research studies on physical fitness programmes designed for patients suffering from diabetes have often found a lack of adherence to the exercise prescription and subsequently, poor maintenance.

This thesis reports the results of a randomised trial of a home-based exercise program using behavioural self-management principles compared to a no-treatment control group. It also tests hypotheses concerned with the factors which may influence exercise adherence in Type II diabetes patients, and which are derived from research and theory on relapse prevention.

Thirty-one participants who had been cleared by their own medical practitioner for exercise, were systematically assigned to either a home-based exercise program or a no-treatment control group for twelve weeks. It was found that overall, most participants were informed about exercise and the diabetes condition, and despite the range of cardiovascular symptoms, many of them took some form of regular exercise.

Pre- and post-tests included physiological, psychological and psychosocial variables. The home-based exercise group showed

significant increases in exercise frequency and significant decreases in body mass index, but contrary to expectations, estimated caloric expenditures and exercise session durations were not significantly different from those reported by the control group. Stepwise regression analysis of psychosocial variables (General Health Questionnaire, Psychosocial Adjustment scale and Profile of Moods States) predicted adherence to the exercise program; while the variables suggested by the Relapse Prevention model, ie. outcome expectancies of exercise and self-efficacy, as well as the self-motivation variable, predicted estimated caloric expenditure. These findings suggest that health professionals and diabetes educators may promote improved adherence to diabetes regimes by thorough attention to patients' psychological characteristics and lifestyle satisfaction. Activities which increase psychological well-being and self-efficacy, as well as education designed to inform the patient about the expected effects and outcomes the regimes prescribed, are also important.

DECLARATION

I certify that this thesis does not incorporate, without acknowledgment, any material previously submitted for the award of any other degree or diploma in any University; and that to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where due reference is made in the text of the thesis.

If accepted for the award of the degree, I consent to this thesis being made available for photocopying and loan if applicable.

Signed

Max W.Simmons

27.12.89.

Date

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OVERVIEW

The issues that confront the diabetes educators and health professionals in addressing adherence related problems both in Type I (Insulin dependent diabetes mellitus (IDDM)) and Type II, (Non-insulin dependent diabetes mellitus (NIDDM)) are complex. Although cognitive-behavioural psychology is not the only relevant conceptual framework, it has been convincingly argued by Owen and Lee (1986) that sound scientific principles are mandatory if health professionals are to improve adherence to healthier lifestyle behaviour. In relation to diabetes, Dunn and Turtle (1987) have called for the development of a more rigorous scientific approach by diabetes researchers attempting to understand and improve adherence by diabetes sufferers to therapeutic management regimes. Cognitive-behavioural psychology is a conceptual framework based upon these attributes.

This thesis is primarily concerned with an investigation of exercise adoption and maintenance in Type II diabetes mellitus sufferers.

The aim is to examine, in the context of current biopsychosocial literature, the determinants of exercise maintenance in the therapeutic management of Type II diabetes mellitus and to suggest procedures which may promote exercise adherence in this group. The theoretical framework attempts to integrate a biopsychosocial approach, suggested by Engel (1980), which involves the examination of the more important contributions made by current psychological theory

towards the understanding of exercise adoption and maintenance and the bioclinical management of the disease. The main theoretical foundation of the present study is suggested by the Relapse Prevention model recently developed by Marlatt and Gordon (1980,1985) which has been used recently in the interpretation of problems of behaviour change, specifically lapse and relapse processes in addictive disorders.

Through the application of bibliotherapy (in the form of a home-based exercise program) as a possible vehicle for the cost-effective delivery of appropriate exercise systems, the study examines the biopsychosocial process and outcomes as a result of an introduction of a self-managed exercise program and explores a range of variables relevant to the understanding of the determinants of exercise adherence within this particular diabetes population.

Chapters 1 and 2 present summaries of the current literature in the therapeutic management of Type II diabetes mellitus; current theoretical psychological developments with respect to exercise adoption and maintenance; and recent developments in home-based exercise delivery systems.

Chapter 1 sets out to briefly describe the nature of Type II, or, non-insulin dependent diabetes mellitus, its incidence and the measures currently adopted in the management of the disease. Included in this section is an explanation of the role of weight reduction in the disease management, and a selection of studies are reviewed which confirm weight reduction as the primary strategy in the management of the disease. Next, the role of physical activity on cardiovascular

and metabolic improvement is briefly examined. Research has shown that vigorous, physical aerobic activity leads to complex changes in HDL-cholesterol and triglyceride concentrations and may also contribute toward improvement in the sensitivity of various oxidative muscle mechanisms or processes, to insulin. Following this mainly biomedical examination of physical activity, the section focuses on the risks and potential benefits of physical activity with an emphasis directed towards an understanding of the impact of moderate to vigorous exercise on the particular age grouping most affected by the disease, ie. the mid-forties onward. The chapter concludes with a brief resume of two current controversies that surround the management of the disease and which impinge on this study; firstly, the role of exercise - primary or secondary prevention? and secondly, the role of education in the advancement of regime compliance and adherence in Type II diabetes mellitus.

Chapter 2 steps outside the immediate biomedical domain of Type II diabetes and examines, from a psychological perspective, the difficulties surrounding exercise adoption and maintenance. The role of psychological theory in contributing to an understanding of exercise adherence is discussed with reference to clinical and non-clinical populations. Recent developments in adherence research have shown certain personal characteristics as more or less useful in predicting who will, and who will not, maintain an exercise program. These contributions are assessed. The chapter continues with a full examination of specific sections of the relapse prevention model

developed by Marlatt and Gordon (1980, 1985) which is used in the present study as a framework for understanding behaviour-change programs and problems of exercise adherence. This model offers direction and guidance in understanding those factors contributing to maintenance of behaviour change. The relapse prevention model may also provide a framework from which to develop strategies to assist exercise maintenance enhancement programs, specifically in providing an understanding of lapse/relapse of exercise behaviours in the face of those high-risk situations, a daily hazard for many late middle-aged Type II diabetes sufferers.

Chapter 2 concludes with an examination of the impact of bibliotherapy, or self-instructional material in the adoption of exercise and physical activity programs. The section contains a review of a number of self-managed exercise programs and discusses the potential contribution of one particular home-based program utilizing behavioural self-managed principles. The particular program under review has already been developed and tested with healthy adults, but is designed to be suitable for sedentary people. This self-managed exercise program forms the basis of the intervention in the study.

Chapter 3 sets out the overall research plan and the major research questions which are to be addressed.

Chapter 4 describes, in detail, the methodology of the research; design, participant selection, allocation to the experimental and control conditions, and the various assessment procedures intended to elicit the required information. Both physiological and psychological

information was collected from all participants, and the criteria used to determine the extent of active participation in the exercise program are discussed.

Chapters 5, 6, 7, & 8 examine the data from the research program. **Chapter 5** examines the collected survey data and presents an analysis of the factors which may influence the adoption of physical activity within the targeted population. **Chapter 6** examines the effects of the intervention, and analyses the results of the self-managed exercise intervention program with particular reference to the physical activity levels of the participants.

In **Chapter 7**, a further analysis of the data is presented in which possible predictors of physical activity adherence are examined. Psychological theorists have argued that programs should be tailor-made to fit the prevailing characteristics of the target population and thus, if potential exercise adherents as well as potential exercise lapsers can be identified, a more focused approach in which individuals exhibiting low exercise potential may be detected and specific programs developed to take cognizance of their particular attributes. In **Chapter 8**, data associated with the specific high-risk situations which confronted the participants in this study are analysed using concepts from the Marlatt and Gordon (1980,1985), relapse prevention model. Finally, **Chapter 9** concludes the study with an examination of the impact of the self-managed exercise program and discusses the implications of those variables which were shown to predict caloric expenditure and the variable measuring exercise

adherence. The chapter continues with an examination of the threats to validity; expectancy bias, selection bias and issues regarding construct validity. Finally, the chapter draws together the threads, sums up the study and suggests areas for further research.

CHAPTER 1

TYPE II DIABETES AND THE ROLE OF EXERCISE

1. 1. INTRODUCTION

In considering the role of exercise in the management of diabetes II, so that educators and health professionals might be able to make more informed decisions about is place in the management of the disease, several lines of evidence are relevant. Reviewing material concerning the nature of the disorder and its complications in Australia, and more particularly the role of obesity in its manifestation, is historically coupled with the natural expectation that weight-loss and exercise must be important in its control. However, the literature does not fully support this expectation, nor the expectation that exercise would improve a sense of physiological well-being, so an analysis of the risk-benefit ratio of exercise in the management protocols needs to be undertaken. This raises, as will be addressed in the next chapter, the issue of adherence with respect to patients´ adopting and maintaining an exercise routine.

1. 2. THE NATURE OF TYPE II DIABETES MELLITUS

It has been claimed that the major causes of morbidity and mortality in adults in developed countries appear to be linked with their lifestyle (Zimmet, King, & Bjorntorp, 1987). It has been suggested that relatively simple changes leading to a healthier

lifestyle would alleviate the prevalence of the major non-communicable diseases (obesity, hypertension and diabetes mellitus), and in doing so, reduce what are believed to be the major risk factors for the other non-communicable diseases such as peripheral vascular disease, coronary heart disease, and stroke.

Diabetes mellitus is a chronic disease which is rapidly becoming one of the world's and, indeed, one of Australia's major public-health problems. It is a common cause of both premature death and major morbidity including retinopathy, renal failure, neuropathy and of premature, accelerated atherosclerotic vascular disease (Pohl, Gonder-Frederick, & Cox, 1984). Diabetes can lead to gangrene of the lower limbs, heart attacks and strokes (Cunningham, 1987). Diabetes sufferers are twenty-five times more susceptible to blindness, seventeen times more susceptible to kidney disease, and five times more susceptible to gangrene and limb amputation than are people who do not suffer from this disease (Crofford, 1975). The incidence of diabetes mellitus in Australia is estimated to be 42,000 new cases per year, with a projected fifty per cent increase each fifteen years (Australian Diabetes Foundation, 1986).

Diabetes is a heterogeneous disease characterized by a deficiency in insulin causing an abnormal fuel-hormone response with decreased storage and conversion of fuels and which leads to increased blood levels of glucose, free fatty-acids and ketones. This anomalous response may have a number of possible contributors: (i) a dysfunction in the insulin secretory mechanism of the beta cells of the pancreas;

(ii) a defect either in the insulin receptor site on the membranes of cells in the liver or of adipose and muscle tissue; or (iii) a metabolic deficiency within these cells. It is postulated that these latter metabolic abnormalities are also the prime conditions which lead to vascular complications in diabetes patients (Cunningham, 1987).

Approximately 80-90 per cent of diabetes sufferers in Australia are characterised as Type II (Australian Diabetes Foundation, 1986). This condition, characteristically, has a gradual onset usually after the age of 40, but it can occur at any age. Unlike Type I diabetes sufferers, ie. Insulin Dependent Diabetes Mellitus (IDDM), Type II patients are not dependent on exogenous insulin to maintain life. Symptoms are usually mild or absent and diabetic control is achieved by diet or a combination of diet and oral hypoglycaemic agents.

Obesity is a major correlate of Type II diabetes: approximately ninety per cent of persons with the disease have excess body fat (Cantu, 1987) and the risk of Type II diabetes is particularly high among obese persons with a family history of the disorder (Knowler, Bennett, Pettit, & Savage, 1981; Wing, Epstein, Nowalk, Scott, & Gooding, 1987). Whereas obesity is not always associated with the development of diabetes, obesity is claimed to precipitate the disease in certain high-risk subgroups (Zimmet, King, & Bjorntorp, 1987) and although research with cross-sectional population-based studies has shown that the prevalence of Type II increases with increasing body weight, it has also been shown that the influence of obesity as a risk

factor varies among different populations and between sexes within a population (Zimmet et al. 1987). Being overweight or obese for males and females between the ages of 25 to 60 has been shown to be related to increased risk of diabetes (Hundley, 1956), while recent studies discussed by Zimmet et al. (1987) reveal an association between diabetes and android obesity (excess fat in the upper part of the body), cardiovascular disease in both sexes, and risk of stroke in males.

1. 3. THE MANAGEMENT OF TYPE II DIABETES MELLITUS

1. 3.1. Weight Reduction

The therapeutic objective in the management of Type II diabetes mellitus is twofold: the normalization (lowering) of blood glucose, and the stabilization of lipid levels believed necessary to diminish the risks associated with vascular complications (National Institute of Health Consensus Development Conference Statement 1986). The American Diabetes Associations' Physicians Guide to Type II Diabetes (NIDDM), (1984) states that diet and exercise should be the primary components of the treatment of NIDDM patients, and that only after behavioural management has failed to produce anticipated outcomes should oral hyperglycaemic medication be recommended (Hartwell, Kaplan, & Wallace, 1986).

Traditionally, weight reduction has been considered the most effective treatment for Type II diabetes. The positive short-term effects of weight loss have been well documented: weight reduction

lowers blood glucose levels (Doar, Wilde, Thompson, & Sewell, 1975; Olefsky, Reaven, & Farquhar, 1974), improves insulin sensitivity (Doar et al. 1975; Olefsky et al. 1974), and may increase insulin secretion (Stanik & Marcus, 1980). Additionally, weight reduction may decrease the hypertension and hyperlipaemia often associated with diabetes (Brownell & Stunkard, 1981; Olefsky et al. 1974). Wing, Epstein, Nowalk, Koeski, and Haag (1985), in a program which compared the short- and long-term effectiveness of a behaviourally-based weight control program to both a nutrition education and a standard medical care condition, evaluated the effects of a weight loss program on glucose tolerance. They showed short-term, but not long-term, benefits.

Karem (1982) has argued convincingly that the reduced tissue sensitivity to insulin associated with NIDDM can be reversed by weight reduction and an accompanying improvement in carbohydrate tolerance. Karem's argument is supported by the National Institutes of Health Consensus Development Conference (1986) which, in a recent position paper, asserted that weight loss in the obese diabetic, as in the obese non-diabetic, ameliorates insulin resistance which leads to an improvement in carbohydrate tolerance.

1. 3.2. Physical Activity

Generally, it has been observed that improvement in physical and mental health are possible outcomes of increased physical activity. Relatively low levels of regular physical activity are associated with

a decline in cardiovascular morbidity and mortality of seemingly healthy, and also high-risk persons, within the clinical population (Martin & Dubbert,1985). Increases in caloric expenditure have been associated with beneficial changes in maximal oxygen uptake and body fatness, HDL-cholesterol and triglyceride concentrations (Blair et al. 1985). The physiological and biochemical effects of regular exercise include decreased levels of serum triglycerides, increased levels of high-density lipoprotein (HDL) cholesterol, a lowering of resting blood pressure, improved peripheral circulatory characteristics, increased oxygen transport and improved cardiac dynamics (Rowland, Witt, & Reiter, 1987). Before effective diabetes drug therapy became available in the 1920's, the effects of physical exercise on abnormal glucose tolerance had been empirically established and physical activity had been a fundamental component of diabetes therapy (Kemmer & Berger, 1983).

The metabolic changes which occur during sustained aerobic activity are complex and are not relevant, of themselves, to this study. However it should be stated that a common denominator linking body fatness, glucose tolerance and the metabolic effects of physical activity, is insulin (Rauramaa, 1984). We know that during physical activity the exercising muscle utilizes glucose (supplied from either glycogen stores in the muscle or from the blood stream) and fatty acids for energy; in non-diabetic people, the regulation of blood glucose is extremely precise, and the pancreatic regulatory system compensates by producing more insulin. This allows the circulating

blood glucose levels to remain relatively constant and brain function is not disturbed by falling blood glucose levels.

It would seem to indicate therefore that physical exercise may be beneficial at two levels: firstly, in assisting weight loss and secondly, facilitating an improvement in the sensitivity of various oxidative muscle tissue mechanisms to insulin.

The link is not as clear as that, however. Recent experimental evidence suggests that the role of exercise in Type II diabetics metabolic control may not be straightforward. Exercise had been shown to reduce blood glucose and to increase insulin sensitivity (James, Kraegen, & Chisholm, 1985; Minuk et al. 1981), although two studies in particular (Ruderman, Ganda, & Johansen, 1979; Saltin et al. 1979), have shown long-term exercise training programs not to have substantial effects on blood glucose control. Other studies have reinforced the lack of clarity in the value of moderate exercise-alone on metabolic control (Rauramaa,1984; Hartwell, Kaplan, & Wallace, 1986), and in carbohydrate, insulin and lipid metabolism among glucose-intolerant males (Lampman et al. 1987).

In recognition of this dilemma concerning the unresolved questions of metabolic control and physical exercise, the National Institute of Health Consensus Development Conference Statement (1986) reported that the effect of regular physical exercise alone on metabolic control in Type II diabetes was quite variable and frequently of small magnitude and that better improvement in glucose homeostasis could usually be obtained by weight loss. The statement

added, however, that despite the relatively small impact of exercise demonstrated to date, regular physical exercise may be an important therapeutic component, supplementing diet in selected patients. The panel concluded that the risk-benefit ratio of exercise in NIDDM remained to be defined and recommended moderate regular exercise because of evidence that exercise may help prevent heart disease - a health problem to which Type II patients were particularly susceptible.

1. 4. OTHER BENEFITS AND RISKS OF PHYSICAL ACTIVITY FOR TYPE II DIABETES SUFFERERS

1. 4.1. Psychological Benefits of Exercise

Given that there are doubts about the metabolic, but not the potential cardiovascular benefits of physical activity in Type II diabetes, how should the role of physical activity, which has had such a long history of involvement in diabetes management, be appraised? What is the evidence which points toward improved psychosocial functioning, and how should that be assessed?

There is a deficit of current literature dealing with the likely effects of exercise on the psychological coping skills of diabetes sufferers and few studies have addressed the role of exercise in the contribution towards psychological benefit, ie. the reduction in psychological morbidity in the Type II diabetes population. Generally, research has supported the anecdotal view that vigorous aerobic exercise improves psychological affect: exercise is reported to reduce

symptoms of mild-to-moderate depression (Greist et al. 1979) in non-psychotic patients; to reduce anxiety (Morgan, 1979); is reported to be associated with tension reduction (de Vries, Wiswell, Bulbulian, & Moritani, 1981); and with increased feelings of psychological well-being in non-clinical populations (Morgan, 1981).

Studies relating physical activity to psychological states in the middle-aged and older exercisers typical of the age group from which Type II diabetes patients are located, show promising results. Woods and Birren (1984) cite studies reporting that older exercisers tend to feel less anxious, less tense and less depressed, and to experience enhanced feelings of well-being when compared to non-exercisers of comparable age. Other studies confirming these outcomes show that active older people have a more positive self-image, report increased resilience and a greater ability to cope with stress and tension, have a more positive attitudes toward work, and overall, feel in better health than inactive people of comparable age (Heinzelman, & Bagley, 1970; Sidney, & Shepherd, 1977).

Other researchers have failed to provide support for the hypotheses that exercise promotes improved psychological well-being in the older adult (Hughes, Casal, & Leon, 1986; Blumenthal, Schocken, Needels, & Hindle, 1982) and the picture, thus, is far from clear. Some of those studies reporting anxiolytic effects of exercise which fail to find statistically significant decreases may be hampered by factors not controllable in the study design: - for example, spontaneous exercise in control group; poor compliance with exercise

programs effectively diluting the strength of the treatment; the lack of intensity of the exercise program; and finally, by utilising measurement methods which may be insensitive to the induced changes (Stern, & Cleary 1981).

The relationship between enhanced psychological well-being (including improved self-image and confidence, decreased anxiety, depression and hostility), and physical activity suggested above and by recent research (Folkins, & Sime, 1981) is promising although inconclusive; few studies are methodologically strong (Hughes, 1984; Taylor, Sallis, & Needle, 1985). In a review of 1,100 studies into the effects of habitual aerobic exercise on mood, personality and cognition, Hughes (1984) describes three methodological deficits consistently present in the studies reviewed: poor choice of measures of psychological constructs, lack of control for experimenter/subject biases, and inadequate descriptions of method.

Taken together, the available evidence seems inadequate to provide a positive link between habitual, aerobic exercise and improvements in psychological well-being. Hughes underscores this uncertainty when he warns us : "...(that) the enthusiastic support of exercise to improve mental health has a limited empirical basis and lacks a well-tested rationale" (Hughes, 1984, p 76).

1. 4.2. Risks of Exercise

Notwithstanding the previous arguments and cautions about the usefulness of exercise in Type II diabetes management, exercise is

still seen to have a useful role. Cunningham (1987) argues that exercise programs designed for a healthy diabetes patient could be planned in the same manner as programs for healthy non-diabetic persons. While many forms of physical activity are subsumed under the term exercise, in the context of exercise required to effect cardio-respiratory fitness, there is already in existence a standard exercise prescription which is appropriate for diabetic patients who exhibit no serious cardiovascular complications. The American College of Sports Medicine (1978) recommends a level of physical training required to achieve and maintain cardiorespiratory fitness in a healthy adult and which can be achieved in three to five exercise sessions per week, each between fifteen and sixty minutes duration and at an intensity of forty to ninety per cent of maximum heart rate.

However moderate this prescription may be perceived to be with reference to the non-clinical population, many Type II diabetes patients are unwilling to participate in exercise programs; for example, Kemmer and Berger (1983) assert that as a group, middle-aged, obese mature-onset diabetes sufferers actively resist participation in planned exercise programs. In common with many late middle-aged people, diabetes sufferers may have a negative attitude towards the role of exercise in health maintenance (Woods, & Birren, 1984). Wiswell (1980) suggests three main reasons why older and middle-aged people do not exercise: they tended to (i) underestimate their physical capabilities, (ii) overestimate the conditioning value of the little exercise they do get, and (iii) to exaggerate the danger that

physical exertion posed on their health.

Physiological constraints may also preclude the ability to exercise. Degenerative processes in the joints may restrict possibilities for increased physical activity, and the older diabetes sufferer may already be exhibiting disabling vascular complications (ie. retinopathy, nephropathy, coronary heart disease, or peripheral vascular disease). Complications of exercise include the increased risk of hypoglycaemia, bone and soft tissue injuries, retinal damage, myocardial infarction, arrhythmias, and sudden death. Thus, it is imperative that before any exercise program can be initiated, persons suffering from the vascular or cardiac complications of diabetes should be fully evaluated by a physician.

1. 5. CONCLUSION

On the basis of the evidence reviewed so far it seems that there are both benefits and risks associated with physical exercise prescriptions for the older mature-onset diabetes sufferer. Most, if not all, research affirms the role of exercise in the reduction of cardiovascular risk factors, ie. the effect which physical activity exerts on plasma concentrations of triglycerides and cholesterol. Research arguments that metabolic control may be improved by regular moderate physical activity must be balanced against claims that, in order to achieve improvements in insulin sensitivity and glucose tolerance, the exercise regime required may be far too demanding for the middle-aged diabetes sufferer at potential cardiovascular risk.

Quite apart from the clinical aspects of exercise, regular,

moderate physical activity may well ameliorate some of the adverse psychological effects of ill-health; loss of self-esteem, depression and anxiety, but on the other hand there are, as we have seen, conflicting perceptions by the older exerciser about the value of that exercise. There are risks and possible complications which are of concern to the health professionals as they contemplate exercise involvement for the Type II diabetes sufferer.

Quite apart from the physiological constraints, for many middle-aged obese persons suffering from diabetes, the lifestyle modifications of diet, medication and exercise may be too arduous and demanding, with the consequence that there will be little or no change in behaviour. As a result, poor adherence to behaviour-change programs would be expected, and indeed this has been shown to be the case. Reviews of behavioural factors in Type II diabetes consistently conclude that non-adherence in the diabetes regimen, including exercise, is a major problem (Ary, 1986; Brownlee-Duffeck et al. 1987; Epstein & Cluss, 1982; Wing, Epstein, Nowalk, Koeske, & Haag, 1985).

It can be demonstrated from other lines of research and in other medical problems, extensive education programs do not guarantee that knowledge concerning adherence issues will automatically translate into preventive actions (Bloomgarden et al. 1987; Cerkoney & Hart, 1980 ; Hartwell et al. 1986). Dunn and Turtle (1987), reviewing recent studies into diabetes adherence factors, commented on the naivety of many of the educational objectives in diabetes education as it has been practised, particularly the assumption that education presumed

knowledge, which then leads to better compliance. Dunn and Turtle (1987), commented that traditional diabetes education has been based upon beliefs that improvements in knowledge, attitudes, and skills lead to improved compliance with treatment advice, which then results in an increase in metabolic control. They report that, to date, there is no evidence that would support the link between an increase in knowledge and metabolic improvement. Many Type II patients who may benefit from a systematic program of moderate exercise would seem likely to fail to initiate an exercise program or to make a concerted attempt to maintain a regular pattern of exercise. In the following chapter, research examining the those factors which are thought to influence exercise adherence are discussed, with particular reference to theoretically-based psychological principles.

CHAPTER 2

RESEARCH ON EXERCISE ADHERENCE

2. 1. INTRODUCTION

The previous chapter examined the role of exercise in the therapeutic management of Type II diabetes mellitus. It was shown, despite conflicting research findings, that regular sustained physical activity has the potential to reduce low-level psychological morbidity, to contribute to cardiovascular conditioning, and when coupled with dietary control, provide assistance with weight loss. Notwithstanding the equivocal nature of the evidence regarding the benefit of exercise in Type II diabetes, there still remains the difficulty in establishing adherence to exercise participation in those sections of the clinical population who may be most likely to benefit. It was argued in the previous chapter that efforts to increase correct self-care behaviours by increasing knowledge did not automatically lead to increases in regimen adherence.

Behavioural perspectives on exercise potentially provide a theoretical platform from which to promote individuals´ attempts to initiate, adopt and maintain new behaviour. In this chapter research evidence is examined in order to evaluate how useful the current psychological theories have been in their efforts to increase exercise adoption and maintenance.

Two of the major psychological constructs currently contributing to exercise adherence research are undoubtedly self-motivation and self-efficacy; these will be examined briefly. Firstly, self-motivation, a trait-like construct has been extensively utilized in the research carried out by Dishman (1982, 1988) and his colleagues (Dishman, & Gettman,1980; Dishman, & Ickes,1981) to explain an individual's perseverance in the maintenance of new behaviour, specifically exercise behaviour. Secondly, Social-learning theory (Bandura, 1977b) introduced the foundation for the concept of self-efficacy or situation mastery and provided a powerful tool; in fact, one could argue that it provided the nucleus for a comprehensive paradigm from which to launch future adherence research. It is the understanding of the lapse/relapse process which has developed from social-learning theory which may explain why some people adopt and maintain new behaviour whereas others drop out or lapse from behaviour-change programs.

The Relapse Prevention model, proposed by Marlatt and Gordon (1980,1985) and which is described in the following section, may help to provide solutions to questions arising when investigators have tried to explain dropout from exercise. The model is not explored here in its totality; this research is interested only with the first stages of the model, ie. with the responses and outcomes to perceived high-risk situations. The appraisal involves, firstly, an assessment of unique situations that may increase the risk of relapse for an individual; and secondly, an assessment of the coping skills that the

individual brings to the situation.

Other sections of the model have obvious advantage in the investigation of the relapse process that realistically confront the adoption of, and adherence to, various health behaviours in clinical populations. This present research project has a more narrow focus, a necessarily more fine grained approach to particular aspects of a particular problem. More specific studies in particular domains have been suggested by reviewers of the relapse model (Brownell, Marlatt, Lichtenstein & Wilson, 1986).

However, before this specific line of exercise-adherence research is fully introduced and examined in more detail, the reader is urged to consider the concept of adherence as it applies to exercise adoption and maintenance and to this end the available data on exercise participation is investigated and conclusions are drawn about the fitness of average Australian adults. In addition, research aimed at increasing exercise participation of both clinical and non-clinical populations is discussed and the common features consistent in nearly all behaviour change programs, ie. dropout, relapse, and low adherence patterns - is noted.

2. 2. RESEARCH INTO EXERCISE PARTICIPATION

The National Heart Foundation's Risk Factor Prevalence Study No. 2 - 1983 (National Heart Foundation of Australia, 1985) indicated that fifty-six per cent of adult males and sixty-seven per cent of adult females take virtually no vigorous or moderate exercise. Of those

persons who do exercise, only ten per cent of males and five per cent of females exercise at a level of exertion and with sufficient regularity to enhance or maintain cardiorespiratory fitness. For the USA and Canada, conservative estimates suggest between ten and twenty per cent of the adult population take regular exercise sufficient for health benefits (Stephens, Jacobs, & White, 1985). More recent Australian estimates suggest that about 14 per cent of adults are active at this level (Bauman, 1988).

These figures suggest that the majority of Australian adults could be classified as sedentary. Further, it would be expected that strategies required to increase their motivation, not only to commence, but also to maintain their participation, would be available now that psychologists have been actively applying behavioural principles to exercise adherence issues. However, while many studies are conceived, implemented, and published, the sparseness of successful application of psychological theory aimed at motivating people to initiate and continue exercising, reflects the complexity of this critical area of health promotion (Owen & Lee 1986b).

In both clinical and non-clinical populations, exercise habits are difficult to initiate and maintain, and outcomes of many programs have been disappointing; of those persons who do begin, many will drop out within the first three to six months (Dishman, 1988; Lee, & Owen, 1986; Martin, & Dubbert, 1982, 1984, 1985; Oldridge, 1979, 1982; Owen, & Lee, 1986a; Wing et al. 1985). It can be concluded overall that physical fitness programs require a fuller understanding of the needs

and the limitations of the participants for which they are designed. Owen and Lee (1986a) have argued that the effectiveness of many existing programs can be increased if a match can be made between the characteristics of the individual and the program design. These authors and others (Glasgow & Rosen, 1978) have stressed the need to identify personal characteristics which are predictive of both good and bad outcomes in behaviour change programs and so advocate personalizing programs to meet the needs of the participants. Behavioural self-management procedures aimed at providing intending participants with the necessary skills, ie. the setting of personally appropriate goals, the need to monitor performance and the need to bring flexibility to the choice of exercise type and the environment in which the exercise is undertaken, are among the most likely strategies in which to bring personalized and effective exercise programs within the motivational repertoire and reach of the sedentary adult (Martin, & Dubbert,1984).

Theories of behaviour change frequently focus on the acquisition of knowledge in the adoption of the new behaviour. Although knowledge significantly influences the range of human endeavour, knowledge alone does not necessarily result in change in behaviour. Persons habitually perform in ways that may be at variance with their best interests. Dishman, Sallis, and Orenstein (1985) argue that there is no evidence which leads to the conclusion that an increase in knowledge about exercise will automatically lead to increased participation. They report that less than five per cent of the American population believe

that increasing information about the benefits of fitness, etc. would result in an increase in their participation.

Increasing participation in exercise programs effectively requires the improvement of adherence rates in the target population. Dishman (1988) comments that dropout rates encountered in exercise programs compared to those rates from other behaviour change programs such as smoking, alcohol and drug abuse, weight loss and psychotherapy are remarkably similar in magnitude and form. While it has been shown that adherence rates differ across different environments and type of programs, the decay curves of adherence rates, ie. the decrease in individual participation rates over time, reveal similar decay gradients. The typical drop-out rate graphs from behavioural change programs, in general, indicate that the majority of drop-outs occur within the initial three months, and the curve is negatively accelerating over the following nine months to a year with a stabilization of retention rates between twenty-five and forty-five per cent (Martin, & Dubbert, 1982).

Factors that have been found useful in constructing hypotheses relating to exercise adherence may be broadly grouped into three categories; (i) exercise program, (ii) subject, and (iii) social/environmental factors.

2. 2.1. Exercise Program Variables

Program factors utilizing intervention techniques based upon behavioural theory have been adopted to increase the participation and

maintenance of exercise programs. Thus, programs based upon behavioural techniques, ie. lottery programs and contingency contracting, (Epstein, Thompson, Wing, & Griffin, 1980; Oldridge, & Jones, 1981; Wysocki, Hall, Iwata, & Riordan, 1979), stimulus control (Thompson, & Wankel,1980), and positive reinforcement (Allen, & Iwata, 1980), have been attempted with mixed results.

2. 2.2. Participant Variables

Emphasis on participant variables have been recommended by Dishman and Ickes (1981), specifically the role of self-motivation which the authors describe as a measure of the individual's tendency to persevere regardless of extrinsic reinforcements and which is claimed to be largely independent of situational influences. Further, self-motivation is argued to be a generalized, trait-like construct; ie. a person's behaviour is determined largely by reinforcement by personal ideas or goals and less by situational influences or the goals of others. Dishman (1988) argues that self-motivation is a learned characteristic, independent of motivational concepts of approval, achievement, ego-strength, locus of control or exercise attitudes. Self-motivated individuals would be better able to persist in long-term behaviour quite independent of social approval, achievement motivation, or expectations or beliefs: individuals who were self-motivated should be able to conquer situational barriers in the exercise setting, including a lack of family and social support.

2. 2.3. Social-environmental Variables

Within the social/environmental factors, social support has been found to be associated with long-term maintenance of weight reduction, smoking cessation and reduction in alcohol usage (Brownell, Marlatt, Lichtenstein, & Wilson, 1986), and exercise (Heinzelmann, & Bagley, 1970; King, & Fredricksen, 1984; Martin et al. 1984; Martin, & Dubbert, 1982). Some studies have suggested that social support may sometimes increase sick-role behaviour (Hyman, 1971).

The concepts associated with the broad groupings of program factors, specifically self-motivation and social support, are potentially useful for the understanding of maintenance and adherence to behaviour-change programs and have been functional in providing information about potential adherers. However, they have not generally provided a theoretical foundation from which to generate and test hypotheses associated with the understanding of exercise maintenance behaviour. Alternative approaches, such as Social-learning theory (Bandura 1977b) and the research which has been generated from that theory, specifically research into lapse and relapse phenomena (Marlatt, & Gordon, 1985), have provided a more integrated theoretical platform which may further our understanding of situation mastery and coping responses, and the cognitive appraisal of factors influencing exercise initiation and maintenance.

2. 3. THE CONTRIBUTION OF PSYCHOLOGICAL THEORY TO EXERCISE ADHERENCE RESEARCH

2. 3.1. Social-learning theory

Social-learning theory views the individual as actively and independently evaluating events and selecting strategies for action on the basis of observation of others and through past experience. Individuals progress from an initial observation of events to an evaluation of possible outcomes contingent on various courses of actions until finally, to the active selection and execution of a plan of action (Bandura 1977b). Social-learning theory posits that self-efficacy is the major mediating variable connecting knowledge and behaviour change.

A further construct relevant to the coping process and conceptually different from self-efficacy, is described by Bandura as outcome expectancies - personal beliefs that a selected behaviour will result in a particular outcome (Bandura, 1977a, 1978). Bandura (1986) distinguishes between the two constructs arguing that self-efficacy concerns judgement about one's level of competence for anticipated performance, whereas outcome expectations refer more to the consequences resulting from the behaviour. Outcome expectancies for example could include beliefs that exercise would lead to the individual feeling more energetic, being healthier, being able to control their weight, and being able to cope better with stresses. Other lines of research (Abramson, Seligman, & Teasdale, 1978) have shown that people who judge that their personal actions do not alter

the environment to any meaningful degree, are likely to give up and cease any attempt at control.

As will be discussed in the next section both concepts taken from Bandura's Social-learning theory; self-efficacy and outcome expectancies, form the nucleus of the cognitive-behavioural model of relapse prevention

2. 3.2. The Relapse Prevention Model

The research direction from which to hypothesize about the behaviours associated with exercise adoption and maintenance is suggested by the cognitive-behavioural model of the relapse process constructed by Marlatt and Gordon (1980, 1985). Developed originally as a framework to assist in the understanding of relapse in the addictive disorders, the relapse prevention model attempts to explain people's coping responses in high-risk situations where lapse or relapse from a prescribed behaviour may follow if inappropriate coping responses are used. Conceptually, a high-risk situation is the initial step in the Marlatt and Gordon relapse prevention model and it is defined as "any situation that poses a threat to the individual's sense of control and which increases the risk of potential relapse" (Marlatt & Gordon, 1985, p. 37). The concepts of lapse and relapse are also of major relevance to maintenance of exercise behaviour. In the context of the Marlatt and Gordon research, a lapse is viewed as a slip from a desired pattern of behaviour which may or may not lead to a relapse, ie. return to an old acquired habit pattern. A lapse is a

single event and suggests that an adjustment can be made, corrective action initiated, and where control is not totally lost. A lapse is said to have resulted if non-adequate coping strategies are attempted and previously unwanted behaviour patterns maintained. The resulting decrease in control increases the probability that further lapses increase the probability of relapse: a result of a total breakdown of the coping response.

Marlatt and Gordon's Relapse model applies to individuals making a voluntary commitment to change their behaviour in a particular area, and has been used in the treatment and study of alcoholism (Donovan, & Chaney, 1985), psychotropic drugs (Chaney, & Rozell, 1985), smoking O'Connell, & Martin, 1987), and obesity (Brownell, Marlatt, Lichtenstein, & Wilson, 1986). Apart from its initial application in understanding the relapse process associated with voluntary behavioural maintenance programs in the addictive disorders, it is claimed by Marlatt & Gordon (1985), that the model's relevance extends to programs associated with lifestyle change and modification, ie. the prevention of unhealthy habits and the participation in a balanced lifestyle.

2. 3.2.1. Situation mastery, outcome expectancies and self-motivation.

The relapse model describes the probable courses of action which result when acquired new behaviour patterns are challenged by situations posing a threat to the continuity of the desired behaviour. When individuals initiate new behaviour by following more appropriate

lifestyles, such as by the adoption of an exercise schedule, there are certain behaviours which, when mastered, result in maintenance of the new lifestyle. At an early stage in the transition process, an equilibrium is established between old behaviour patterns and the associated need to indulge in the rewards linked to those patterns, and the tentative incorporation of the desired new behaviour patterns into their lifestyle. As people master these new patterns and as the desired behaviour becomes progressively implemented, they would tend to experience a sense of perceived control. The longer this equilibrium can be maintained as the new behaviour is implemented, the greater will be their perception of control and situational mastery.

The equilibrium continues until disturbed by a situation which poses a threat to the desired behaviour and challenges the perceived sense of self-control relative to the adopted behaviour. At this shift in the equilibrium, coping strategies are required to deal with the high-risk situation. Coping, defined by Leventhal, Zimmerman, & Gutman (1984), is planning and action directed by the representation of the threat and is generated from the individual's (a) self-efficacy level, (b) capacity to relate to problem situations, and (c) their repertoire of coping and appraisal skills. This is consistent with the approach of Marlatt and Gordon. If, in the face of a high-risk situation the individual's repertoire of coping skills is inadequate or non-existent, the sense of control will be diminished and the experience of self-efficacy decreased.

Self-efficacy: The influence of this Social-learning theory concept, as one of the major components in the coping process, is recursive; it not only assists in the cognitive structuring of coping responses, but it is also strengthened by the successful outcome of the coping response. This reasoning suggests that the interaction of the coping behaviour and the persistence of that behaviour in specific situations is governed by individual perceptions of exerting, or acquiring, mastery in that particular area.

Perceived self-efficacy is believed to exert two main effects on behaviour: on the one hand it directs and influences activity choice, and on the other, it modulates the effort that is directed toward combating the high-risk situation. The influence of self-efficacy allows people to evaluate situations effectively and refrain where they believe the coping skills required would exceed their capabilities. Or, secondly, it would allow people to judge the effort to put into difficult situations, slackening their efforts or giving up entirely if there is some doubt about their capabilities. (Bandura 1981)

Outcome expectancies: These were earlier described as expectations of what may happen as a result of engaging in a particular behaviour. This construct augments the concept of self-efficacy in the relapse-prevention model. Marlatt and Gordon (1985) concentrate on outcome expectancies as determinants of relapse. That is to say, they draw distinctions between the actual effects and the expected effects of engaging in a particular behaviour, arguing that

the expectancies one has about a behaviour often exert a greater influence than the actual effect of that behaviour. Outcome expectancies have two components (i) cognitive (informational) and (ii) motivational (incentive). The first component associates with what is known about the outcome of engaging in a given behaviour while the second factor, the motivational component, influences the desirability or the reinforcement value of the specific outcome or effect. It is the balance between the perceived positive and negative outcome expectancies that is seen to hold the key to the continuity of new behaviour patterns in the face of perceived risks.

Self-motivation: In an earlier section of this chapter self-motivation was discussed as a concept believed to influence strongly, adherence to exercise behaviour. Dishman (1982) argues that self-motivation provides assistance in answering the question: Who is more likely to persist in long-term exercise behaviour? Persons who are self-motivated should be able to surmount situational barriers in the exercise setting. Accepting this view says nothing about the coping behaviour and it is unwarranted to suggest that a highly self-motivated person would be less (or more) likely to lapse in the face of a high-risk situation. A distinction should be drawn between the process of coping, and the possession of a particular trait such as self-motivation. In other words, self-motivation is independent of the coping/non-coping process, self-motivated people can, and probably do, experience high-risk situations as they attempt to adopt new behaviour patterns, just as people who have less self-motivation also face the

risk situations. Marlatt and Gordon (1985) recognize motivation as an important contributor to the model in that it determines the commitment likely to be made towards the accomplishment of a particular goal, but warn that concepts which define an individual's energy for commitment to change should not be equated with self-efficacy judgements:

> "... the failure to conceptualize the task of changing to a required behaviour as involving both motivational factors (commitment to change to the overall goal) and self-efficacy (for coping with high-risk situations as a means to achieve this goal) often leads to a self-defeating over-emphasis on will-power as a sole means of coping with temptation." (Marlatt & Gordon, 1985, p.132)

2. 3.2.2. The role of lifestyle balance.

In reviewing findings from their own research, Marlatt and Gordon (1985) report that, in many instances, the initial lapse occurred in situations that were unexpected, ie. in situations that were unanticipated and where the individual was quite unprepared to cope. Thus, people attempting to cease smoking or perhaps reduce their alcohol intake, light cigarettes automatically or in the other case, absent-mindedly order drinks while engaged in conversation with little or no thought given to the consequences of the act, and with poor recognition of the potential risk involved. There are other times when the individual appears to construct knowingly, the circumstances from which relapses are inevitable. How could we account for this apparently self-directed dismantling behaviour?

The concept of an equilibrium that is established between the old behaviour patterns and the associated need to indulge in the rewards linked to those patterns, and the incorporation of the desired new behaviour patterns into people's lifestyle has already been mentioned. In addition to this sense of equilibrium between new and old patterns, the authors have introduced a further concept suggesting an equilibrium between competing demands, ie. lifestyle balance. The lifestyle balance is said to exist in one's daily life in the continuum between those activities perceived as external aggravations or demands, that is the `shoulds' and at the other end, perceived as pleasures or self-fulfilment - the `wants'. The perception of self-deprivation and the accompanying need to `break-out' that follows a predominance of shoulds in one's life, may ultimately lead to defiance against the imposition of external restrictions, rules and regulations. Rationalization and self-justification then interfere with planned intentions, and thus prepare the way for a return to the older behaviour pattern - relapse.

Marlatt & Gordon's (1985) relapse model predicts that persons who experience an imbalance between the perceived `shoulds' and `wants' in their day-to-day lifestyle will face high-risk situations less confidently than those whose lifestyle is more balanced. The balance will (obviously) involve both the day-to-day experiential stress, and the coping resources that can be marshalled to counter such stress. Sources of stress include physical illness - an individual's resources may be diminished considerably from

debilitating chronic illness. Psychological stress may further contribute to the overall health status and has the potential to disturb the lifestyle balance (Schwartz, 1977). Individuals whose internal demands are excessive may show dysfunctional affective states indicated by higher than normal anxious and or depressive behaviour. Equally, those people whose overall mental-health is poor may be experiencing an imbalanced lifestyle. The relapse model predicts that where a lifestyle is influenced by the persons incapacity to persevere on a day-to-day basis, coping strategies in the face of the high-risk situations may not be generated, and the person will experience lower self-efficacy and an increased probability of a lapse.

Further, the functional aspects of a person's relationship with family and friends can be a contributor either to a successful coping response, or where dysfunctional, to a source of stress. Financial, career, parenting and ageing issues are significant areas from which stresses or alternatively, protectors may be generated. As well, minor aggravations, the daily "hassles" with family, traffic, and work contribute towards shifting the equilibrium and the potential disturbance of the balance. The evidence is by no means sufficiently clear-cut to warrant the assumption that sources of stress *per se*, shift the equilibrium toward a potential lapse. Shephard and Cox (1980), report that men participating in an industrial fitness program and who were experiencing high numbers of stressful life events in their family and personal life were more likely to continue their program involvement. The influence of spouse support, for instance,

seems to interact with potential lifestyle stresses and modifies their influence. Lines of research into social support in cardiac rehabilitation (eg. Oldridge, Wicks, Hanley, Sutton, & Jones, 1978; Andrew et al. 1981; Oldridge, 1982) have concluded that spouse support increased exercise adherence in males undergoing cardiac rehabilitation.

A careful evaluation of lifestyle balance may reveal potential indicators of lapse: - activities perceived as external demands, and internal physiological and psychological constraints. The relapse prevention model predicts that the probability of relapse will increase when these `shoulds´ outweigh the `wants´, leading the individual to re-engage in maladaptive behaviour or to cease the pursuit of a more healthier lifestyle.

2. 4. RELEVANCE OF THE RELAPSE PREVENTION MODEL TO DIABETES

The authors of the relapse prevention model could almost have been referring specifically to the behaviours often exhibited by diabetes sufferers as they attempt to balance - both the external and internal injunctions constituting an appropriate `other-directed´ therapeutic regimen: - and their wants, their desire to lead a more normal, less restrictive lifestyle. Particularly where the requirements or demands of significant others form the main motivating force in a person´s attempt to alter their behaviour, ie. where others seem to be a source of `shoulds´, the defiance is marked, and the

justification to resort to the previous unwanted behaviour strengthens in response to the perceived injunctions.

Thus, in the face of high-risk situations, the individual´s repertoire of coping skills is the main defence against relapse. If they are inadequate, inappropriate or non-existent, the sense of mastery, ie. self-efficacy will be decreased to a point where the individual feels helpless to control the situation and the possibility of capitulation to the previous unwanted behaviour increases. A lapse is said to have resulted if inadequate coping strategies are attempted and previously unwanted behaviour patterns maintained. The resulting decrease in control increases the probability that further lapses will lead to an eventual relapse, a result of a total breakdown of the coping response.

How may health professionals present an effective, attractive, rational and safe exercise program to those who suffer from this disease, and, at the same time, enlist their active involvement? The following section investigates possible answers and provides a basis for this research project.

2. 5. RATIONALE FOR SELF-INSTRUCTIONAL BEHAVIOUR CHANGE PROGRAMS

The literature reviewed to date stresses the potential benefit that regular exercise may exert with respect to Type II diabetes mellitus, ie. the effect on metabolic control, on cardiovascular fitness and finally, on the psychological well-being and general day to day coping with the rigours of the disease - the quality of life

component. From the points of view expressed in earlier chapters, Type II diabetes sufferers who are desirous of incorporating exercise into their lives by following an exercise prescription, will invariably encounter lapse and relapse as a result of their disease, their age, and their sedentary life-style.

In the earlier sections of this chapter it was argued that successful interventions assisting behavioural change in exercise adoption would require the application of self-management and self-control procedures which attempt to identify for the individual: firstly, the constraints placed upon their lifestyle; and secondly, the high-risk situations in which that individual determines some possibility of lapse. Further, the behavioural interventions would require the understanding of the constructs from which the coping responses would be generated, that is the expected predictors of behaviour maintenance - self-efficacy, outcome expectancies and self-motivation.

Martin and Dubbert (1984) have suggested that behavioural self-management procedures which (i) teach performance monitoring; (ii) assist the participant to set personally appropriate goals; (iii) introduce notions of flexibility in the choice of appropriate exercise activities; and (iv) assist the participant in selecting the most appropriate environment, and which are aimed at providing intending participants with the necessary skills, are among the most likely strategies by which personalized and effective exercise programs can

be brought within the motivational repertoire and reach of the sedentary adult.

Research in other behavioural change areas, such as smoking cessation have suggested that participants favour assistance which is flexible and independent of group membership or involving other forms of face-to-face contact (Schwartz, & Dubitzky, 1967). Martin et al. (1984) have concluded that a 'flexible goal setting' condition in exercise programs produce significant increases in exercising behaviour compared to 'fixed goal setting' condition in out-of-class exercise; flexible goal subjects attended 85 per cent of out of session sessions whereas fixed-goal subjects attended only 71 per cent. Wankel and Thompson (1977) have argued that being able to choose an activity from a number of alternatives, increases the participants' commitment to that activity and keeps them active longer than if they have an activity chosen for them. Finally, King and Frederiksen (1984), suggest that there is a need for the development of procedures that foster exercise adoption, both in, as well as distinct from, structured face-to-face programs. Their research investigated participant-controlled exercise which occurred apart from any formal, on-going program and in which they believed: "more accurately reflect(ed) the manner in which a significant number of Americans exercise(d)" (p.5)

2. 6. SELF-INSTRUCTIONAL EXERCISE PROGRAMS

Information packages based on self-instructional interventions have been found to be cost effective in delivering behaviour change programs to large numbers of people in weight loss programs (Jeffery, & Gerber, 1982); smoking cessation programs (Jeffery, Danaher, Killen, Kinnear, & Farquhar, 1982), and for physical fitness (Cooper, 1970) although long-term benefits are difficult to establish.

Owen, Lee, Naccarella and Haag (1987), have investigated the impact of a graduated, self-instructional aerobic exercise package delivered through the mail. The program delivered either a complete 12-week package in a single mailing, or the same material delivered in several mailings; and it included information that participants should know prior to the adoption of exercise, ie. how to choose the most appropriate aerobic activity, how to initiate and maintain exercise behaviour and how to overcome the barriers to exercise. As well, self-assessment procedure, goal-setting techniques, self-monitoring of exercise activity, the self-administration of rewards for completing the required activity were provided. Follow-up testing concentrated on self-reported physical activity, self-reported self-efficacy measures and contact difficulty. The results indicated that there was little difference in rates of maintaining aerobic activity between the two groups who received the exercise by mail and those in a comparison group attending a face-to-face fitness program. The investigators concluded that the single package format may be potentially useful in exercise program delivery for those people not desirous of group

structured, face-to-face participation. Subsequent revision and collation of the program material led to the production of a self-help aerobic fitness publication (Owen, Lee, & Gilbert, 1987).

Lee (1989), in assessing the resultant publication, conducted a randomised trial comparing a standard program of aerobic floor classes with the provision of the above self-help publication in a population of mainly university students. The results confirmed the earlier research (Owen et al. 1987), and indicated that there was an overall improvement in fitness in both the face-to-face aerobic exercise group and the exercise group based upon self-management principles, although at follow-up both groups reported a reduction in the amount of exercise and their respective fitness scores.

2. 6.1. Self-managed Exercise Programs for Type II Diabetes Sufferers

It has been argued earlier that many mature-onset diabetes sufferers are located in a constricting life-style of external demands. The exacting requirements surrounding the self-management and monitoring of blood-glucose regime serve as one example, the dietary/exercise adherence issues another.

Practical and organizational factors which have been shown to identify exercise maintainers from within the general population and which may be of importance in the initiation and maintenance of exercise from within the Type II diabetes population include convenience in the time and location of the exercise program, (Oldridge, 1982; Andrew et al. 1981); and a relatively active leisure

and work life (Oldridge, 1979; Andrew et al. 1981). Personal factors associated with initiation and maintenance include adequate knowledge concerning health and exercise (Sallis et al. 1982) and a belief in the health value of exercise and a positive attitude toward it (Andrew et al. 1981; Sallis et al. 1982); a confidence in one's ability to exercise (Kissinger,1979; Sallis et al. 1982); and the predicted achievement of exercise goals and objectives during the exercise program (Danielson, & Wanzel,1978).

2. 7. CONCLUSION

It has been argued elsewhere in this study that through diabetes educational programs, the Type II diabetes sufferer possesses the required information about the need to exercise and would seem also to possess a belief in the value of exercise with respect to diabetes management. It is also likely that appropriate individual exercise programs have been designed for their particular level of competence, agility and physiological status. Thus, it is probable that their confidence in their ability to exercise is realistically determined. and it is, perhaps, the practical and organizational factors which inhibit these people from undertaking a higher commitment to exercise.

While the limited available evidence suggests that self-managed programs may be no more effective than traditional structured face-to-face programs in maintaining exercise behaviours, it is clear that such programs are not inferior. As a result of research into healthy, and a predominantly student population (under 35 years of age), Lee

(1989) concluded that self-help programs may prove especially useful for those people who take responsibility for their own health and who can act independently of others. The question whether this strategy of assisting NIDDM patients to exercise would prove beneficial provides the purpose and rationale of this study.

CHAPTER 3

PURPOSES OF STUDY AND HYPOTHESES

3. 1. INTRODUCTION

If exercise is to be prescribed by diabetic educators and health professionals as a strategy in the management of the disease, either in combination with dietary control to assist weight-loss, or to assist in metabolic control and increased insulin sensitivity, then research is required to evaluate those characteristics believed to be important in the adoption and maintenance of an exercise program which would result in increasing physical activity.

This study conducts a trial of a self-help exercise program. The model chosen to explore the psychological attributes surrounding exercise adoption is Marlatt & Gordon's (1985) relapse prevention model which predicts, at one level, that persons who experience high levels of self-efficacy, motivation, and high levels of positive outcome expectancies will have more effective coping strategies in the face of high-risk situations. The model postulates that individuals measured as exhibiting higher levels of these constructs will be able to overcome high-risk situations, will have successfully redefined lapses and will continue to adhere to new behaviour regimens.

The model also predicts that persons who experience an imbalance between the perceived 'shoulds' and 'wants' in their day-to-day lifestyle will face high-risk situations less confidently than those

whose lifestyle is more balanced. Thus, persons whose internal and external demands are excessive may exhibit dysfunctional affective states, indicated by higher than normal anxiety and/or depression scores. Equally, those people exhibiting higher levels of minor psychiatric morbidity may be considered to be experiencing an imbalanced lifestyle. The relapse model predicts that where a lifestyle is influenced by a person's incapacity to cope on a day-to-day basis, coping strategies in the face of the high-risk situations may not be generated and the person will experience lower self-efficacy and an increased probability of lapse. Conversely, those persons who do persevere in the face of high-risk situations and have seemingly acquired adequate coping skills to deal with the aversive situation and have continued with their adopted behaviour could be expected to show an increase in their perceived coping efficacy.

3. 2. PURPOSE OF STUDY

1. To examine the psychological and physiological characteristics of a sample of Type II diabetes mellitus sufferers with respect to exercise knowledge, expectations and performance.

2. To determine the impact of a home-based, self-managed exercise program on exercise adherence.

3. To test hypotheses generated from psychological theory, specifically those generated from selected sections of the relapse prevention model about the factors influencing exercise adherence in the Type II diabetes population.

3. 3. HYPOTHESES

3. 3.1. Impact of the Self-managed Exercise Program

Hypothesis 1

That participants in the self-managed exercise condition will be more likely to exercise and will have achieved a higher level of physical activity than those participants in the control condition.

3. 3.2. Predictors of Exercise Adherence

Hypothesis 2

That for participants in the self-managed exercise condition, there will be a significant positive relationship between changes in reported levels of physical activity and caloric expenditure, and those variables which measure exercise-specific self-efficacy, outcome expectancies for exercise behaviour, and self-motivation.

3. 3.3. Effect of Lifestyle Balance in High-risk Situations

Hypothesis 3

That participants in the self-managed exercise condition initially reporting lower levels of anxiety and depression, higher levels of psychological functioning and higher levels of lifestyle satisfaction will be more likely to maintain an exercise plan.

CHAPTER 4

METHOD

4. 1. PARTICIPANT RECRUITMENT

Names of potential participants were drawn from the files of The Queen Elizabeth Hospital's Diabetes Service. The names, addresses, dates of birth, ages at diagnosis, medication and diet details together with the dates of last contact with Diabetes Services were recorded for 247 patients. The records did not distinguish between Type I or Type II diabetes sufferers.

Prior to any introductory enlistment letters being sent to participants, a selection of 41 doctors situated in the north and north-west Adelaide metropolitan area were contacted by letter and given information about the study (See Appendix II.1). It was suggested in this letter that as participants became involved in the recruitment phase, the researcher would contact the participants' doctors and provide further information about the project and planned interventions.

An initial check of the 247 names made through the 1987/88 Adelaide phone directory to update any possible address changes since the last contact with the diabetes service failed to find 26 clients.

Following this initial address check, a letter of introduction from the Director of Endocrine and Diabetes Services at The Queen

Elizabeth Hospital was dispatched to the remaining 221 potential participants (See Appendix II.2).

Two weeks after the introductory letter had been dispatched, it became clear that many people had moved away from the address shown on the updated records and forty letters were returned by Australia Post. In addition, four letters had been dispatched to deceased persons. A further twelve people contacted the researcher, either through the Adelaide University or through The Queen Elizabeth Hospital Diabetes House indicating that they were not interested in taking part in the survey. In all, 56 of the potential participants were unavailable for inclusion in the survey.

In mid-October 1988, an enlistment letter was sent from the Adelaide University Psychology Department to the remaining 165 potential participants (see Appendix II.3). The specific criteria for inclusion in the program required subjects to be confirmed non-insulin dependent diabetes sufferers. The letter requested their assistance in providing answers to a comprehensive questionnaire and health survey. Participants consenting to take part in the program were asked to update their name and address and return their acceptance on a pro-forma to the University in a reply-paid envelope.

Forty-seven (28.5 per cent) replies were received and a further seven Type II confirmed participants self-referred into the program as a result of media publicity. Phone contact was made with all fifty-four potential participants to establish a date and time for the initial home-based interview.

In the course of this first interview, 13 persons were excluded from the survey.

Table 4.1 Selection criteria exclusions

Criteria exclusions	N
Mobility restriction (amputee)	2
Language barrier	4
Mental retardation	1
Severe cardiovascular disability	3
Outside body-mass criteria	3

Acceptable responses totalled forty-one (twenty-one males and twenty females). Participants had a mean age of 51.9 (sd 7.4) yrs.; 80.5 per cent were currently married and two-thirds of the group were born in Australia. Mean age at diabetes diagnosis was 46.1 (sd 8.2) yrs.

4. 2. ASSESSMENT

4. 2.1 Assessment Procedure

The basis for the interview was a series of questionnaires administered by structured interview (see Appendix III). All persons were interviewed in their own homes. The following descriptions refer to the assessment protocol and are listed in the order presented to the respondents.

SECTION I of the assessment protocol consisted of personal and demographic information based upon the National Heart Foundation Risk Factor Prevalence; Study No.2. (1985).

SECTION II of the assessment protocol contained a variety of physical activity indicators.

1. The validated, **7-Day Recall of physical activity** questionnaire (Blair, 1984; Blair et al. 1985) covering, leisure, at-home and occupational activities. Questions asked referred to the number of hours spent in sleep and at different levels of intensity of physical activity - moderate, hard and very hard. Since activities in these three categories are easier to recall and describe and are performed less frequently, the remaining time is taken to represent light activity. A selection of representative activities falling into the categories were presented to the participant on a card. Hours spent in the five categories (sleep, light, moderate, hard and very hard activities) are converted to MET values (work metabolic rate/rest metabolic rate) and the estimated caloric expenditure calculated to give total Kcal. kg^{-1} day^{-1}. This value was used to quantify the amount of physical activity reported by an individual which is independent of body size but can be multiplied by the individual's body weight in kilograms to estimate the total caloric expenditure.

2. **Exercise beliefs**: the participants were asked if they believed that they were getting enough exercise.

3. **Exercise participation** in which the participants were asked whether, in the past two weeks, they had engaged in any exercise at all.

4. **Vigorous physical activity participation** in which the participants were asked whether, in the past 2 weeks, they had engaged

in vigorous activity - activity which made them breathe harder or puff and pant. Vigorous physical activities were those rated equal or above 6 MET's (where metabolic rate is estimated at 6 times resting caloric expenditure). This activity is associated with a heart rate of about 60-70 per cent of maximum, age-related, heart rate (refer to Section IV).

5. **Extent of exercise participation**. Participant were asked whether they had undertaken specific exercise behaviour in the previous week and if so, to report the mode, frequency and the duration of each exercise session.

6. **Comparative exercise** in which the participants were asked to rate, on a 1 - 7 scale, the physical activity that they were now getting compared to others their same age and sex.

SECTION III of the assessment measured the responses to the following psychological constructs: exercise specific self-efficacy, social support for exercise, exercise outcome expectancies, self-motivation, psychological disturbance, psychosocial adjustment, and affect (mood) state.

1. Exercise specific self-efficacy (Bandura, 1986). Six questions were asked in which the participants assessed their confidence levels (measured as percentages) on specific exercise behaviours which may be relevant to middle-aged exercisers. Sonstroem (1988) argues for the need to standardize self-efficacy measures applicable to middle-aged and elderly populations; items that reflect self-perceptions of

flexibility, injury proneness, persistence at exercise, optimum weight and fatigue and which would be seen to be relevant to cardiovascular conditioning the older adult.

2. Social support for exercise. Five questions were asked in which the participants assessed the level of support from family and friends for exercise-related behaviour. Participants were asked to rate behaviours on a seven-point scale ranging from "no, definitely not occurring" to "yes, definitely occurring".

3. Exercise outcome expectancies This instrument consists of 20 questions designed to measure the respondents' expectations of engaging in exercise-specific behaviour (Marlatt & Gordon, 1985).The scale was adapted from Ajzen and Fishbein's (1980) methods of measuring attitudes and beliefs towards a behaviour. Expectancies measured by this instrument have both a cognitive (informational) and a motivational (incentive) components. Twenty questions were asked in which the participants assessed both their cognitive and motivational levels (measured as per percentages) on specific exercise beliefs. A combined score representing a Total Outcome Expectancies (TOE) was obtained by summing the products of the cognitive component score with the motivational component score expressed as a decimal proportion of 1.0. Thus, for each belief element the motivational component modified the cognitive component by a factor between 0.01 and 1.0. in deriving the final Total Outcome Expectancies score

4. Self-motivation (Dishman & Ickes, 1981) was measured via the shortened version of the original forty-item Self-Motivation scale

(Falls, Baylor & Dishman, 1980). The instrument consisted of a seven-point, eight-item scale. Values ranged between 1 and 5 with some items requiring reverse scoring.

5. Psychological disturbance measured via the shortened, validated version of the General Health Questionnaire (Goldberg, & Hillier, 1979) in which the participant scores, on a four-point, twelve-item scale, responses to four sub-scales of symptomatology, somatic symptoms, anxiety, insomnia, social dysfunction and depression. The twelve-item GHQ, designed primarily to identify symptoms of minor psychiatric disturbance such as minor emotional distress and related physical complaints was used in the Risk Factor Prevalence Study (NHF,1983).

6. Psychosocial Adjustment (Taylor, Houston-Miller, Ahn, Haskell, & DeBusk, 1986) in which the degree of happiness or satisfaction to ten psychosocial areas is assessed. The original scale was modified to reflect the expected lifestyle of the current participants. Participants rated each item on a ten-point scale from 1 (completely unhappy or unsatisfied) to 10 (completely happy or satisfied) and were asked to consider aspects of their life including support and affection, career, sex, finances, relations with children, freedom, thoughts about the future, social activity, control, and happiness in general.

7. Profile of Mood States (POMS) assessed the participants' affective states via a shortened, validated version of the POMS (McNair, Lorr, & Doppleman, 1981). The questionnaire is a factor

analytically derived inventory which measures six identifiable mood or affective states: Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigour-Activity, Fatigue-Inertia, and Confusion-Bewilderment. For this study, only the Tension-Anxiety, Depression-Dejection, Vigour and the Fatigue scales were used.

SECTION IV of the test instrument checked participants' physiological characteristics. Participant's cardiac and hypertensive symptoms were evaluated from a short questionnaire. If questions relating to chest pains, heaviness in the chest, shortness of breath undertaking simple tasks, treatment for high blood pressure or a history of stroke, angina, heart attack were answered in the positive, patients were informed that the researcher would check with their physician before continuing with the Harvard Step Test or the proposed exercise program.

The height (without shoes), weight (in street clothes) and resting pulse rate of each participant was measured. Weight was measured using a *Soehnle* digital balance scale. Prior to each day's measurements, the scale was standardized using an accurate, mid-range standard weight. Height was measured with a self-designed, modular platform-based rule. From the participant's weight and height, a index of body fatness was calculated. The body mass index (BMI) provides a good estimate of body fat (Keys, Fidanza, Karvonen, Kimura, & Taylor, 1972) and is derived from both height (metres) and weight measurements (kilograms). The index is described by Bray (1978) and can be classified to provide a measure of obesity as distinct from absolute

body weight. Body mass index accounts for differences amongst persons in terms of height and frame size and is based upon Quetelet's formulae ($kg*m^{-2}$) which defines four categories; underweight - less or equal to 19 $kg.m^{-2}$, acceptable weight - 20 to 25, overweight - 26 to 30, and obese, greater than 30 $kg.m^{-2}$.

Pulse counts were taken with a Copal Actimeter model UB-103. Resting heart rate was calculated as an average of two, one-minute integrated pulse measurements taken while the person was comparatively relaxed responding to subsequent sections of the assessment protocol.

If there were exclusions due to observed physical fitness or as indicated from Section IV of the assessment questionnaire, the person was asked for permission for the researcher to contact their doctor to seek approval for further testing and subsequent inclusion into either the exercise or control groups of the intended program. Refer to Appendices II.4 & II.5 for pro-forma letter, pro-forma reply and the relevant extracts of the exercise schedule which were sent (reply-paid) to the participants' doctor.

If there were no exclusions indicated from Section IV, or if the physician subsequently gave clearance for inclusion in the exercise or control condition, the participant was requested to undertake a Harvard Step Test protocol to measure cardiovascular function. The participant stepped up and down on a test bench of height 400 mm (at a rate of thirty steps per minute) for four minutes or unless he/she stopped because of fatigue, chest pains or other difficulties. Pulse rates were determined immediately after the stepping concluded and at

1 minute intervals until the pulse returned to near resting rate. During this recovery stage, participants were instructed how to measure their own heart rate and to calculate an estimate of their maximum heart rate, ie. (220 - AGE).

4. 2.2. Participant Selection

All participants who successfully completed the Harvard Step Test without reporting undue discomfort or chest pains, and participants who terminated the Harvard Step test without undue discomfort after two minutes, and as well, participants who showed a pulse recovery period of less than five minutes, were randomly assigned to one of two conditions: (a) a 12-week self-managed exercise program, or (b) a no-treatment control condition.

A letter informing the participant's GP of the selection protocol and of the successful entry into the research study, as well as relevant photo-copied extracts of the proposed exercise schedule was dispatched within 12 hours of selection into the study.

A total of thirty-one screened persons (seventeen males and fourteen females) were eligible to participate in one or the other of the two conditions of the exercise study.

For the participants allocated to the self-managed exercise condition, the researcher gave standardized verbal and written instructions (see Appendix II.6) in the following areas;

* calculation of maximum heart rate,
* the need for regular exercise,

* dealing with exercise hypoglycaemic attacks,
* routine warning about precautions for injury, prevention and safe exercise practice
* the potential difficulty of integrating exercise into their lives.

The participants were then given a copy of the booklet Getting Fit: A do-it-yourself guide to aerobic fitness (Owen, Lee & Gilbert, 1987). They were given a comprehensive set of standardized instructions into the use of the book (see Appendix II.7), and asked whether they would consider taking part in a twelve-week exercise program based on the publication. All eighteen participants agreed to undertake the twelve-week self-managed exercise regimen. Finally, the participants were given a standard diabetes orientated exercise pamphlet (see Appendix II.8).

For the participants allocated to the control condition, the researcher gave standardized verbal and written instructions in the following areas;

* calculation of maximum heart rate,
* the need for regular exercise,
* dealing with exercise hypoglycaemic attacks,
* routine warning about precautions for injury prevention and safe exercise practice,
* the potential difficulty of integrating exercise into their lives, and

were given the standard diabetes exercise pamphlet (Refer

Appendix II.8)

Participants from both groups were given two Consent Forms and an associated Information sheet (Refer Appendices II.10 & II.11) and were asked to carefully read the information contained. If they had no objections to taking part in the survey they were asked to sign both copies of the Consent form. The researcher signed both forms and one copy plus the Information sheet was retained by the participant. All participants were then informed that the researcher would contact them after twelve weeks and arrange a follow-up meeting.

4. 3. SUMMARY OF PARTICIPATION AND RESEARCH DESIGN

TABLE 4.2 Summary of participant selection

Names selected from TQEH client records	247
Less 26 unlisted with Telecom	
TQEH letters dispatched	221
Less 40 returned 'address unknown'	
Less 4 deceased	
Less 12 voluntary withdrawals	
Adelaide University letters dispatched	165
Less 118 refused participation	
Less 13 outside selection criteria	
Plus 7 self-referred	
Number of potential participating in study	41
Less 10 excluded on health check	
Active exercisers available for randomization	31

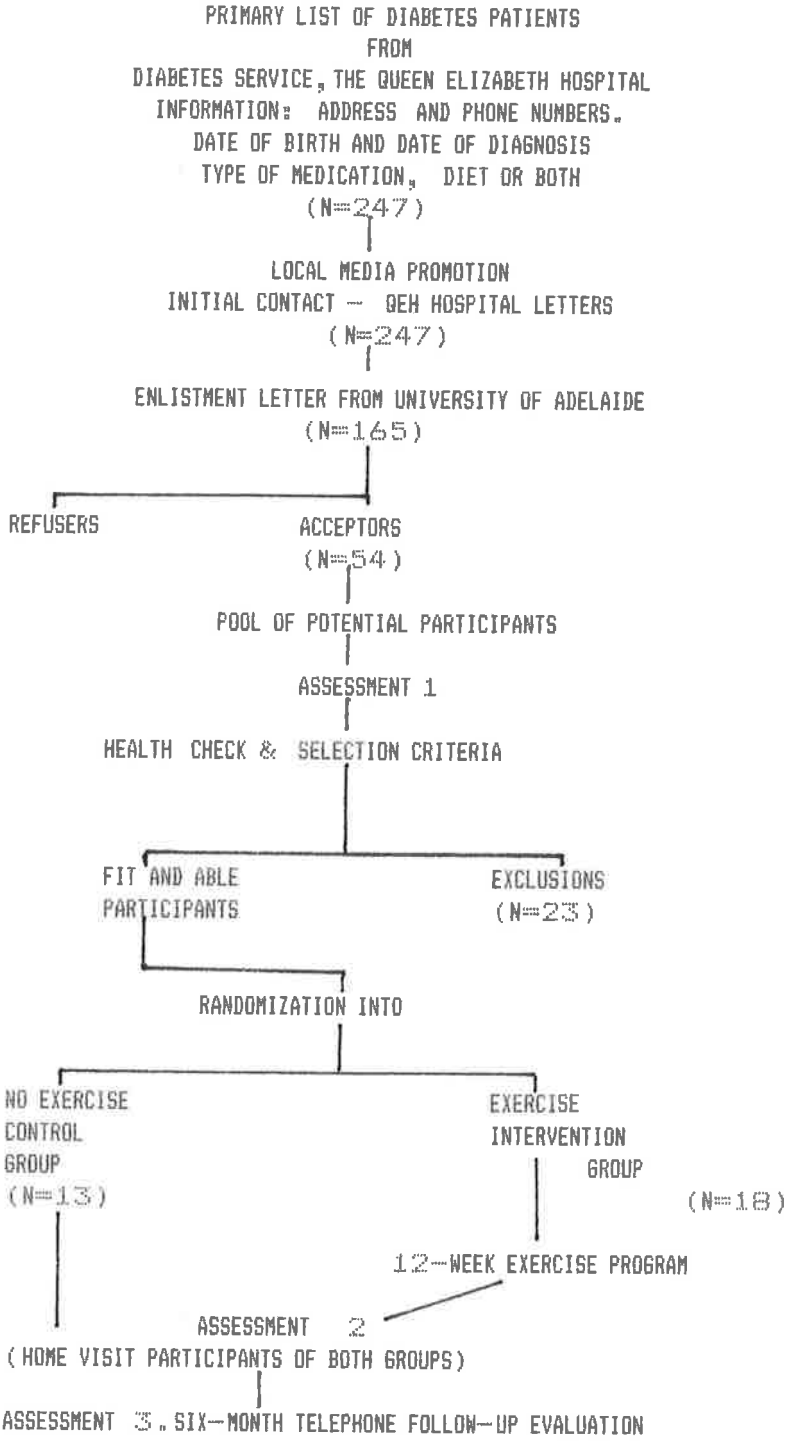


FIGURE 1 RESEARCH DESIGN INDICATING PARTICIPATION AT EACH LEVEL.

CHAPTER 5

CHARACTERISTICS OF PARTICIPANTS AND THEIR EXERCISE HABITS

5. 1. INTRODUCTION

The characteristics of physical activity in the diabetes population are not well documented; researchers attempting to measure and compare activity levels are not well served by uniquely Australian information bases. General cross-sectional studies describing the distribution and the range of characteristics of this specific patient base are not readily available and there is little published information regarding secular trends or cohort differences. The National Heart Foundation Risk Factor Prevalence Study seeks information on cardiovascular risk factors and related health issues which includes information about the prevalence of diabetes, health profiles of the diabetes sufferer and details of any physical activity undertaken. However, as comprehensive as these surveys are, without access to the data base, it is not possible for researchers to construct either a physical or a psychological profile of the average Type II sufferer.

Because the number of potential participating Type II patients in this current survey was relatively small, it was decided at the planning stage of the project to extract information which would provide a profile of exercise-specific characteristics and allow

comparisons to be made with the 1983 Risk Factor Prevalence Study (National Heart Foundation, 1983).

Specifically, the information gathered in the survey was suitably transformed to allow an examination of the following questions.

(a) what are the characteristics of the sample in terms of sex, ethnic distribution, marital status, education and employment?

(b) what are the primary physiological characteristics of the sample, eg. present age, age at diagnosis, degree of obesity, resting and exercising heart rates, and caloric expenditure profiles?

(c) what are the major cardiac/hypertensive symptoms experienced?

(d) do the participants exercise, and if so, what are their exercise activities and the frequency and duration of such exercise?

(e) how does the participant's cardiac and hypertensive characteristics influence both their caloric expenditure and exercise performance?

(f) how are the various exercise-specific psychological variables, eg. self-motivation, self-efficacy, outcome expectancies, and social support for exercise, descriptive of this group, and finally,

(g) how is the group described by the selected psychosocial variables used to examine psychological affect, psychological disturbance and psychosocial satisfaction in major areas of lifestyle?

5. 2. CHARACTERISTICS OF POTENTIAL PARTICIPANTS

The reader is referred to Chapter 4, Sections 4. 1 and 4. 2 which describe the participant selection and assessment process.

5. 3. RESULTS

5. 3.1. Preliminary Remarks Regarding Selected Variables

Total scores and information which were obtained for the five main variable groupings are shown below.

Demographic variables which included sex, age both at survey and at diabetes diagnosis, marital status, country of birth, education level, employment status and job category smoking behaviour, medicinal status.

Physiological variables which included weight, height and derived body mass index; recent cardiovascular symptoms; resting and exercising heart rate (Harvard Step Test).

Exercise-related variables which included questions relating to recent physical activity, ie. physical activity (7-Day Recall), vigorous physical activity participation, any exercise participation, the extent of exercise participation (mode, frequency and duration), comparative exercise and exercise beliefs.

Psychological (exercise-specific) variables which included, situation-specific self-efficacy, exercise outcome expectancies (cognitive and motivation subsets), self-motivation, and social support for exercise.

Psychosocial variables: which included psychological disturbance (General Health Questionnaire); psychosocial satisfaction (Psychosocial Adjustment); and psychological affect (Profile of Mood States; depression/dejection, tension/anxiety, fatigue, and vigour).

5. 3.2. Preliminary Analysis

5. 3.2.1. Demographic and Physiological Variables

A brief summary, which illustrates the main characteristics of the Acceptors (N = 54), follows. Refer to Figure 1 for sample definition.

Males and females were evenly represented in the survey, 51 and 49 per cent respectively; the majority of participants (80 per cent) were married. Ethnic distribution reflected the potential TQEH patient base fairly representatively; Australians accounted for 63 per cent, southern Europeans 24 per cent followed by people from the United Kingdom, 5 per cent and finally, Asian-born, 5 per cent. All persons interviewed had completed all or a proportion of secondary school, with 17 per cent currently completing, or had finished their tertiary education. Less than half the respondents (42 per cent) were engaged in full- or part-time employment, while 27 per cent were engaged in home duties. Retirees or those persons permanently unable to work accounted for 24 per cent, the remaining 7 per cent were either unemployed, ie. not employed and not retired, or full-time students. Current job-position categories for those in paid work were

distributed throughout the professional, clerical, or service/sport categories of employment.

Sixty-eight per cent were taking anti-hypertensive, oral insulin medication or a combination of the two. Approximately one in three participants had smoked at some time in their life but at the time of survey, and as a result of their diabetes diagnosis, just under half of these smokers had ceased. For those who still smoked, the average daily number of cigarettes smoked was 25.

Table 5.1 illustrates the major physiological characteristics of the population studied.

TABLE 5.1 Means and standard deviations of potential participants' physiological characteristics

Variable	Mean	SD
Physiological		
Age (yrs.)	51.9	7.4
Age at diagnosis (yrs)	46.1	8.2
Weight (kg)	86.9	15.4
Height (m)		
Body mass index ($kg.m^{-2}$)	30.8	5.2
Exercising heart rate*($beats.min^{-1}$)	120.5	21.4
Resting heart rate ($beats.min^{-1}$)	79.4	9.4
Estimated daily caloric expenditure ($Kcal.kg^{-1}.day^{-1}$)	40.7	9.6

* (Note: Not all participants were tested on this measure)

These results are similar to previously reported figures from other sources (Wing et al. 1985; Hartwell et al. 1986). For the reported mean body mass index in this sample of 41 participants, only 2.4 per cent were underweight, 14.6 per cent fell into the acceptable weight category, while 31.7 per cent were found to be overweight and

over fifty per cent (53.7) were categorised as obese. Maximum heart rate, derived from the formulae (maximum heart rate = (220-AGE)), (Cantu, 1987), was used in combination with the mean exercising heart rate to estimate the average percentage exercising heart rate for those participants who completed the Harvard step test. The resulting estimates suggests that on average, the participants were working at 71 per cent of maximum heart rate when completing the step test.

5. 3.2.2. Cardiovascular symptoms in sample.

In order to identify possible risk areas which may have precluded exercise involvement in some participants, various health professionals associated with the study had requested that a preliminary cardiac and hypertension health questionnaire be included. For further details relevant to the rationale of this specific questionnaire, refer to details in Chapter 4, Section 4.2.1. Assessment procedure. Table 5.2 illustrates the results of that questionnaire.

TABLE 5.2 Frequency of cardiac and hypertensive symptoms in sample

Symptoms	YES N	%	NO N	%
Have you, in the past two years, had any of the following:				
1. Pain or discomfort in the chest?	18	43.9	23	56.1
2. Pressure or heaviness in the chest?	12	29.3	29	70.7
3. Shortness of breath doing simple tasks?	11	26.8	30	73.1
Have you, in the past two years, been told that you have:				
1. High blood pressure?	16	39.0	25	60.9
2. Angina pectoris?	4	9.8	37	90.2
3. Heart attack?	3	7.3	38	92.7
4. Stroke?	1	2.4	40	97.6
5. High cholesterol?	10	24.4	31	75.6
6. High triglycerides?	7	17.1	34	82.9
Are you having treatment for the following:				
1. High blood pressure?	19	46.3	22	53.7
2. Lowering of blood fats?	5	12.2	36	87.8
3. Weight control diet?	29	70.7	12	29.2

The results of this cardiac and hypertensive questionnaire established the relatively high risks associated with exercise participation and, as well, provided a screening device for potential involvement in the following exercise program. As a result, ten persons were to be excluded from participation in the self-managed exercise program.

5. 3.2.3. Exercise participation

Exercise sessions were defined as deliberate physical activity in which some pre-determined plan was followed to achieve or maintain

physical fitness and, as such, excluded shopping tours on foot (unless they were undertaken as a planned exercise activity). Also, walking activities that occurred at the participant's place of work were also excluded. Thus, the group reporting **no exercise** may have walked for shopping and at work, etc. but those activities would not be reported here in any exercise category as they were not planned or structured. The assessment required each participant to report the mode, frequency and the duration of each exercise session in the past two weeks. Table 5.3 illustrates the breakdown of exercise activity. Exercise modes reported under 'Other' comprised ballroom dancing, aquarobics, and cycling.

TABLE 5.3 Frequencies, means and standard deviations of mode, frequency and duration of exercise participation

Session details:	N	%	Frequency (sessions/week) mean (sd)	Duration (hours/session) mean (sd)
Exercise mode				
No exercise	14	34.1	- -	- -
Walking	20	48.8	2.31 (2.36)	0.77 (1.05)
Jogging	2	4.9	2.00 (-)	0.50 (-)
Aerobics	2	4.9	4.00 (1.41)	0.75 (0.35)
Other	3	7.3	3.66 (1.15)	0.92 (1.56)
Total	41	100.0	2.482 (2.26)	0.84 (1.06)

5. 3.2.4. Physical activity and caloric expenditure

An estimation used to express the caloric contribution of the component categories to the total caloric expenditure due to physical activity is found by the simple formula: Kcal(total daily physical

$Kcal_{(activity)} = Kcal_{(sleep)} + Kcal_{(occupation)} + Kcal_{(leisure)}$

Caloric expenditure derived from the 7-Day Recall of physical activity quantifies the amount of physical activity, independent of body size, reported by the participant in sleep, occupation and leisure-time activities. Table 5.4 illustrates this measure of caloric expenditure broken down by selected exercise and physiological variables; full details of these data are illustrated in Table 1, Appendix I.

TABLE 5.4 Means and standard deviations of estimated daily caloric expenditure per kilogram for all participants at time T1 by selected variables

ESTIMATED DAILY CALORIC EXPENDITURE ($KCAL.KG^{-1}.DAY^{-1}$)						
Variables	Males			Females		
	N	mean	(sd)	N	mean	(sd)
Body mass index						
<19	-	-	-	1	55.9	-
20-25	4	38.3	(1.8)	1	49.5	-
26-30	9	37.9	(4.8)	4	43.3	(5.9)
>30	8	43.3	(5.9)	14	39.7	(10.9)
In past 2 weeks have you engaged in any vigorous activity?						
Yes	7	42.9	(11.5)	7	48.1	(11.8)
No	14	38.0	(7.5)	13	38.3	(7.7)
Do you believe that you are getting enough exercise?						
Yes	9	43.0	(12.6)	8	42.8	(9.9)
No	12	40.4	(8.6)	12	39.8	(8.0)

As has already been discussed, the activity measured in the 7-Day recall device includes occupation as well as leisure-related caloric expenditure; as a result the data reported in Table 5.4 are

skewed by the inclusion of two obese manual workers involved in energetic physical activity.

Table 2, Appendix I presents a breakdown of estimated caloric expenditure with cardiovascular symptoms (scored on a YES/NO basis) for all respondents at the initial measurement time (T1).

For a comparison with published caloric expenditure data from non-clinical populations, the reader is referred to Figure 1, Appendix I which represents a direct comparison of estimated caloric expenditure for a US non-clinical population (Blair 1986) together with the estimates derived from this current TQEH sample. This comparison confirms participants' engagement in regular physical activity and significant caloric expenditure, and despite complications, the implication of regular exercise.

5. 3.2.5. Exercise-specific psychological variables

In this section, psychological data designed to assess beliefs and attitudes about exercise behaviour are presented. Table 3, Appendix I illustrates the means and standard deviations for the psychological variables believed to be important in explaining people's exercise behaviour.

The self-motivation questionnaire elicited very low comprehension and some confusion from the majority of the respondents and proved difficult to decipher. This confusion is reflected by the low Cronbach's alpha (0.426) reliability figure reported in Table 7.1, Despite this caveat Dishman et al. (1980) suggests that if the self-motivation score total is equal or less than 24, there is a probability that people may ultimately discontinue a regular exercise program. Self-motivation scores measured in this program (mean 17.4, sd 3.9) indicate that the many participants in the sample may not be able to sustain current exercise related behaviour. If an assessment

for subsequent exercise programs were involved at this point there would be a need to be an awareness that some participants will be drop-out prone, on this criteria, at least.

Bearing in mind that the sample includes those who are exhibiting some level of cardiovascular symptomatology and who would not normally embrace an exercise program, the self-efficacy score (mean 410.8, sd 148.5) reflect individual self-efficacy levels of about 65 to 70 per cent, suggesting that respondents are reasonably confident about their ability to incorporate and maintain an exercise schedule. Because the score seems conservative, the inference is that participants are not grossly over-estimating their capabilities to perform regular exercise.

Reflecting the family concern and expected spouse and family involvement in the exercise-specific management of the disease generally, respondents rated their total level of expected social support at 29.8 (sd 6.6) (on a five-item questionnaire with a scale of 1 to 7), a figure which presumes a significant level of family support for their exercise activities. In the context of this survey, social support for exercise can best be regarded as a measure of subjective experience, reflecting perhaps what was believed to be a demand characteristic which satisfied both the individual's perception of how it is, and, with their spouse invariably in attendance at the test setting, how it had better be.

The Outcome Expectancies of Exercise instrument disclosed the expectations about particular aspects associated with exercise

behaviour and the rated importance of those outcomes. On average, respondents rated their perceptions about the likely effects of exercise (for instance, If I were to exercise regularly I would be *less moody, have more energy, have less time for family and friends* etc.) lower than the importance of exhibiting that attribute or outcome (how important is it for you to be *less moody, have less energy, have time for family and friends* etc). This reflects a fairly realistic belief structure about exercise and the possible outcomes. All respondents were able to distinguish that getting injuries was not necessarily an outcome of exercise but rather of their individual management practices around exercise adoption. Similarly, respondents did not think that exercise time precluded involvement in family and friendship activities, they would make time for these activity as well as exercise time. Thus, the relatively low scores obtained in the cognitive subset of exercise outcome expectancies reflects a discriminating belief about the possible outcomes of exercise while the higher scores reported on the motivational subscale reflect a desirability or a reinforcement value of the specific outcome. Thus, the motivational beliefs are clearly held at a different conceptual level from the expectancies reported in the cognitive sub-section of the questionnaire.

A split of estimated caloric expenditure into three equal parts representing low, medium and high caloric expenditure revealed almost equal participant numbers in each caloric category, eg. n = 15, 12, & 14 respectively. A breakdown of the major exercise-specific

psychological variables, self-efficacy, self-motivation, and outcome expectancies for exercise into the three energy subgroups are shown in Table 5.5.

TABLE 5.5 Exercise-specific psychological variables for three estimated caloric expenditure subgroupings

	Estimated Caloric expenditure					
	Low		Medium		High	
Variable	mean	(sd)	mean	(sd)	mean	(sd)
Psychological						
Self-motivation	16.0	(3.4)	18.5	(2.9)	18.0	(4.7)
Self-efficacy	365.5	(173.5)	435.5	(124.7)	438.9	(134.4)
Outcome expectancies						
Cognitive	52.8	(16.4)	57.4	(17.3)	52.9	(15.1)
Motivational	72.1	(16.4)	77.6	(17.4)	71.0	(14.4)

Statistical analysis, via planned comparisons using SPSS-x ONEWAY, carried out to determine whether there were differences in the exercise-specific psychological variable means between low to medium and medium to high caloric expenditure, failed to reject the null hypothesis; ie. there were no significant differences in any of the psychological variables across the three caloric ranges. Other factors which may interfere with the adoption of increased physical activity, such as psychological and psychosocial adjustment, are discussed in the following section.

5. 3.2.6. Psychosocial variables

The relevant data collected under this general variable grouping represent measures which attempt to tap three substantial areas.

(a) **Psychological disturbance**; measured by the shortened General Health Questionnaire (GHQ). (Note: the calculated GHQ score represents a combined score for all 12 items. A total possible score of 48 reflects a score of 4 for each individual item. Scores at this level represent a degree of disturbance that may warrant professional assistance, while scores between 2 and 3 on individual items tend to represent people's responses to passing problems).

(b) **General day-to-day happiness and satisfaction** in central aspects of one's normal lifestyle; measured by the Psychosocial Adjustment (PA) scale. (Note that a total possible score of 100 represents a score of 10 on each individual test item).

(c) **Psychological affect** with specific ability to differentiate state anxiety, depression, fatigue and vigour; measured by the Profile of Mood States (POMS) questionnaire. (Details of these three questionnaires, GHQ, PA and POMS may be found in Chapter 4, Section 4. 2.1. and in Appendix III, Section III, Questionnaires 5, 6 & 7).

Means and standard deviations for these psychosocial variables believed to exert an influence on the lifestyle of those intending to adopt exercise behaviour, are shown in Table 5.6 following.

TABLE 5.6 Means and standard deviations of potential participants' psychosocial variables

Variable	mean	sd
Psychosocial		
Psychosocial Adjustment score	85.4	6.7
General Health Questionnaire	22.8	5.5
Profile of Mood States		
Depression/dejection	44.7	7.8
Tension/anxiety	44.2	7.4
Fatigue	46.9	9.7
Vigour	50.9	8.4

Overall, these scores illustrate that the sample population appear satisfied with major areas of their lifestyle, and symptoms of psychological disturbance as shown by GHQ scores are considered well within community norms (Goldberg & Hillier 1979). Profile of Mood States data confirm that emotional affective states for this population are within the non-psychiatric norm (McNair, Lorr, & Doppleman, 1981).

Estimated caloric expenditure was split into three equal parts representing low, medium and high caloric expenditure. The breakdown of the major psychosocial variables' means and standard deviations into the three caloric expenditure subgroups, are in Table 5.7 following.

TABLE 5.7 Psychosocial variables for the three estimated caloric expenditure subgroupings

	Estimated Caloric expenditure					
	Low		Medium		High	
Variable	mean	(sd)	mean	(sd)	mean	(sd)
Psychosocial						
Psychosocial Adjustment	74.40	(13.8)	78.00	(19.9)	73.93	(18.5)
General Health Questionnaire	23.46	(5.2)	24.33	(7.2)	20.92	(3.7)
Profile of Mood States						
Depression/dejection	44.86	(7.1)	44.50	(8.1)	44.57	(8.8)
Tension/Anxiety	44.66	(7.0)	46.00	(7.7)	42.07	(7.3)
Fatigue	46.93	(8.8)	48.00	(11.8)	46.07	(9.2)
Vigor	49.73	(8.2)	48.91	(8.0)	53.85	(8.6)

Statistical analysis, via planned comparisons using SSPS-x ONEWAY, carried out to determine whether there were differences in the psychosocial variable means between low to medium and medium to high caloric expenditure failed to reject the null hypothesis; ie. there were no significant differences in any of the psychosocial variables across the three caloric ranges.

5. 4. DISCUSSION OF RESULTS

The foregoing analysis of demographic and physiological characteristics suggest the sample, representing a fairly typical Type II population, had relatively educated beliefs about the health benefits of exercise. There are few surprising results; the high body mass index reflects the high prevalence of obesity in sufferers of Type II diabetes. Obesity, as depicted by BMI ratios of greater than

30 $kg.m^{-2}$ is higher in females than males. A comparable study on an American population (Hiss et al. 1986) does not report patient obesity in BMI, rather as a percentage of Ideal Body Weight, (% of IBW). Those data illustrate typical % of IBW ranges from between 79 and 194 per cent for Type II males, and between 79 and 360 per cent for Type II females.

The data breakdown indicating hypertension, stroke and heart-attack for The Queen Elizabeth Hospital (TQEH) sample is shown in Table 5.8 and it indicates a lower order of such complications in the American data (shown in brackets) reported by Hiss et al. (1986).

TABLE 5.8 Comparison of hypertension, stroke and heart attack by age for TQEH sample and American diabetes research data.

Type II without insulin

Age group	16-44	45-64	> 64
Symptom	%	%	%
Known hypertension	50 (50)	35 (55)	0 (72)
Heart Attack	- (14)	9 (14)	0 (24)
Stroke	- (0)	3 (3)	0 (11)
			(Hiss et al. 1986)

Accurate comparisons of the two sets of data shown in Table 5.8 are not reliable, however as (i) Type II sufferers at both ends of the age distribution are under-represented in the TQEH sample, and (ii) the TQEH sample was self-selected and many people with cardiovascular symptoms may not have volunteered for the study.

The scores reflected by the abridged General Health Questionnaire and the Profile of Mood States imply those people were

coping reasonably well and were not overly depressed or anxious. This gives cause to speculate that overall, those participants are psychologically well-balanced, and have relatively low psychological disturbance. Psychosocial adjustment scores for the sample indicate that the majority of participants were finding better than average satisfaction in the important areas of their lives. But caution is required when interpreting these data, as it is likely that the presence of the spouse at the interview when the instruments were completed, may have influenced this particular assessment.

Reported weekly exercise patterns were higher than anticipated for this group of people, and most participants engaged in some form of physical activity. A substantial proportion of people reported walking as their preferred activity, and a proportion of this group stated that golf was their main form of regular exercise. The reported duration and frequency of the respective exercise indicated that many of those people were performing physical activity comparable to at least, but perhaps better than, the prescription by ASCM (1978), although it was not possible to obtain a measure of the exercising heart rate for most respondents. Nevertheless, as most reported, the amount of activity performed seemed, for them, adequate given their condition, their age and their other commitments. While most believed they were exercising at a level comparable with others of similar sex and age, they did believe that, in the context of their received diabetes education from TQEH, they perhaps could be exercising more.

CHAPTER 6

THE IMPACT OF A HOME-BASED EXERCISE PROGRAM ON PHYSICAL ACTIVITY

6. 1. INTRODUCTION

Various researchers (Glasgow & Rosen, 1978; Owen, Lee, Nacarella, & Haag, 1987) have recommended that self-managed exercise programs are worthy of further attention. Lee (1989) has suggested that development and evaluation of self-help programs, for those traditionally partaking of low levels of physical activity, awaits further research and has recommended a range of media from which these self-help programs may be initiated.

The focus of this section of the research is a determination of whether the intervention, based upon a self-managed, home-based exercise program, would lead to an increased level of physical activity over and above the levels which existed prior to the intervention. The major research question to be examined was whether the exercise program, developed for the non-clinical population, would lead to an increase in physical activity, and as well, whether the program would be effective for increasing exercise adherence in Type II diabetes sufferers.

Determinations of changes in physical activity included comparisons of caloric expenditure before and after the intervention; reported physical activity, ie. frequency and duration of exercise

activity in the week prior to both pre-test and post-test, weight changes and, finally, for those participants in the exercise group, the profile of adherence to the exercise plan.

6. 2. METHOD

6. 2.1. Preliminary Notes

Adelaide has a Mediterranean type climate with warm to hot dry summers and cool winters with an average maximum summer temperature of 29.9° Celsius.

The intervention took place over the summer period (November to March) in which schools and many industries close-down for annual Christmas holidays. During the period of intervention, maximum daily temperatures were higher than average and there were at least six, consecutive 5-day periods when the daily temperature stood above 35° Celsius and it included 10 days where the temperature rose above 40° Celsius.

Details of method such as participant recruitment and subsequent allocation into the control and the self-managed exercise condition, and descriptions of the measures used in quantifying the variables, are in Chapter 4.

6. 2.2. Procedure

Of the 41 initial participants eligible to take part in the study, 31 were available for randomization. Approximately three and one half months after the initial interview, participants in the two

conditions were contacted by phone and a home-based interview was planned for the coming week. All but two of the original 31 participants agreed to take part in the post intervention follow up interview; these two both were males from the self-managed exercise condition. One participant refused to continue with the post-test evaluation and the other participant was found to have been re-diagnosed as insulin dependent since the study commenced and, under medical advice, had not undertaken any exercise. The remaining 13 control and 16 self-managed exercise condition participants were available for interview. At the 6-month follow-up telephone interview, all 29 (13 control, 16 exercise group) participants were again available.

6. 2.2.1. Variables obtained at post-test

Physiological and energy-based variables: (a) Estimated daily caloric expenditure ($Kcal.kg^{-1}.day^{-1}$) derived from the 7-Day Recall of physical activity and, (b) body mass index (BMI).

Exercise activity: Three dichotomous variables: vigorous physical activity participation, exercise participation, and exercise beliefs. Three scalar variables: the weekly frequency of any reported exercise sessions and the duration of such sessions, comparative physical activity; and for the intervention group only - a measure of program adherence, ie. the self-reported actual number of weeks continuous adherence to the home-based exercise program.

6. 2.2.2. Variables obtained at the 6-month follow-up

Exercise activity: with respect to the week prior to contact: vigorous physical activity participation, frequency and duration of reported weekly exercise, and comparative physical activity. For the intervention group only: whether they were still exercising at activity levels suggested by exercise program.

6. 3. RESULTS

6. 3.1. Preliminary Analyses of Daily Caloric Expenditure, Exercise Performance, Weight and body Mass Index

Pre-test enquiry confirmed that exercise activities coincided with the activities represented in the exercise program material; eg. walking, jogging, cycling and swimming. Participants also reported physical activity not specifically represented in the exercise program, eg. aerobics, and dancing. Exercise sessions were defined as deliberate physical activity in which some pre-determined plan was followed. Unless they were undertaken as a planned exercise activity, shopping tours on foot and walking activities occurring at the participants place of work were excluded. Participants at both pre- and post-test had been asked to recall the frequency and duration of planned individual exercise sessions for the previous week.

Means and standard deviations for estimated daily caloric expenditure, exercise session frequency and duration, weight and body mass index of the control and self-managed exercise group participants' are shown in Table 6.1. Data from the two exercise

intervention refusers have been excluded.

TABLE 6.1 Means and standard deviations of estimated daily caloric expenditure, estimated exercise frequency and duration, weight and body mass index

	Group	
	Control	Self-managed exercise
Variable	mean (sd)	mean (sd)
Pre-test	n = 13	n = 16
Estimated caloric expenditure $Kcal.kg^{-1}.day^{-1}$	37.94 (5.12)	42.62 (10.26)
Frequency:exercise performance $Session.week^{-1}$	3.23 (1.83)	2.69 (2.12)
Duration: exercise sessions $Hrs.session^{-1}$	1.67 (1.42)	0.64 (0.59)
Weight Kg	88.39 (16.88)	84.62 (15.90)
Body mass index $Kg.m^{-2}$	30.73 (6.18)	29.79 (4.98)
Post-test	n = 13	n = 16
Estimated caloric expenditure $Kcal.kg^{-1}.day^{-1}$	36.39 (4.11)	45.59 (9.71)
Frequency of exercise $Sessions.week^{-1}$	3.19 (1.77)	5.22 (3.23)
Duration of sessions $Hrs.session^{-1}$	1.60 (1.68)	1.49 (1.74)
Weight Kg	88.88 (17.61)	81.48 (16.32)
Body mass index $Kg.m^{-2}$	30.89 (6.38)	29.03 (5.03)

Numbers of persons reporting vigorous exercise activity performed in the past two weeks from the control condition declined from three at pre-test to one at post-test. In the exercise condition, five participants reported exercise activity at vigorous levels and

this increased to seven at post-test. The data for reported vigorous exercise are shown in Table 4, Appendix I.

Subjective judgements of comparative physical activity are illustrated in Table 6.2 and represents a numerical rating (1, - extremely inactive to 7, - extremely active) to the following question: **"How do you rate your physical activity that you are now getting compared to others your same age and sex?"**.

TABLE 6.2 Self-rated comparative physical activity

	Comparative exercise rating		
	Control mean (sd)	Exercise mean (sd)	(sig.)
Pre-test	4.53 (1.60)	5.08 (1.58)	NS
Post-test	4.61 (1.17)	5.14 (1.69)	NS
Follow-up	4.27 (1.12)	5.06 (1.71)	NS

Results confirmed that both control and the intervention groups believed they were exercising above average. Analysis of variance using SPSS-^{x} ANOVA conducted to assess differences in comparative exercise rating between the two groups indicated that there were no significant differences between control and exercise groups at pre-test, $F = .861$; or post-test, $F = .907$; but differences in group means between control and exercise group approached significance, $F = 3.186$ ($p < 0.1$) at follow-up. Repeated measures analysis of variance using SPSS-^{x} MANOVA for evaluation of pre-test, post-test, and follow-up means of comparative physical activity, failed to establish significant differences for either the control or the exercise groups.

6. 3.2. Repeated Measures Analysis of Covariance

Analysis of the means and standard deviations do not allow judgements to be made on the effectiveness of the intervention. The following analyses, based upon group mean scores for the dependent measures :- estimated daily caloric expenditure, weight and body mass index, and frequency and duration of exercise sessions, utilize repeated measures analysis of covariance between the control and exercise groups over time T_1 to time T_2; (pre-test, post-test) to examine the impact of the intervention.

Analysis was performed using SPSS-^{x} MANOVA procedure with an assist from SPSS-^{x} FREQUENCIES for evaluation of normality assumptions and SPSS-^{x} CORRELATIONS for linearity and multicollinearity assumptions. Two cases were deleted due to missing data.

6. 3.3. Outcomes of the Interventions: Caloric Expenditure

The self-managed exercise group showed an increase in mean estimated caloric expenditure from 42.62 (sd 10.26) to 45.59 (sd 9.71) units, an increase of 7.0 per cent while the control group marginally decreased their caloric expenditure by 4.1 per cent; from 37.94 (sd 5.12) units to 36.39 (sd 4.10) units. Refer to Figure 3.

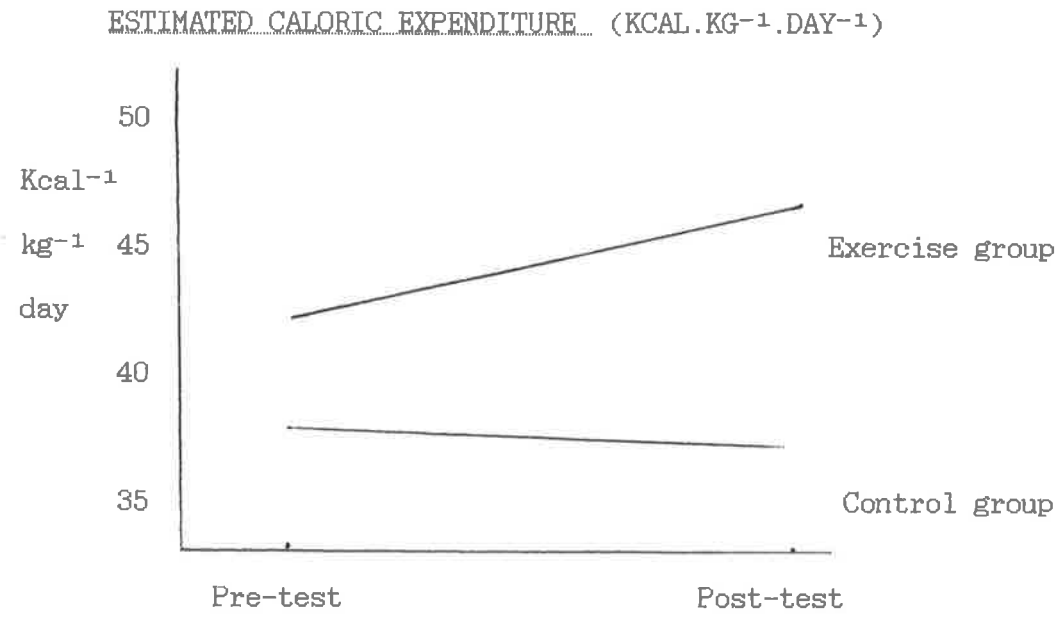


Figure 2. Main effects and interaction for estimated caloric expenditure within groups and between pre- and post-test

Table 6.3 shows the results of the 2 X 2 factorial analysis: (GROUPS = Self-managed exercise group and Control group) (TIME = pre-test and post-test measures of caloric expenditure), which tests for the between-subjects (GROUPS) effect, the within-subjects (TIME) effect, and the interaction effect GROUPS by TIME. The covariate was pre-test caloric expenditure.

TABLE 6.3 Repeated measures of covariance:: Estimated caloric expenditure ($Kcal.kg^{-1}.day^{-1}$) with pre-test caloric expenditure as covariate

Source of variation	df	F	Sig of F.
BETWEEN SUBJECTS EFFECTS			
Groups	1	7.48	p .05
TIME: WITHIN SUBJECTS EFFECTS			
Time	1	0.31	NS
Groups X Time	1	3.15	NS

Differences between means on the between-subjects factor GROUPS are significant (p =.011), suggesting significant improvement for caloric expenditure. The interaction effect (GROUPS X TIME), approached significance (p=.087), which suggests that changes in caloric expenditure are related to the self-managed exercise treatment condition but that the differences between the means of the estimated caloric expenditure for the two groups are not significantly different across experimental conditions.

6. 3.4. Outcomes of the Interventions: Weight and Body Mass Index

Changes in weight and BMI between pre-test and post-test reveal that the control group very marginally increased their mean weight from 88.39 (sd.16.88) kg to 88.88 (sd.17.61) kg, whereas the self-managed exercise group decreased their mean weight from 83.62 (sd.15.90) kg to 81.48 (sd.16.32) kg, a decrease of 3.7 per cent. These effects translated to a mean increase in BMI of 0.5 per cent for the control and a mean decrease of 2.6 per cent for the self-managed exercise group. Refer to Figure 4.

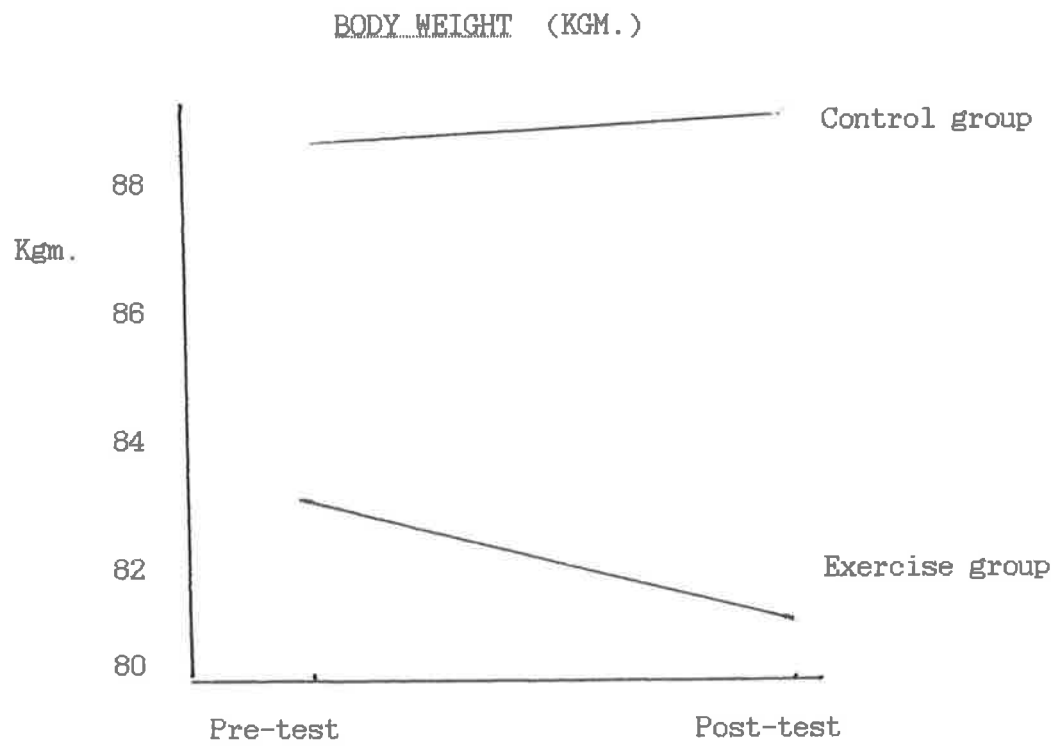


Figure 3. Main effects and interaction for body weight within groups and between pre- and post-test

Tables 6.4 shows the results of the 2 X 2 factorial analysis: (GROUPS = Self-managed exercise group and Control group) (TIME = pre-test and post-test measures of weight), which tests for the between-subjects (GROUPS) effect, the within-subjects (TIME) effect, and the interaction effect GROUPS by TIME. Table 6.5 shows the corresponding repeated measures analysis output for body mass index. In each case, the pre-test value of the corresponding dependent variable is the covariate.

TABLE 6.4 Repeated measures analysis of covariance: Change in weight with pre-test weight as covariate

Source of variation	df	F	Sig of F.
BETWEEN SUBJECTS EFFECTS			
Groups	1	4.25	p <.05
TIME: WITHIN SUBJECTS EFFECTS			
Time	1	1.90	NS
Groups X Time	1	4.85	p <.05

TABLE 6.5 Repeated measures analysis of covariance: Change in body mass index with pre-test BMI as covariate

Source of variation	df	F	Sig of F.
BETWEEN SUBJECTS EFFECTS			
Groups	1	4.61	p <.05
TIME: WITHIN SUBJECTS EFFECTS			
Time	1	2.10	NS
Groups X Time	1	4.98	p <.05

For both cases, differences between means on the between-subjects factor GROUPS were significant, indicating that there were significant improvements for weight over time. Main effects related to time of assessment were not significant. The interaction effect TIME X GROUPS is significant on both measures and suggests that weight-loss was attributable to the self-managed exercise condition

Thus, this analysis has shown that participants in the self-managed exercise group lost significantly more weight during the intervention than did participants in the control condition.

6. 3.5. Post-test:Repeated Measures Analysis of Covariance - Exercise Frequency and Duration

Changes in exercise frequency and duration between pre-test and post-test reveal that the control group very marginally decreased their mean exercise frequency from 3.23 (sd.1.83) kg to 3.19 (sd.7.77) sessions per week, whereas the self-managed exercise group increased their mean exercise frequency from 2.69 (sd.2.12) to 5.22 (sd.3.23) sessions per week an increase of 94.7 per cent. For exercise duration, the control group decreased from 1.67 (sd 1.42) to 1.60 (1.68) hours, a decrease of 4 per cent and the self-managed exercise group exercise duration increased from 0.64 (sd 0.59) to 1.49 (sd (1.74) hours, an increase of 132 per cent. These effects translated to a mean increase in BMI of 0.5 per cent for the control and a mean decrease of 2.6 per cent for the self-managed exercise group. Figures 5 and 6 illustrate these effects.

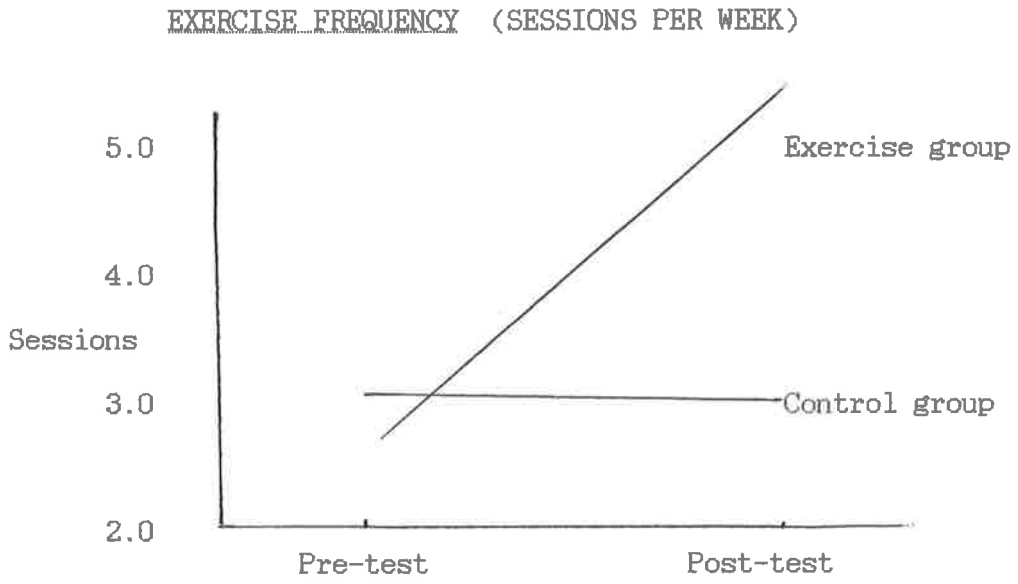


Figure 4. Main effects and interaction for exercise session frequency within groups and between pre- and post-test

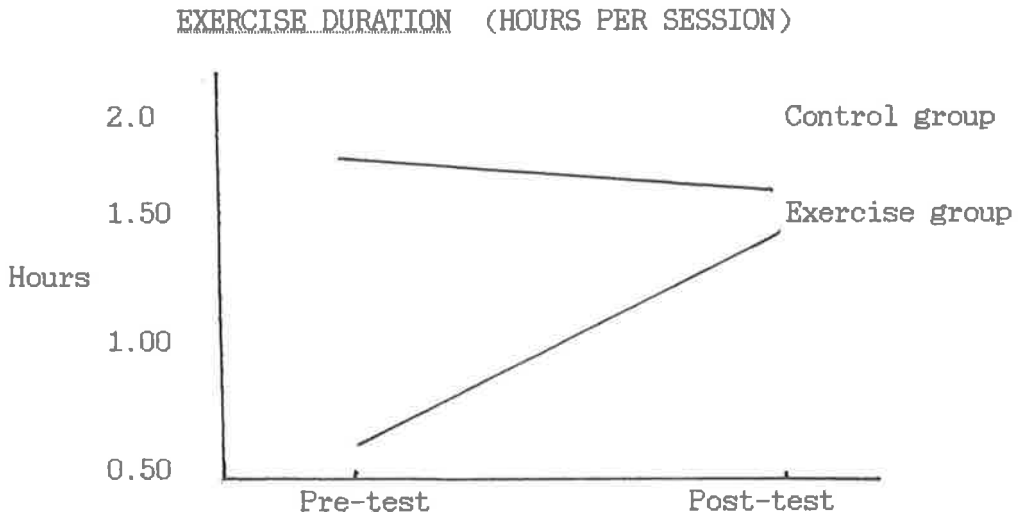


Figure 5. Main effects and interaction for exercise session duration within groups and between pre- and post-test

Table 6.6 & 6.7 shows the results of the 2 X 2 factorial analyses: (GROUPS = Self-managed exercise group and Control group) (TIME = pre-test and post-test measures of exercise frequency and duration respectively), which tests for the between-subjects (GROUPS) effect, the within-subjects (TIME) effect, and the interaction effect GROUPS by TIME for the two variables. Pre-test exercise frequency was the covariate Refer to Figures 4 & 5.

TABLE 6.6 Repeated measures analysis of covariance: Exercise frequency with pre-test exercise frequency as covariate

Source of variation	df	F	Sig of F.
BETWEEN SUBJECTS EFFECTS			
Groups	1	5.17	p <.05
TIME: WITHIN SUBJECTS EFFECTS			
Time	1	5.55	p <.05
Groups X Time	1	5.89	p <.05

Differences between exercise frequency means on the between-subjects factor GROUPS are significant (p= 0.031) as are differences between means for the variable, TIME (p=.026). The interaction effect is also significant (p=.022). The significant GROUPS X TIME interaction suggests that the differences between the means of exercise frequency scores for the two conditions are significantly different across the experimental conditions. Thus, it may be concluded that the intervention appeared to increase the exercise frequency of the participants in the self-managed group.

TABLE 6.7 Repeated measures analysis of covariance: Exercise duration with pre-test exercise duration as covariate

Source of variation	df	F	Sig of F.
BETWEEN SUBJECTS EFFECTS			
Groups	1	3.53	NS
TIME: WITHIN SUBJECTS EFFECTS			
Time	1	2.71	NS
Groups X Time	1	3.05	NS

Differences between exercise duration means on the between-subjects factor GROUPS approach the 5 per cent significance (p=0.071) but differences between means for the variable, TIME is non-significant. The interaction effect approaches significance (p=.064). The evidence from this analysis is marginal. The evidence in the main effect GROUPS implies that the two groups show differences in exercise duration but that the difference lies just outside significance. The marginal GROUPS X TIME interaction result shows that the intervention increased the exercise duration of the participants in the self-managed group, but did not reach statistical significance.

6. 3.6. Estimates of Exercise Participation in the Exercise Intervention Group

When asked how much of the actual exercise program material they had read, all 16 participants in the self-managed exercise group reported reading the entire contents of the exercise program publication and the associated diabetes-specific literature. Fourteen participants indicated that they had set themselves a specific goal at the start of the program while the two who did not, believed that

their on-going priority of reducing their diabetes condition was an effective goal. Ten people (62 per cent), while they were following the program, made full use of the exercise heart rate and weight record sheets contained in the program, four (25 per cent) made some attempt at record keeping and two participants (those who had not contracted any formal goals explicitly with respect to exercise) made no attempt to record information.

Programme adherence was measured by examining individual records kept by participants adopting the program but does not measure on-going exercise performed outside the program protocol. Table 6.8 displays the number of exercisers complying with the specific exercise schedule for each week of the program; the adherence data is represented graphically in Figure 2, Appendix I.

TABLE 6.8 Percentage of self-managed exercise group participants continuously exercising over duration of 12-week self-managed exercise program

No. of weeks continuously. exercising	Participants exercising N	%	No. of weeks continuously exercising	Participants exercising N	%
1	16	100	7	8	50.0
2	15	93.8	8	8	50.0
3	13	81.2	9	7	43.8
4	13	81.2	10	6	37.5
5	10	62.5	11	6	37.5
6	9	56.2	12	6	37.5

Where the program had been followed in full or in part, walking was the most preferred activity (n = 12), followed by jogging/walking and static cycling.

6. 3.7. Analysis of Follow-up Survey

The 6-months' follow-up contact was made by telephone and the integrity of the information **duration and frequency of exercise** was not assumed to be of the same order as that requested in the earlier pre- and post-test face-to-face interviews.

6. 3.7.1. Exercise frequency and duration

Table 6.9 below illustrates the exercise frequency and duration measures reported at follow-up; for comparisons between pre- and post-test measures refer to Table 6.1

TABLE 6.9 Means and standard deviations of estimated exercise frequency and duration at follow-up

Variable	Group Control mean (sd)	Exercise mean (sd)	ANOVA (Sig.)
Six-month follow-up	n = 13	n = 16	
Frequency: exercise performance Sessions.week^{-1}	2.38 (1.44)	3.59 (3.48)	NS
Duration: exercise sessions Hrs.session-1	0.85 (0.67)	1.09 (1.12)	NS

Analysis of variance performed between group means at 6-month follow-up show there was no significant difference between control and exercise groups for exercise frequency or duration.

6. 3.7.2. Adherence to program at follow-up

Follow-up interviews of participants in the self-managed exercise condition at the 6-month period after post-test, indicated

that the 6 self-managed exercise participants who had maintained their program commitment were still exercising at equivalent program levels, and that a further 2 participants had re-commenced exercising at the equivalent of the 12-week level.

6. 4. DISCUSSION OF THE RESULTS OF THE EXERCISE INTERVENTION TRIAL

There is evidence from this trial to suggest that the impact of the self-managed exercise program was successful. As a result of increased physical activity, there was significant weight-loss in the exercise condition. The analyses found that caloric expenditure resulting from increased physical activity, although just failing to reach statistical significance, increased in the intervention group but not in the control group. A further measure of increased physical activity was shown by the significant increase in the number of purposeful exercise sessions undertaken per week in the self-managed exercise trial compared to the control group. The conclusions reached from a consideration of trial data is for support for the initial hypothesis; ie. that participants in the self-managed exercise condition would be more likely to exercise and would have achieved a higher level of physical activity than participants in the control condition.

The program aimed to induce sedentary people to participate in physical activity, to maintain exercise behaviour and to gradually build up exercise levels which would ensure cardiovascular conditioning. We believe for this population, in the short term, there is evidence to suggest that the exercise program was successful in that aim. It appears to have assisted in weight reduction, and was partially successful in maintaining increased caloric expenditure. To approximate some similarity in the contact frequency that exists between many diabetes sufferers and the health professionals, the program was designed with a deliberate lack of contact between researcher and participant within the 12-week program, and during the intervening 6-month period to follow-up. A more detailed study incorporating more frequent contact would be necessary to understand more fully, the weekly caloric expenditure patterns associated with increasing levels of physical activity.

Weeks spent exercising in accordance with the program material allowed an estimate of adherence to be made, although as other researchers (Wilhelmsen et al. 1975) have concluded, physical activity may still be performed at acceptable levels even though the participant is not maintaining the exercise program suggested. The adherence graph describing short-term program participation was typically, negatively accelerating as predicted by other researchers (Dishman, 1987; Martin & Dubbert, 1982,1984; Oldridge, 1982; Oldridge et al. 1983) and although only six participants saw the program through to completion, circumstances which were present during the 12-

week intervention period, eg. weather and the concurrent Christmas holiday period, precluded regular involvement by many participants.

Follow-up data indicate that exercise patterns were being maintained and that participants rated their level of physical activity that they were achieving, compared to others of same sex and age, at roughly the same comparative level as they did at the start of the program. It may be that people's beliefs about exercise and their abilities in relation to exercise may remain relatively stable over time - a factor which may require addressing when future diabetes exercise programmes are formulated.

Finally, the implications of the low numbers of participants requires to be addressed. Indirectly, N effects the power of the chosen statistical test and if power is low, the probability of a Type II error is high and consequently a false null hypothesis may not be rejected.

In this research, alpha is set at .05 significance criterion, and the (directional) alternative hypothesis is that $m_{(post-test)} > m_{(pre-test)}$, where $m_{(post-test)}$ and $m_{(pre-test)}$ are population means. The calculated 'effect size' **d** for the independent variables in the self-managed exercise group are as follows: estimated caloric expenditure, d = 0.3; exercise frequency, d = 0.93; exercise duration, d = 0.64; weight and BMI, d= 0.2. Meta-analysis of recent diabetes research into the effects of exercise-specific interventions incorporating a randomized assignment study design, reveal effect sizes in the order of d= 0.12, Campaigne et al. (1985); d= 0.25, Minuk

et al. (1981); d= 0.25, Ruderman Ganda & Johansen (1979); and d= 0.17, Wing et al. (1985). Analyses of the effect size of various reported interventions in diabetes research indicate that the type of setting, ie. home, outpatient and inpatient for the intervention, proved to be significantly associated with the magnitude of d: Interventions which yielded the highest positive mean d's were inpatient settings while interventions set in the home yielded negative mean d's (Padgett, Mumford, Hynes, & Carter 1988).

The main methodological weakness of this present research is the low numbers of participants in the two categories. A low N coupled with the influence of uncontrollable extraneous variables (as would be encountered in a home-based study) which minimizes the size of the effect relative to these variables, leads to low experimental power for the caloric expenditure and weight determinations. This in turn implies that the acceptance of the alternative hypothesis, ie. that there is a difference between means, say for weight-loss, cannot be confidently made and in fact, there maybe good reason to accept the null hypothesis, ie. that there is no difference between the group means.

CHAPTER 7

PREDICTORS OF PHYSICAL ACTIVITY CHANGE IN TYPE II DIABETES SUFFERERS

7. 1. INTRODUCTION

The understanding of potential predictors of initiation and maintenance of physical activity in both clinical and non-clinical populations has been identified as a key concern of this thesis. It has already been shown that in many instances, exercise intervention studies have been weakened by high dropout rates and the concerns of many researchers, as expressed by Oldridge et al. (1983), are predominantly about identification of potential dropouts, with a view to providing and initiating specific compliance-improving strategies.

The task of this chapter is to seek, from the major variable groupings, ie. physiological, exercise specific psychological and psychosocial, variables which may assist in determining those characteristics which increase caloric expenditure, as well to those which point to participant perseverance in completing an exercise plan.

Before this line of research is investigated, a potential concern in realistic adherence research should be recognized. Sonstroem, (1988) has cautioned researchers attempting to describe adoption of new behaviour strategies from a static, linear modality and who uncritically utilize statistical regression analysis based

upon assumptions of linearity. It has been alternatively argued that new health behaviour, eg. the adoption and maintenance of exercise, may be a more complex and recursive process which is cyclical rather than linear and in which interaction, reinforcement and recursive augmentation may better explain the distinctly systemic nature of new behaviour adoption (Marlatt and Gordon,1987; Sonstroem, 1988). The relapse process as described by Marlatt and Gordon (1985) and expanded by Brownell, Marlatt, Lichenstein and Wilson (1986), identifies the contribution of individual/intrapersonal factors together with physiological and environmental/social factors which contribute to the overall determination of the lapse and relapse phenomena. This analysis emphasises that the risks for both lapse and relapse are determined by: "...an interaction of individual, environmental, and psychological factors" (ibid, p. 772). Thus, future progress in refining the relapse prevention model could well be determined by techniques which accommodate recursive as well as linear interactions between major independent variable groupings.

7. 1.1. The Research Questions

This section of the research examines, by partial correlation analysis, the influence of the three major independent variable groupings, (physiological, exercise-specific psychological, and physiological), on two measures of exercise related outcomes - estimated daily caloric expenditure and a measure of exercise adherence.

Following the partial correlation analysis, the components of the major independent variables groupings were employed in seeking to explain changes effecting (a) estimated daily caloric expenditure, (b) a measure of exercise adherence and lastly, (c) duration and frequency spent of the exercise sessions, completed by the exercise group participants.

Refer to section 7. 2.1.1 for the major independent variables groupings and their component variables,

7. 2. METHOD

7. 2.1. Procedure

Data was collected from the 16 participants allocated to the self-managed exercise intervention group.

7. 2.1.1. Independent Variables: Baseline predictor measures derived from relapse prevention model

(a) **Physiological variables**: age at survey; age at diagnosis, body mass index; sex and medicinal status, **(b) Exercise-specific psychological variables**: situation specific self-efficacy, self-motivation, exercise outcome expectancies - subsets cognitive and motivation, social support for exercise, (c) **Psychosocial variables**: General Health Questionnaire score (GHQ), Psychosocial Adjustment score (PSA), Profile of Mood States score (POMS).

7. 2.1.2. Dependent Variables: Post-test performance measures

(a) Actual number of weeks continuous adherence to the specific exercise plan, (b) exercise activity frequency and duration, and (c) estimated daily caloric expenditure in Kcal.kg $^{-1}$.day^{-1}.

7. 2.1.3. Preliminary notes on variable scale dimensions and test reliabilities

The scale range, number of component items for each of the various predictor variables and the reliabilities (Cronbach's alpha) of the nine tests are shown in Table 7.1

TABLE 7.1. Variables,scale ranges, number of component items and reliability for the psychological and psychosocial predictor variables in exercise intervention

Variables	Scale range	Number of items	Cronbach's alpha
Self-efficacy	1 - 99	6	0.946
Self-motivation	1 - 5	7	0.426
Exercise outcome expectancies			
Cognitive	1 - 99	10	0.770
Motivational	1 - 99	10	0.792
Social support for exercise	1 - 7	6	0.864
General Health Questionnaire	1 - 4	12	0.878
Profile of Mood States	1 - 4	32	0.875
Psychosocial Adjustment	1 - 10	10	0.931

7. 3. RESULTS

7. 3.1. Preliminary Analysis: Absolute Differences

Means and standard deviations for the physiological, exercise-specific psychological and psychosocial predictor variables for the

control and self-managed exercise groups are listed in Table 5. of Appendix I.

7. 3.2. Initial Comparisons

Analyses of variance conducted to assess any pre-existing differences between participants in the two conditions found no pre-existing differences on the psychological or psychosocial variables (self-efficacy, F= 1.66; self-motivation, F=1.47; exercise outcome expectancies (i) cognitive; F=0.001; (ii) motivational, F=0.52; social support for exercise, F= 0.97; General Health Questionnaire, F=1.35; Psychosocial Adjustment, F=0.99; Profile of Mood States (i) depression/dejection, F=0.04; (ii) fatigue, F=0.17; (iii) tension/anxiety, F=0.34; (iv) vigour, F=0.10); or the major physiological/demographic variables (BMI, F=0.54; age, F=1.32).

7. 3.3. Correlation Analysis

Total scores of each individual in the self-managed exercise group (N = 16) for the predictor measures were calculated and partial intercorrelations determined holding pre-test caloric expenditure and pre-test exercise frequency and duration as covariates. Tables 7.2, 7.3 and 7.4 illustrate the partial correlations matrix for variables within the psychological, psychosocial and physiological factors respectively.

TABLE 7.2 Summary table of partial correlations between exercise-specific psychological predictor variables with estimated caloric expenditure and exercise adherence with pre-test measures as covariates

EXERCISE GROUP	Measure of activity at post-test: Estimated Caloric Expenditure ($Kcal.kg.^{-1}.day^{-1}$)	Measure of activity at post-test: Actual Exercise Adherence (weeks)
Pre-test Variables		
Self-efficacy	.18	-.09
Outcome expectancies		
Cognitive	-.57*	.39
Motivational	- 16	.22
Self-motivation	.37	.21
Social support	.01	.22

Note: n=16 *p < 0.05

TABLE 7.3 Summary table of partial correlations between psychosocial predictor variables with estimated caloric expenditure and exercise adherence with pre-test measures as covariates

EXERCISE GROUP	Measure of activity at post-test: Estimated Caloric Expenditure (Kcal.kg-1.day-1)	Measure of activity at post-test: Actual Exercise Adherence (weeks)
Pre-test Variables		
General Health Questionnaire	.12	-.55*
Psychosocial Adjustment	.12	.50*
Profile of Mood States		
Depression/dejection	-.12	-.66**
Tension/anxiety	.07	-.60*
Fatigue	.48*	-.46*
Vigour	.17	.46*

Note: n=16 * p < 0.05 ** p < .005

TABLE 7.4 Summary table of partial correlations between physiological predictor variables with estimated caloric expenditure and exercise adherence with pre-test measures as covariates

	Measure of activity at post-test	
EXERCISE GROUP	Estimated Caloric Expenditure ($Kcal.kg^{-1}.day^{-1}$)	Actual Exercise Adherence (weeks)
Variables		
BMI	.28	-.31
Sex	-.49*	-.13
Age		
(pre-test)	.20	-.07
(diagnosis)	.15	.07
Medicine	.06	.13

Note: n=16 * $p < 0.05$

7. 3.3.1. Discussion on correlation analysis of adherence measures

The data contained in Table 7.2 suggests that the statistical relationships between the measures of self-efficacy and the measures of exercise adherence were far from significant, although partial correlations of a higher magnitude and approaching significance do exist for the other exercise specific psychological variables. The negative correlation between the cognitive component of the outcome expectancies and estimated caloric expenditure may suggest that those participants who increased their physical activity may have a scepticism about the effects of exercise on their disease. This explanation does not seem to explain why those participants who reported a longer actual exercise adherence would show a positive correlation associated with the cognitive component of outcome

expectancies. approached significance. The correlation between self-motivation and estimated caloric expenditure approaches significance and is signed in the anticipated direction.

Table 7.3 data illustrates significant information and confirms hypotheses which suggest the importance of psychological well-being as an influence in the participants' ability of adhere to the exercise program, although there is no indication in which way the "influence" is working. It indicates two relatively simple measures which may be useful to diabetes educators and health professionals in evaluating patient's depressive symptoms, ie. GHQ and POMS depression/dejection scales. The anticipated direction of all correlations is confirmed.

The data shown in Table 7.4 indicates sex as the sole physiological variable significantly correlating with caloric expenditure while for the adherence variable, body mass index approaches significance. The negative sign associated with the binary sex variable indicates a direct relationship between gender of the participants, ie. females, and estimated caloric expenditure.

7. 3.4. Multiple Regression Analysis

7. 3.4.1. Data assumptions; Normality,outliers and multicollinearity

A series of standard multiple regression analyses were performed between the exercise-specific psychological variables, the psychosocial variables, and selected physiological variables as independent variables and post-test caloric expenditure and exercise adherence, respectively, as dependent variables. Analysis was

performed using SPSS-x REGRESSION with an assist from SPSS-x FREQUENCIES for evaluation of normality assumptions and SPSS-x CORRELATIONS for multicollinearity assumptions.

The case-to-IVs ratio has to be substantial- a requirement of at least 5 times more cases than IVs - or the regression analysis is meaningless (Tabachnick & Fidell, 1989). It was therefore not possible to combine all major factor groupings (psychological, psychosocial and physiological) into one singular model which would address each major research question and so each group was dealt with individually. In the case of the psychosocial and exercise-specific psychological groupings, suggested ratio of cases to IVs did not fulfil the requirements and a decision was made to combine some subscales. A global estimate of affective state, Total Mood Disturbance (TMD) score was obtained from the POMS by summing the scores across all four factors (weighting Vigor negatively). Similarly a Total Outcome Expectancies (TOE) score was obtained by summing the product of the cognitive subset with a proportion of the motivational subset score. The reader is referred to Section VI.2.1 Questionnaire 3 for the explanation of this transformation.

Following reccomendations by Tabachnick & Fidell (1989), results of evaluation assumptions about normality obtained from residual analysis, kurtosis and skewness coefficients led to data transformation to reduce skewness in their distributions, reduce the number of outliers, and improve the normality, linearity of residuals. A $\log_{10}$ transformation on the IVs was used on the General Health

Questionnaire (LGHQ), self-motivation (LSLFMOTV). One IV, self-efficacy (SLEF), was significantly skewed (coefficient of skewness= -1.30) but both $\log_{10}$ (-2.20) and square root (1.81) transformations failed to rectify the distortions and it remained untransformed for the subsequent regression analyses. Three missing data cases where identified and mean substitution was applied. With the use of a p .05 criterion for Mahalanobis distance, three outliers were identified and the respective case numbers removed from the data set.

7. 3.4.2. Estimated caloric expenditure

A series of stepwise multiple regressions were performed to determine whether linear combinations of the predictor variables from the three major independent variable groups would be useful in predicting the dependent variable: post-test caloric expenditure (KCALDAY).

The initial regression model sought combinations from the exercise-specific psychological group; self-efficacy (SLEF), total exercise outcome expectancies (TOE), and $\log_{10}$ self-motivation (LSLFMOTV). Table 7.5 presents the correlations between the variables, the unstandardized regression coefficients (B) and the intercept, the standardized regression coefficients (beta), the semipartial correlations (sr^2), and R, R^2, and adjusted R^2. After entry of all three IVs, R was significantly different from zero at the end of each step. After step 3, with all IVs in the equation, R = .738, $F(1,12)$= 3.98, p .05.

TABLE 7.5 Stepwise regression of exercise specific psychological variables on estimated caloric expenditure

Variables	KCALKGM DV	TOE	LSLFMOTV	SLEF	B	beta	sr^2
TOE	-.54				- .03	-.48	.29*
LSLFMOTV	-.18	.69			-10.80	-.10	.06
SLEF	.49	.01	.45		.05	.54	.18*
					Intercept =53.00		
Means	45.22	522.69	1.35	462.71			
SD	8.97	132.52	0.08	95.52			
							R^2 = .54*
					Adjusted		R^2 = .41*
					Multiple		R = .74*

After step 1, with total outcome expectancies in the equation, R^2 = .29, (adjusted R^2 = .232, $F(1,12)=4.92$, $p < .05$). After step 2, with $\log_{10}$ self-motivation added to total outcome expectancies for prediction of estimated caloric expenditure, R^2 = .359 (adjusted R^2 = .24, $F(1,12)=3.09$, $p > .05$). After Step 3, with self-efficacy added to total outcome expectancies and $\log_{10}$ self-motivation for prediction of estimated caloric expenditure, the value of R^2 = .544 (adjusted R^2 = .41, $F(1,12)=3.98$, $p < .05$).

The data show that only two of the IVs contributed significantly to the prediction of caloric expenditure estimates; total outcome expectancies scores (sr^2 =.29) and self-efficacy scores (sr^2 =.18). The three IVs in combination contributed 41 per cent (adjusted) of the variability in caloric expenditure.

A further stepwise multiple regression analysis was performed to determine whether some linear combinations of the psychosocial IVs, ie. $\log_{10}$ general health questionnaire, total mood disturbance, and

psychosocial adjustment would be able to predict the dependent variable - post-test caloric expenditure. No IVs capable of predicting the DV were found from within this group.

The final regression model sought combinations from the physiological IVs, ie. sex, body mass index, age at diagnosis, and use of medicine to predict post-test caloric expenditure. No IVs capable of predicting the DV were found from within this group.

7. 3.4.3. Exercise adherence

A series of stepwise multiple regressions were performed to determine whether linear combinations of the predictor variables from the three major independent variable groups would be useful in predicting the dependent variable - exercise adherence.

The initial regression model sought combinations from the exercise-specific psychological IVs; self-efficacy, total exercise outcome expectancies, and $\log_{10}$ self-motivation. No IVs capable of predicting the DV were found from within this group.

A further stepwise multiple regression analysis was performed to determine whether some linear combinations of the psychosocial IVs, ie. $\log_{10}$ general health questionnaire score (LGHQ); total mood disturbance score (TMD); and psychosocial adjustment score (PSA) would be able to predict the post-test dependent variable, exercise adherence. Table 7.6 presents the correlations between the variables, the unstandardized regression coefficients (B) and the intercept, the standardized regression coefficients (beta), the semipartial

correlations (sr^2), and R, R^2, and adjusted R^2 after entry of all three IVs, R was significantly different from zero at the end of each step. After step 3, with all IVs in the equation, R = .648, $F(1,12)=3.38$, $p < .05$.

TABLE 7.6 Stepwise regression of psychosocial variables on exercise adherence

Variables	EXCWEEK DV	LGHQ	TMD	PSA	B	beta	sr^2
LGHQ	-.50				2.17	.04	.24*
TMD	-.61	.71			- .08	-.50	.13*
PSA	.50	-.69	-.51		.08	.27	.03*
				Intercept	=5.37		
Means	7.05	1.32	84.00	75.05			
SD	4.41	0.09	25.94	15.03			
							R^2 = 42
					Adjusted		R^2 =.29
					Multiple		R =.64*

After step 1, with $\log_{10}$ general health questionnaire score, R^2 = .249, (adjusted R^2 = .202, $F(1,12)=5.31$, $p < .05$). After step 2, with total mood disturbance added to $\log_{10}$ general health questionnaire score for prediction of exercise adherence, the value of R^2 = .381 (adjusted R^2 = .29, and $F(1,12)=4.62$, $p < .05$). After Step 3, with psychosocial adjustment added to $\log_{10}$ general health questionnaire and total mood disturbance score for prediction of exercise adherence, the value of R^2 = .42 (adjusted R^2 = .295, and $F(1,12)=3.38$, $p < .05$) per cent (adjusted) of the variability in exercise adherence scores was predicted by knowing scores on these three IVs. Note the high intercorrelations between all IVs which

explains their total low variance contributions in spite of the high correlations between the IVs and the DV.

The final regression model sought combinations from the physiological IVs, ie. sex, body mass index, age at diagnosis, and use of medicine. No IVs capable of predicting the DV, exercise adherence were found from within this group.

7. 4. DISCUSSION OF RESULTS

Regression analysis: The preceding analysis aimed to determine whether information gathered on exercise-specific psychological variables, psychosocial and physiological variables could be used to predict outcomes associated with caloric expenditure and adherence to exercise programmes. As was demonstrated, due in part to the relatively small numbers of participants taking part in the study, it was not possible to apply the full set of potential predictor variables from the psychological, psychosocial and physiological domains to the model building process and it was necessary to change the proposed research format to deal with the limitations imposed by the relatively small number of participants in the study.

Firstly, caloric expenditure associated with physical activity was used as the outcome variable. It was possible to assemble a series of variables which would assist in predicting increases in caloric expenditure and, as increased caloric expenditure is expected to be associated with weight loss, predictors of caloric expenditure should assist those professionals who advise diabetes patients on dietary and

weight-loss regimens.

The subsequent regression model revealed that variables reflecting the relapse prevention models' components (outcome expectancies and self-efficacy) did predict post-test caloric expenditure. However it was shown that the self-motivation variable did not add to the predictability of caloric expenditure. Thus the hypothesis (H_2) which suggested a significant relationship between changes in reported levels of caloric expenditure and variables measuring exercise-specific self-efficacy, outcome expectancies for exercise behaviour, and self-motivation, has not been confirmed.

Secondly, this analysis examined adherence as an outcome measure and examined variables which may predict the ability to maintain an exercise program. The subsequent model revealed that psychological affect, psychological functioning, and lifestyle satisfaction did predict adherence to the exercise program. The hypothesis (H_3) which suggested that those persons exhibiting lower levels of anxiety and depression, higher levels of psychological functioning and higher levels of lifestyle satisfaction would have the ability to maintain an exercise plan, has been confirmed.

The study has confirmed the relapse prevention's argument, ie. that the psychological component of our lifestyle is important; the basis of our psychological affect influences our emotional responses and feelings, and ultimately our behaviour. Coping with high-risk situations will usually mean that the patient has overcome minor psychological disturbance, negative moods, interpersonal conflicts and

perhaps social pressure. Those who have learnt to persevere with their emotions, handle conflict with others, and deal with pressure generated by significant others will be more able to adhere to complex and difficult treatment regimens.

CHAPTER 8

MAINTENANCE OF EXERCISE IN HIGH-RISK SITUATIONS AND COGNITIVE STRATEGIES INFLUENCING ADHERENCE

8. 1. INTRODUCTION

Social-learning theory (Bandura, 1986) suggests that as people attempt to master new patterns of behaviour and as those patterns became progressively implemented, people tend to experience a sense of control or situational mastery. The theory assumes that an equilibrium between old and new behaviour patterns becomes established and which continues until disturbed by a situation posing a threat, and which represents a risk or a challenge to the perceived sense of situational mastery. As people face the challenges and overcome them, their sense of situational mastery, or self-efficacy, increases and recursively feeds back to assist them in facing further challenges and risky situations and in so doing, entrenches the new behaviour.

As diabetes educators and associated health professionals are responsible for assisting patients to adopt and maintain complex patterns of behaviour and adherence to treatment regimens, it seems logical that they should attempt to define, for the individual patient, the threats and risks which may influence the continued mastery of the required behaviour.

The concept of "risk" should at this point be restated. The relapse prevention model (Marlatt & Gordon, 1985) is clear that it is

the individuals' own subjective definition of 'risk' that characterises the high-risk situation and not those independently arrived at by others. Marlatt and Gordon have proposed a taxonomy of high-risk situations which they found useful in dealing with alcohol addiction, but which needs modification if it is to be applied to non-addictive behavioural change processes such as exercise maintenance.

The aim of this chapter is to categorise the risk situations which were reported, and to analyse the data from two perspectives: whether, on the one hand, the presence of Type II diabetes *per se* qualified as a high-risk situation and was the major factor influencing the lapses and relapses that occurred during the exercise program, or, on the other, whether the challenges which caused the subsequent lapses and relapses in exercise behaviour were independent of the diabetes condition. That is, would the challenge of exercise have caused coping difficulty for most middle-aged people attempting to incorporate exercise into their lifestyle?

8. 2. METHOD

8. 2.1. Procedure

High-risk situations, Marlatt and Gordon (1986) draw distinctions between intrapersonal and interpersonal determinants of high-risk situations in their research. In this present study, an attempt was made to retain the original classifications, but to sub-categorise them into either environmental, physical/emotional or lifestyle situations. Participant data on perceived high-risk

situations were recorded in the diary section of the program book which had formed the basis of the exercise intervention. At the follow-up interview the interviewer reviewed the description of each individual high-risk situation encountered and, with the participant present, recoded the `raw' responses into the standardised format. The accuracy of the standardized classification, compared to the actual perceived situation, was carefully checked with the respondent.

The standardized classification of perceived high-risk situations (which were the major influences for the lapse in exercising behaviour situations) were; (i) physical and/or emotional influences, (ii) lifestyle influences; for example, the holiday period and (iii) environmental influences; for example, weather conditions or altered living arrangements. The major interactional influences mediating each situation resulted from the participants own volitions or were those from significant others (ie. their children, their spouse or their friends).

8. 2.1.1. Preliminary notes on prevailing weather conditions during survey period

Earlier reference has been made to the environmental conditions during which the intervention took place, eg. schools and industry close-down for annual Christmas holiday. During the period of intervention, average temperatures were high and there were at least six consecutive 5-day periods when the daily temperature stood above 30° Celsius; there were 10 days when the temperature rose above 40° Celsius.

8. 3. RESULTS

8. 3.1. Analysis of High-risk Situations

The distinction between interpersonal and intrapersonal determinants is based on the Marlatt and Gordon (1985) categories for classification of relapse episodes (p.80). Intrapersonal determinants refer to events which do not primarily involve other people, where the emphasis is on a precipitating event in which other people or groups of individuals are not mentioned as a significant factor. The intrapersonal classification applies when the event preceding the lapse or relapse involves the significant influence of other individuals. In keeping with the above classification, results were coded as intrapersonally determined unless participants reported that other persons significantly exerted an influence on their decision from which a lapse or relapse resulted.

Situations where feelings of anxiety, anger, sadness, boredom, depression, guilt and apprehension contributed to the decision not to exercise were recorded under the physical/emotional risk category, as were situations where physiological determinants, such as responses to physical pain, fatigue, injury or headache influenced the adherence to the exercise program.

Situations resulting from the participant's or significant other's lifestyle (eg. move to a new job, the holiday period, or the inclusion of new members in the household), and which influenced decisions concerning exercise perseverance, were recorded under the

lifestyle category. Finally, situations involving a change of location (eg. holiday trips, camping etc.), or where the prevailing weather conditions influenced adherence patterns, were recorded under the environmental category.

The recoded responses of the high-risk situations are shown in Table 8.1.

Table 8.1 Classification of the major high-risk situations leading to a lapse or relapse in exercise adherence to the program

Situational classification	Determinants					
	Interpersonal		Intrapersonal		Total	
	n	%	n	%	n	%
Physical/emotional	10	20	5	10	15	30
Lifestyle	7	14	16	32	23	46
Environmental	12	24	-	-	12	24
Total	29	58	21	42	50	100

8. 4. DISCUSSION

Risk situations were difficult to code accurately; emotional and physical risk situations were exacerbated by environmental and lifestyle conditions. In one case, a foot injury, incidental to the program, caused a participant to stop exercising. This lapse eventually developed into a relapse, because weather conditions were oppressive when he was ready to take up exercising again. Older, single female participants expressed significant anxiety about the difficulties they perceived in walking alone - citing locations of nearby hotels, delis and TABs as safety hazards they did not wish to

encounter. Other participants cited inner suburban traffic risks such as exhaust pollution, noise, busy roads etc, while others claimed that unsuitability of locations, the absence of parks, etc. made it difficult for them to exercise if their children were to accompany them. The high-risk situation most often cited was inclement weather conditions. Some people claimed that the weather was just too hot to perform exercise; in other cases, they believed that the weather patterns influenced their psychological state causing an exacerbation of depression or anxiety symptoms while others cited the weather as having an adverse effect on their childrens' health and temper, which caused them anxiety and reduced their interest in any physical activity.

The holiday period brought about changes in routine and lifestyle. Many people interrupted their exercise routine when they went on holidays, visited or had visitors, spent more time at the beach or pool and just generally did not adjust their exercise schedule to meet the changed circumstances.

In some cases, people recovered from the exercise program lapse and continued to exercise for some time at the durations and frequencies according to the program. Some fought the urge to give up, and resumed their program, only to lapse again and to finally discontinue exercise totally. In many cases participants, in hindsight, blamed lack of will-power and self-motivation and resolved to recover their ambition and continue exercising when the weather became more conducive; when their routines became more stabilized, for

instance when they returned back to work; or when their spouses and children were back at work or school.

Successful continuity with the self-managed exercise program in the face of diabetes-specific risks has not been fully addressed in this study. Cunningham (1987) claims that initial screening for cardiovascular complications should exclude those most at risk, and only then should exercise programs, no different from exercise prescriptions written for the non-diabetes adult of comparable age and mobility, be introduced to the healthy mature-onset diabetes sufferer. In this study that advice was followed; the initial pre-test health check and doctors diagnosis isolated and subsequently removed from program participation those participants who were at cardiovascular risk at the time of pre-test. It was expected that the diabetes condition and associated obesity may have been prime factors contributing to the challenge and would have figured more prominently in the analysis of high risks. Interestingly, few participants cited their diabetes condition as contributing to their lapse or relapse. Apart from the foot injury mentioned earlier, no diabetes-specific symptoms as such, were reported at post-test or follow-up.

Environmental and personal conditions, not necessarily specific to their disease, precluded participants' continued involvement with the self-managed exercise program, resulting in lapse and relapse. There is inadequate evidence from this study to offer claims about exercise adoption and maintenance in high-risk situations which are solely specific to Type II diabetes sufferers.

CHAPTER 9

CONCLUSIONS

9. 1. THE IMPACT OF THE SELF-MANAGED EXERCISE PROGRAMME.

The findings of the study suggest a number of conclusions which may be drawn when consideration is given to providing an exercise program for Type II diabetes sufferers. The proposition put forward throughout this study that most people who engage in exercise for 20 to 40 minutes per day, three days per week, at an intensity level of 40-60 per cent of maximal heart rate will derive at least some health-related benefit associated with improved cardiac fitness and achievement of optimum body weight.

Individuals given the structured, well designed exercise program showed a willingness and an ability to exercise. As a result of this program, the self-managed exercise group experienced an increase in self-reported caloric expenditure and greater weight loss in comparison to the control group. While the predominant exercise mode was basically of moderate intensity, it has been argued (Sallis et al, 1985) that although moderate-intensity activity such as walking will probably not greatly effect cardiovascular conditioning, such activities provide some measure of protection against heart disease. Thompson, Jarvie, Lahey and Cureton (1982) argue that moderate physical activities, in which classification brisk walking qualifies,

will assist in weight reduction. Sallis et al. (1982) state that a moderate-intensity activity such as walking will assist in the behavioural shaping process thus helping people to become more vigorously active.

Some statistically significant differences were found between those in the intervention group and those participants in the control group; those persons in the self-managed exercise condition exercised at a greater frequency than those in the control group, however there was no corresponding improvement in exercise session duration. Most participants engaged in some form of moderate exercise activity, which approximates a caloric expenditure of between 3.0 to 5.0 MET's. This translates into a heart rate of about 70 to 75 per cent of maximum heart rate (Cantu, 1987), a rate which would satisfy the American College of Sports Medicine (1978) criteria for exercise which may increase or maintain cardiorespiratory fitness.

The attrition rates to the prescribed exercise program found in this study are to be expected, and similar rates have been reported elsewhere (Dishman 1988, Martin, & Dubbert, 1982, 1984, 1985). The trend for some to drop out early, and the negatively accelerating adherence graph resulting from adherence vs. time calculations found in the study supports other research findings and suggests that Type II diabetes sufferers behave little differently in their adherence patterns from other clinical, or indeed, non-clinical exercise groups. It should be kept in mind that those participants choosing not to stay with the program may have, and indeed reported that they had,

undertaken some deliberate physical activity but not within the intensity, the frequency or the duration criteria of the suggested program.

The most conservative interpretation of this section of the study is that over the twelve-week intervention and without peer support or individualized frequent feedback, the self-managed exercise program was effective in terms of increasing physical activity. Despite the self-selection process which resulted in a less than hoped for participation rate and the methodological deficiencies of this study, the results may be generalizable to Type II populations elsewhere.

Apart from the foot injury suffered by one of the participants, no member of either group reported any deleterious diabetes-specific after-effects, (eg. hypoglycaemic reactions, cardiac difficulties) as a result of the exercise program *per se*, although there were some participants, who were physically affected by the adverse weather conditions existing during the study and who prematurely terminated their program.

9.2. PREDICTORS OF PHYSICAL ACTIVITY CHANGE AND ADHERENCE IN TYPE II DIABETES SUFFERERS

Partial support for the hypotheses generated by the relapse prevention model is claimed. The study found that over 40 per cent of the variance in caloric expenditure estimates could be predicted by measures of exercise outcome expectancies, self-motivation and self-efficacy, although only two of these indicators, outcome expectancies

and self-efficacy, contributed significantly to the prediction of caloric expenditure.

The inability of the exercise-specific psychological variables to correlate significantly with, and predict, exercise adherence (number of weeks adherence to the program), requires an explanation.

Bandura (1986) argues that self-efficacy is not a constant personality trait, but reflects the intricate and frequently changing interaction of personal behavioural, social environmental and internal physiological influences; as individuals are differentially exposed to these inputs, their self-efficacy judgement will undoubtedly fluctuate. Thus, it is probable that the range of inputs experienced over the exercise program may have shaken self-efficacy judgements made by the participants, judgements which failed to be supported in times of uncertainty and in the face of risk situations. This lack of self-mastery in diabetes-specific situations may indicate a flaw in the design of the assessment protocols. For instance, it was shown that there was a high correlation between self-reported caloric expenditure and the cognitive outcome expectancies scale - a scale which was constructed with the sedentary condition in mind. It could be argued that future exercise-specific self-efficacy measures be constructed more closely to the diabetes condition, taking into account the expected personal/behavioural, social/environmental and internal physiological constraints imposed by this disease.

As hypothesized, those persons suffering a lifestyle imbalance, (operationalized in this study by psychosocial dissatisfaction,

psychological disturbance and negative psychological affect), were less able to sustain an exercise program than those who apparently enjoyed a more psychologically healthy outlook. Three of the independent variables contributed significantly to prediction of number of weeks exercise program participation: ie. the General Health Questionnaire scores, Profile of Mood States and the Psychosocial Adjustment scores. The three variables in combination accounted for about 29 per cent of the variance in reported exercise adherence, a not altogether disappointing result considering the high intercorrelations between all three variables. This finding may have relevance to educators and health professionals associated with the Type II diabetes population, ie. a simple initial screening to detect anxiety, depression and minor psychological dysfunction may assist the identification of those patients who are drop-our prone and who may need additional educative input - either about exercise and its benefits or their individual cardiovascular capabilities and limitations for exercise - to influence their ability to adhere.

9. 3. CHALLENGES TO EXERCISE MAINTENANCE: RESPONSE TO HIGH-RISK SITUATIONS

The results from the examination of actual situations which caused lapses and relapses in the program's requirements suggest that the self-managed exercise program used in this study may be a safe and effective program from Type II diabetes sufferers whose condition is not complicated by cardiovascular dysfunction.

While the divisions between the three major categories of high-

risk situations, ie. physical/emotional, lifestyle and environmental, were not straightforward, the study found that just under a third (30 per cent) of all participant-experienced high-risk situations were as a result of physical or emotional situations or a combination of the two. Minor psychological dysfunctioning was cited as the major reasons for dropout, anxiety and depression were expressions many participants used in summarizing their reasons for lapsing. As may be expected in the major holiday period, just under half (46 per cent) of the situations which initiated lapse or relapse resulted from lifestyle. Most often these situations came about as a result of significant others such as immediate family, who, influenced the participants and caused a disruption to the exercise routine. Finally, it was shown that the participant's environment, ie. where they felt they could exercise most effectively, influenced their decision to discontinue exercising, accounting for just under a quarter (24 per cent) of the reported high risk situations.

Unexpectedly, the decisions which led to an initial lapse and which contributed toward a final relapse in exercise maintenance were not necessarily connected to the diabetes condition and it is probable that a non-clinical group of comparative age and fitness may have experienced the program little differently.

In considering the resources the patient can bring to altering their behaviour and deciding to adopt healthier lifestyle patterns, educators and health professionals need to be mindful of their patient's circumstances; not only their physiological limitations but

as well, their emotional stability, their lifestyle, and the environment in which the behaviour change is expected to occur.

9. 4. LIMITATIONS IN THE PRESENT RESEARCH

9. 4.1. Threats to Validity

9. 4.1.1. Expectancy

Even though most, if not all, measures were based on self-report protocols, implicit investigator demand and subject expectancy bias may have influenced this study. Firstly, the investigator carried out all phases of the research and it is possible that demand characteristics were unintentionally introduced due to *a priori* beliefs about exercise. Next, the requirements of the various ethics committees that a detailed informed consent form and associated purpose-of-study information sheet be distributed to each participant meant that the participants were, from the start, fully informed about the nature and the expected directions that the research project would be likely to take. It is believed that this inadvertently increased subject expectancy. Finally, there was reason to believe that premeditated physical activity 'spontaneously' took place in the control group subsequent to the pre-test assessment, partly as a result of information included on the consent information sheet.

Rosenberg (1969), found that respondents are apprehensive about being evaluated by persons whom they believe to be experts in personality modification or the assessment of human skills. In the

present study, that particular threat may have been operating when the Profile of Mood State assessment and the General Health Questionnaire were being administered. Particularly with male participants, there may have been an attempt to present themselves as psychologically healthy. It seemed in some cases that husbands, who were in attendance whilst their wives completed the assessment, attempted to influence their wives to answer in a more psychologically healthier direction, ie. husbands attempted to sway their wives against reporting negative psychological affect and lower degrees of psychological functioning.

9. 4.1.2. Selection bias

Feinstein (1975) argues that self-selection by the motivated introduces a serious source of bias into controlled studies such that the degree of impact of the exercise intervention and the resulting habitual physical activity in a particular population may be wrongly estimated.

Self-selection bias was likely to have occurred in the present study as a result of the recruitment procedures adopted. Had the research design been based upon clinic visits, ie. interviewing potential participants as they came into contact with the The Queen Elizabeth Hospital Diabetes House, a more representative and perhaps larger sample may have been selected.

9. 4.1.3. Participant numbers

Reference has already been made to the implications of the relatively small number of participants taking part in this study (See Chapter 6, Section 6. 4.). The analysis has shown that the power, ie the probability of getting a significant result, or alternatively, the probability of rejecting the null hypothesis, is directly related to both the effect size and the sample size (Cohen,1977). A larger participant sample would have yielded better estimates of the population parameters and would have more likely that the null hypothesis would have been rejected in confidence, when it was correct to do so. A larger effect size, say in the order of d = 0.5 - 1.0 particularly in the measures of increases in post-test caloric expenditure and increased weight loss, would also have meant greater confidence in either rejecting or accepting the null hypothesis. While it was shown that the differences in the means of post-test weight-loss were significant across the experimental conditions and thus, there was evidence to reject the null hypothesis, the small power values associated with this research area gives us very little confidence in that rejection process.

9. 4.1.4. Construct validity

Instruments which were selected to measure the relapse prevention model's concepts of lifestyle imbalance must be considered critically. Marlatt and Gordon's (1985) concept of lifestyle imbalance suggests that the principal aim in lifestyle assessment procedures in

the addictive disorders, is to determine the extent to which the persons' daily "activities contain a sufficient pattern of coping strategies to balance out or offset the impact of various life stressors." (Marlatt and Gordon, 1986, p.284.)

It could be argued, however, that a more appropriate measure of lifestyle imbalance, similar in design and intent to the instruments described by Marlatt and Gordon, for example the Hassles scale; the Uplift scale, and the Daily Want-Should Tally form (Kanner, Coyne, Schaefer, & Lazarus, 1981), be introduced for those persons suffering from Type II diabetes and which may provide a clearer understanding of the internal/external demands. The rationale for selecting the chosen assessment instruments were based upon the assumption that people suffering a "shoulds" versus "wants" imbalance would be expected to experience dissatisfaction in relation to the day-to-day lifestyle issues, would experience greater levels of anxiety, tension and depression, and would most likely exhibit minor psychiatric morbidity compared to those persons who were experiencing greater freedom from internal and external psychological demands.

In conclusion, the choice of instrument will, of course, determine what is being measured. In this research it is asserted that the Profile of Mood States, Psychosocial Adjustment and General Health Questionnaire instruments were in fact measuring psychological affect, psychosocial functioning and minor psychiatric morbidity respectively, and that these constructs directly mediated the impact of the various life stressors.

9. 5. DIRECTIONS FOR FURTHER RESEARCH

Specifically, the following research questions require further consideration.

1. For clinical populations facing long-term health problems such as diabetes sufferers, do self-efficacy, outcome expectancies, and self-motivation) contribute more to the understanding of regimen adherence, or, in the face of concerns about future health, are indices of psychosocial morbidity more relevant.

The development of a diabetes-specific, exercise-specific self-efficacy measure to complement the diabetes-specific exercise-outcome expectancies questionnaire, as well as a clearer, more readily comprehended version of the self-motivation questionnaire may provide a more suitable combination of instruments to better assess the contribution to exercise-adherence by the social-learning theory constructs.

2. The provision a more detailed medical assessment of participants in relation to cardiovascular risk factors in the Type II diabetes population may ensure that a larger, more comprehensive selection of participants be included in future surveys. The inclusion of persons more representative of late-adulthood and exhibiting cardiovascular symptoms may extend the generalization of future research.

9. 6. CONCLUSIONS

Clinical, physiological, as well as social and psychological outcomes of increased physical activity had been the focus of numerous contemporary studies which had critically addressed the issues of adherence in clinical populations. Contemporary research in diabetes mellitus suggested that increased physical activity reduces cardiovascular risk factors and may achieve improvements in insulin sensitivity and glucose metabolism through weight-loss. Research also suggested that increased physical activity ameliorated the psychological affects of ill-health; loss of self-esteem, depression and anxiety. Throughout the research however, it seemed that adherence/compliance issues were of paramount importance to diabetes educators and health professionals as they attempted to assist the diabetes sufferer to live with, and to manage their condition. The examination of the literature led to the conclusion that it would be appropriate to apply cognitive-behavioural psychological principles to investigate exercise adoption and maintenance of exercise in this clinical population.

The study aimed to use formally derived hypotheses to determine those influences affecting adherence to a exercise program. Its objective was to determine the psychologically based factors influencing exercise adherence in a Type II diabetes mellitus population who had been encouraged to adopt a self-managed, home-based exercise program.

The study has been accomplished within the clinical population.

The results indicate a modest overall improvement in fitness following the home-based exercise program.

The study also found a significant positive relationship between changes in levels of physical activity and the measures suggested by the relapse prevention model; ie. self-efficacy, outcome expectancies and self-motivation.

As well, the study confirmed that psychosocial functioning and lifestyle satisfaction influence adherence to regimens such as exercise participation; people feeling anxious and depressed, who see themselves in limiting circumstances and who experience very little satisfaction in areas of their life, will find it difficult to adopt new behaviour patterns.

Thus, as well as education designed to inform the patient about the expected effects and outcomes of the regimes prescribed, activities which increase psychological well-being and self-efficacy can be used by the diabetes health professionals to promote adherence.

APPENDIX CONTENTS

APPENDIX I

STATISTICAL INFORMATION FROM STUDY

TABLE 1. Means and standard deviations of estimated daily caloric expenditure per kilogram for all participants at time = T1 by selected demographic and physiological variables

Variables	Estimated daily caloric expenditure ($Kcal.kg^{-1}.day^{-1}$) Males N	Mean	SD	Females N	Mean	SD
Body Mass Index						
<19	-	-	-	1	55.9	-
20-25	4	38.3	1.8	1	49.5	-
26-30	9	37.9	4.8	4	43.3	5.9
>30	8	43.3	5.9	14	39.7	10.9
Do you believe that you are getting enough exercise?						
Yes	9	43.0	12.6	8	42.8	9.9
No	12	40.4	8.6	12	39.8	8.0
In past 2 weeks have you engaged in any vigorous activity?						
Yes	7	42.9	11.5	7	48.1	11.8
No	14	38.0	7.5	13	38.3	7.7
Are you smoking now?						
Yes	15	41.4	10.0	10	46.1	11.2
No	6	35.3	3.6	10	37.4	7.2
Are you on medication?						
Yes	16	39.9	10.0	12	39.8	10.6
No	5	38.6	5.8	8	44.6	9.5
Australian born?						
Yes	15	39.3	9.1	11	43.2	11.9
No	6	40.4	9.6	9	39.9	8.1
Marital status						
Never married	1	42.5	-	0	-	-
Married	18	39.8	9.6	15	39.9	9.0
Separated	0	-	-	1	67.3	-
Divorced	0	-	-	3	39.6	5.8
Widowed	2	36.7	6.1	1	49.5	-
Total	21	39.6	9.1	20	41.7	10.2

TABLE 2. Breakdown of estimated caloric expenditure with cardiovascular symptoms: All respondents.

Variables	Males			Females		
	n	Mean	(SD)	n	Mean	(SD)
Cardiac & Hypertensivity status						
Pain in chest						
Yes	10	37.41	(4.60)	8	40.53	(12.12)
No	11	41.69	(11.64)	12	42.50	(9.21)
Heaviness in chest						
Yes	6	36.53	(5.64)	6	43.00	(14.15)
No	15	40.90	(10.00)	14	41.16	(8.62)
Shortness of breath						
Yes	4	37.92	(6.75)	7	41.82	(13.29)
No	17	40.07	(9.65)	13	41.65	(8.76)
High blood pressure						
Yes	7	34.75	(3.62)	9	40.32	(11.91)
No	14	42.11	(10.04)	11	42.85	(9.03)
Angina						
Yes	2	38.44	(2.19)	2	40.17	(14.29)
No	19	39.78	(9.52)	18	40.77	(8.51)
Heart attack						
Yes	2	36.32	(0.81)	1	33.00	(-)
No	19	40.01	(9.47)	19	42.17	(10.28)
Stroke						
Yes	1	40.00	(-)	1	40.00	(-)
No	20	39.64	(9.29)	20	41.71	(10.21)
High cholesterol						
Yes	3	36.29	(0.57)	7	36.38	(7.33)
No	18	40.22	(9.70)	13	44.58	(10.62)
High triglycerides						
Yes	3	36.69	(0.47)	4	33.72	(0.81)
No	18	40.15	(9.73)	16	43.71	(10.52)
Treatment to control:						
Blood pressure						
Yes	9	38.20	(8.82)	10	39.68	(11.41)
No	12	40.75	(9.46)	10	43.74	(8.99)
Blood fats						
Yes	1	35.75	(-)	4	38.67	(9.54)
No	20	39.85	(9.25)	16	42.47	(10.52)
Diet						
Yes	14	41.47	(10.44)	15	41.13	(10.06)
No	7	36.03	(3.77)	5	43.47	(11.66)

TABLE 3. Means and standard deviations of potential participants' psychological (exercise-specific) variables

Variable	Mean	SD
Psychological		
Self-efficacy	410.8	148.5
Self-motivation	17.4	3.9
Social support for exercise	29.8	6.6
Exercise outcome expectancies		
Cognitive	54.2	15.9
Motivational	73.4	15.9

TABLE 4. Frequencies of people reporting vigorous exercise performance in control and intervention groups:Pre-test, post-test and follow-up

Reported vigorous exercise in past two weeks				
	Groups			
	Control		Exercise	
	N	%	N	%
Pretest				
Reporting				
Yes	3	23.1	5	27.7
No	10	76.9	13	72.2
Post-test				
Reporting				
Yes	1	7.7	7	43.8
No	12	92.3	9	56.3
Follow-up				
Reporting				
Yes	1	7.7	8	50.0
No	12	92.3	8	50.0

TABLE 5. Means and standard deviations of physiological, exercise-specific psychological, and psychosocial predictor variables for both control and self-managed exercise group

Variables	Condition			
	Control group (n = 13)		Exercise group (n = 16)	
	mean	(SD)	mean	(SD)
Variable				
Age at survey	51.2	(5.9)	48.3	(7.4)
Age at diagnosis	46.6	(6.9)	42.7	(7.7)
Body mass index	30.7	(6.2)	29.8	(4.9)
Weight	88.4	(16.8)	84.6	(15.9)
Self-efficacy	482.9	(112.5)	427.0	(123.2)
Self-motivation	24.3	(5.2)	20.9	(9.1)
Exercise outcome expectancies				
Cognitive	56.3	(15.7)	56.5	(16.6)
Motivional	78.0	(16.4)	74.4	(16.7)
Social support for exercise	29.2	(8.5)	31.4	(3.3)
General Health Questionnaire score	23.7	(7.3)	21.4	(4.7)
Psychosocial Adjustment score	79.1	(18.8)	77.2	(16.5)
Profile of Mood States				
Depression/dejection	43.7	(8.3)	44.3	(6.7)
Fatigue	46.0	(9.7)	47.5	(9.8)
Tension/anxiety	43.7	(8.1)	43.2	(6.1)
Vigour	53.0	(7.3)	51.0	(9.4)

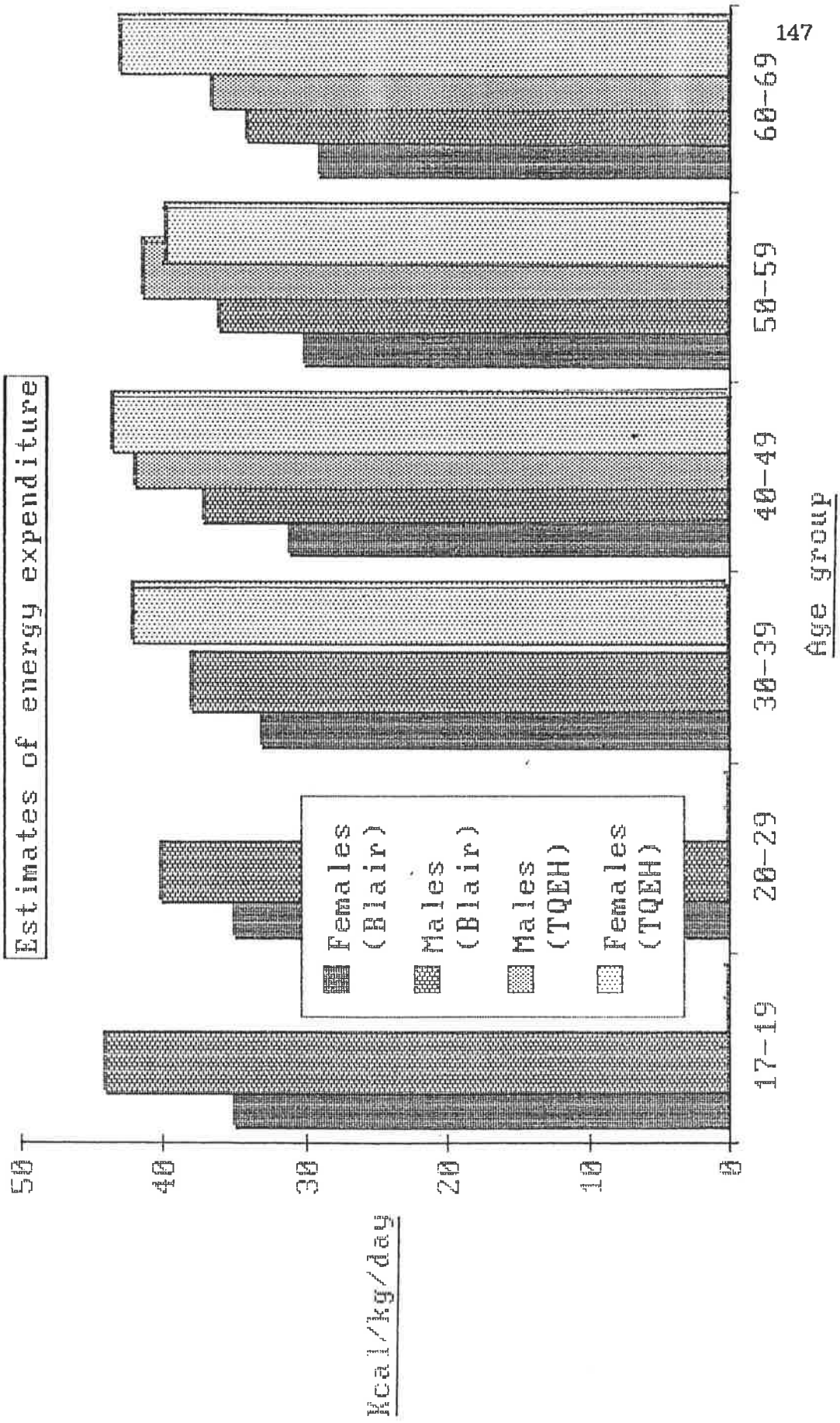


Figure 1. Estimated caloric expenditure for current sample and a US non-clinical population (Blair,1986)

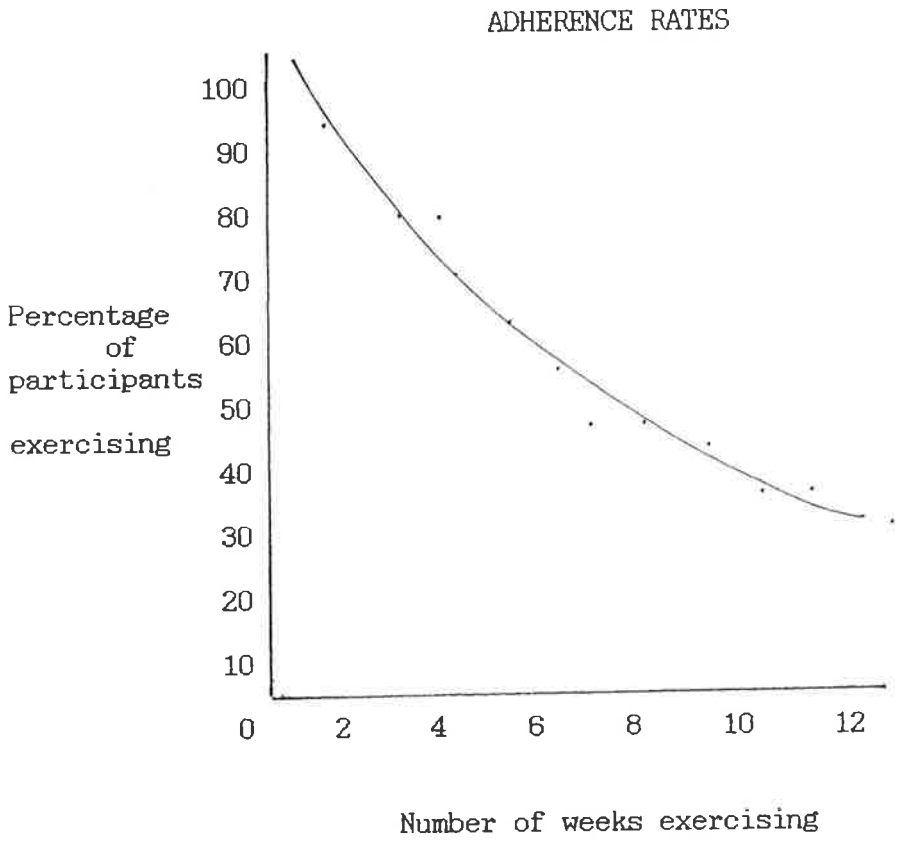


Figure 2. Program adherence: Percentage of exercisers maintaining specific exercise over the 12-week program

APPENDIX II:

GENERAL INFORMATION FROM STUDY

THE UNIVERSITY OF ADELAIDE

BOX 498, G.P.O., ADELAIDE, SOUTH AUSTRALIA 5001

APPENDIX 1.1

Thursday 25th August,1988

Doctor,«first» «name»
«address»
«town»,«state», «postcode»

Dear Doctor «name»

The Psychology Department of this University has asked assistance from both the Queen Elizabeth Hospital and the Royal Adelaide Hospital for a co-operative joint research project with Type II diabetes mellitus patients.

The project requires recruitment of Type II diabetes sufferers who have passed through the respective hospital's endocrine and diabetes units. The people so recruited will be approached to participate, initially in an extensive test battery questionnaire based upon seeking answers to adherence/compliance issiues with respect to moderate exercise.

Secondly, participants may be requested to engage in a trial where a programmed, self-managed moderate exercise regime, specifically designed for elderly and obese patients, is put into operation.

I am writing to you initially, as a medical practitioner in the north western suburbs, to inform you of our intention and to alert you to the possibility that your patients may be approached to join in this research project.

As soon as our researchers involved in the recruitment and questionnaire phase of the project become aware that your particular patients are involved, I will contact you and provide you with further information about the project and the planned interventions which we shall be using.

The following professionals constitute the supervision and technical liason associated with this project.

Dr Pat Phillips,Director Endocrine and Diabetes Services,The Queen Elizabeth Hospital.

Dr Phillip Harding, Director,Endocrine Unit,Royal Adelaide Hospital.

Dr Cris Cooper MB BS.,Senior Lecturer,Department of Psychology,The University of Adelaide.

Dr Neville Owen,PhD.Senior Lecturer,Department of Community Medicine,Royal Adelaide Hospital.

Mr Chris Edwards, Clinical Psychologist,Beaufort Clinic,Woodville.

Should there be any queries, would you please direct them to the undersigned who is the chief investigator on the project.

Your sincerely,

Max.W.Simmons

ARMIT,ARACI,BA (Hons) Adelaide
Diabetes Counsellor.

quote

151

28 Woodville Road
Woodville South
South Australia 5011
Telephone (08) 450222
International +618450222
Telex QEHOSP AA89365
Facsimile (08) 243 6806

APPENDIX 1.2

Friday 2nd August, 1988

«STATUS», «FIRST» «SURNAME»
«ADDRESS»,
«TOWN» «POSTCODE»

Dear «status» «surname»

The Queen Elizabeth Hospital in conjunction with The University of Adelaide is conducting a research programme to investigate certain aspects of the Type II diabetes condition.

I believe that you will be in a position to assist in this important project. The Diabetes Service has provided the University staff with the names of selected people who have passed through Diabetes House at Woodville. In the near future, the University of Adelaide will be in contact with you and you may be asked to assist in the survey and the following research programme.

I urge you to provide the chief investigator, Mr Max Simmons with as much assistance as you can in this most important survey - the results of which could be of major benefit to diabetes sufferers throughout Australia.

Yours sincerely,

Dr Pat Phillips,
Director,
Endocrine and Diabetes Services.

THE UNIVERSITY OF ADELAIDE

BOX 498, G.P.O., ADELAIDE, SOUTH AUSTRALIA 5001

Exercise Adherence - Type II

Appendix II·3

Dear Sir or Madam,

The Diabetes Service of the Queen Elizabeth Hospital has organized a research project involving exercise and diabetes. We seek your help with this work.

Over 60 years after drugs became available for diabetes sufferers, diabetes still remains a significant health problem in Australia. The majority of people with diabetes develop their disease after age 40. These people who have "adult onset" diabetes (Type II diabetes), are the people who we wish to interview and from whom we request assistance in developing a research programme.

Initially, we would seek your assistance in providing answers to a comprehensive questionnaire and health survey. Your responses to all questions will remain absolutely confidential and neither your name nor any other identifying characteristics will be recorded with your questionnaire responses. At any stage in the programme you may withdraw without prejudice.

IF YOU USE INSULIN INJECTIONS TO CONTROL YOUR DIABETES.

If you are required to use insulin injections to keep your diabetes under control, please disregard this letter. The project is concerned only with those patients who use diet and/or tablets to control their diabetes.

IF YOU DO NOT WISH TO TAKE PART IN THE PROJECT.

If you do **not** wish to be included in this project, ignore this letter. If we do not hear from you we will assume that you do not wish to take part in this project and we will not contact you further.

IF YOU WISH TO TAKE PART IN THE PROJECT.

If you decide to be included in this project and give your assent for our interviewer to make contact with you, please fill out your name and address on the enclosed slip, place it in the enclosed reply-paid envelope and post the envelope as soon as convenient. The research interviewer will make contact with you and outline the nature of the project and you will have an opportunity to discuss your involvement, or alternatively you may decide to withdraw from the project.

Whilst we encourage you to assist in this survey in whatever way you can, you are under no obligation to do so and your treatment at this hospital would not be prejudiced in any way.

We look forward to your co-operation in this programme and to make contact with you in the near future.

Yours Sincerely,

Max. W. Simmons,
Diabetes Research Counsellor, Diabetes Services.

THE UNIVERSITY OF ADELAIDE

BOX 498, G.P.O., ADELAIDE, SOUTH AUSTRALIA 5001

Exercise Adherence – Type II

Appendix: 11·4

December 9th ,1988

Doctor «FIRST» «NAME»
«ADDRESS»
«TOWN» «STATE» «POSTCODE»

Dear Dr. «name»,

In mid-August of this year I wrote to most doctors in the north-western suburbs advising them of a research project that was being undertaken by the Psychology Department of the University of Adelaide in conjunction with the Endocrine & Diabetes Service of The Queen Elizabeth Hospital.

I apologise if you did not receive a copy of that letter but include an extract, below:

'The Psychology Department of this university has asked assistance from both The Queen Elizabeth Hospital and The Royal Adelaide Hospital for a co-operative joint research project with Type II diabetes mellitus patients.
The project requires recruitment of Type II diabetes sufferers who have passed through the respective hospital's endocrine and diabetes units. The people so recruited will be approached to participate, initially in an extensive test battery questionnaire based upon seeking answers to adherence/compliance issues with respect to moderate exercise.
Secondly participants may be requested to engage in a trial where a programmed self-managed moderate exercise regimen, specifically designed for the middle-aged and overweight subjects, is put into operation.'

At this stage only those people who have passed through Diabetes House (TQEH) have been recruited.

As part of the survey, I am interviewing all consenting participants in their own home and have obtained from them, answers to a variety of questions designed to find out about their attitudes towards exercise, their overall self-motivation, and their psychological mood states. As part of the test battery, the participants are also been asked to complete the abridged version of the General Health Questionnaire.

I have also recorded their weight and height, and where their overall fitness and cardiovascular/respiratory history have been judged by them to be adequate, I have requested that they attempt a Harvard Step test. As you may be aware, this test involves the measurement of the Exercising Pulse rates via a stepping motion on a step (approximately 16 " high), performed for 4 minutes, or alternatively, up until that time (before 4 minutes have elapsed) where the participant wishes to terminate the test. Post Exercise Pulse rates are then taken with the participant at rest for the following 6 minutes or until the pulse rate returns back to near resting rate.

Consenting participants who were judged fit were randomised into either:
(a) No Exercise Control group or (b) an Exercise intervention group. The intervention proposed being a twelve week self-managed (reasonably) low-level exercise programme based upon the recent book, *Getting Fit*, (Owen,N. Lee,C & Gilbert,A.(1987), Adelaide: ACHPER:). Extracts illustrating the intensity, duration and mode of the 12 week exercise programme are enclosed for your perusal.

Where participants have been placed in the exercise intervention, it has been stressed both in writing and orally by the researcher, that should they have any queries concerning their ability to exercise at the levels suggested and indicated by the book, *Getting Fit*, they are to contact their doctor and discuss the exercise programme and their fitness or otherwise to proceed.

Overall, the research programme is designed to assist in an understanding of adherence/compliance to health related behaviour and is based upon the Relapse Prevention model proposed by Marlatt and Gordon. (Marlatt,G.A. & Gordon,J.R. (Eds.) (1985) *Relapse prevention: Maintenance strategies in the treatment of addictive behaviours.* New York: The Guilford Press).

Participants who have expressed an interest in joining the survey and who are judged fit enough to procede into the exercise programme phase have been recruited; the names of your patients involved in the survey and in the exercise programme thus far, are shown below.

Also, the names of your patients who are judged physically unfit to enter the exercise programme have been placed 'on hold' until I have received your authority to proceed and your permission to recruit them into the exercise phase of programme. Their names and the reasons for their exclusion are also set out below. Enclosed is a consent form requesting your permission to include, and a return paid postal envelope. Your co-operation is requested.

I trust that this information will be useful and prove beneficial should your patients bring their queries about the programme to your attention. We would also value your comments concerning the relevance or otherwise of the particular programme. Should there be any queries, please contact me at my home (332 9205) during the following times.

AM: Monday,Wednesday,Thursday & Friday.0830 - 0900.
PM: Monday,Tuesday & Friday. 1800 - 2200.

Yours faithfully,

Max. W. Simmons,
Diabetes Research Counsellor,
Psychology Department,
The University of Adelaide,

Participants who have been recruited into exercise programme

Name of Doctor.
«status»,«first»,«name»
«address»
«town» «state» «postcode»
Name & address of Participant.

Participants where doctor's authority and permission are required before entry into exercise programme

Name of Doctor
«status»,«first»,«name»
«address»
«town» «state» «postcode»

Name and address of Participant.

Reasons for exclusion.

Date interviewed.

Patients Name.

Symptoms of Concern.

"I consider that the above patient: (cross out which does not apply)

is physically capable,

is not physically capable,

of undertaking exercise as described in the extracts of the publication, Getting Fit (Owen,Lee & Gilbert, 1987)

Signed

Date

Name & Address of doctor.

.....

Patients Name.

Symptoms of Concern.

"I consider that the above patient: (cross out which does not apply)

is physically capable,

is not physically capable,

of undertaking exercise as described in the extracts of the publication, Getting Fit (Owen,Lee & Gilbert, 1987)

Signed

Date

Name & Address of doctor.

WHY PEOPLE WITH TYPE II DIABETES COULD EXERCISE MORE

RESEARCH HAS SHOWN THAT PEOPLE WHO EXERCISE ON A REGULAR BASIS;

* AT LEAST THREE TIMES A WEEK,
* FOR ABOUT 20 TO 40 MINUTES PER EXERCISE SESSION, AND
* WHO EXERCISE AT ABOUT 60 TO 70% OF THEIR MAXIMAL HEART RATE;

WILL IMPROVE THEIR POTENTIAL FOR WEIGHT LOSS AND THUS HELP TO REVERSE THEIR DIABETIC CONDITION.

ALSO, RESEARCH HAS SHOWN THAT REGULAR EXERCISE IMPROVES:

* FEELINGS OF WELL BEING AND CONFIDENCE;
* A LESSENING OF ANXIETY
* A REDUCTION IN THOSE FEELINGS OF NOT BEING ABLE TO COPE;
* REDUCES BLOOD-CHOLESTEROL LEVELS;
* LOWERS BLOOD PRESSURE AND AIDS CIRCULATION; AND
* HELPS TO LOWER AND CONTROL BLOOD SUGAR (GLUCOSE).

FOR OVERALL HEALTH, REGULAR EXERCISE WILL DO THE FOLLOWING:

* STRENGTHENS HEART, LUNGS AND BONES.
* RELIEVES STRESS;
* BUILDS STRENGTH AND ENDURANCE;
* INCREASES ENERGY;
* TONES AND FIRMS MUSCLES;
* IMPROVES SLEEP; AND
* ENHANCES A SENSE OF WELL-BEING.

ONE OF THE EASIEST WAYS OF REGULAR EXERCISING IS BY WALKING.

REGULAR AND BRISK WALKING.

IT'S GOOD FOR ALL AGES AND ALL SHAPES AND SIZES

WHAT IS MORE, WALKING:

* NEEDS NO LESSONS: WE HAVE WALKED SINCE WE WERE BABIES;
* COSTS ABSOLUTELY NOTHING; APART FROM PROPERLY FITTED SHOES
* FITS IN WITH OUR DAILY ROUTINE;
* IS VERY SAFE, DOES NOT REQUIRE A LOT OF STRENGTH, AND
* CAN BE DONE JUST ABOUT ANYWHERE AND WITH A FRIEND.

WALKING - ESPECIALLY FOR THE MIDDLE AGED PERSON WHO IS SUFFERING FROM DIABETES ... NEEDS TO BE DONE WITH THOUGHT.

THEREFORE FOR SAFE WALKS:

* NEVER WALK BAREFOOT;
* WEAR PROPERLY FITTED SHOES (NOT TENNIS OR STREET SHOES, BUT SHOES SPECIFICALLY DESIGNED FOR WALKING);
* WEAR COTTON SOCKS.
* CHECK FEET FOR INJURIES; AND NOTIFY YOUR DOCTOR IF BLISTERS OR PAIN ON WALKING DEVELOPS;
* WEAR LOOSE FITTING CLOTHING AND DRESS FOR THE WEATHER (HAT AND GLOVES IN COLD WEATHER).
* BE ALERT TO SYMPTOMS OF LOW BLOOD SUGAR (WEAKNESS, SWEATING, DIZZINESS, ETC.)
* CARRY SOME SOURCE OF FAST-ACTING SUGAR, SUCH AS ORANGE JUICE OR HARD BOILED LOLLIES.
* DON'T LET YOURSELF GET THIRSTY - TAKE SOME FLUIDS WITH YOU.

ONE STEP AT A TIME.

* KEEP BACK STRAIGHT, HEAD ERECT;
* TAKE LONG EASY STRIDES;
* SWING ARMS LOOSELY AT SIDES;
* SMILE A LOT AND BREATHE DEEPLY.

TRAIN, DON'T STRAIN

* WARM-UP AND COOL DOWN (ALWAYS BEGIN AT A SLOW PACE)
* SLOW DOWN DURING THE LAST FIVE MINUTES OF THE WALK
* START A WALKING PROGRAM AT A COMFORTABLE PACE.
* SLOWLY INCREASE PACE AND DISTANCE.
* AIM FOR SAY, 30 TO 60 MINUTES AT LEAST 3-4 TIMES A WEEK.
* EVEN BETTER: BUILD UP TO AN HOUR A DAY (8 KILOMETERS)

BURN THOSE CALORIES

3 km.of level walking	burns 140-190 calories
4 km.of level walking	burns 190-250 calories
5.km.of level walking	burns 250-340 calories
6.km.of level walking	burns 340-420 calories
8.km.of level walking	burns 420-480 calories

THANK YOU FOR AGREEING TO PARTICIPATE IN THE UNIVERSITY OF ADELAIDE SPONSORED DIABETES RESEARCH PROJECT. WE TRUST THAT AT THE END OF THE PROJECT YOU WILL HAVE LOST WEIGHT, FEEL MORE IN CHARGE AND MOST IMPORTANTLY, YOU WILL FEEL FITTER.

OVER THE NEXT THREE DAYS WE WOULD ASK YOU TO DO TEN IMPORTANT THINGS.

1. Please would you read Chapters 1, and 2, of the book ***GETTING FIT***, paying particular attention to the section on page 2, ***Exercise and your Health.*** You may need to see a doctor and have a check-up before undertaking this fitness programme; we will determine that presently.

Also at this stage, think about the exercise activity you believe will best fit your individual needs; at a later stage, if you wish, you can change to another exercise style.

2. Would you also read Chapter 3 - all the way through, very carefully. When you have read it, turn back to pages 12 and 13 and check your **Resting Heart (Pulse) Rate.**

It will probably be about .....beats per minute .

3. Turn to page 42 and select your particular exercise activity for the first week.

4. Read the section entitled ***Preliminary fitness test***, in Chapter 3, page 13 and do the simple fitness test described. *Record both your Resting Heart Rate and your Exercising Heart Rate in the section provided on page 13.* This result will be collected from you later on in the programme.

5. Go out and try your first exercise session - *but take it carefully.* Before and after the activity, record your Resting Heart Rate and your Exercise Heart Rate. and write it down in the Exercise Planning and Record Sheet on page 61. *If your Exercising Heart Rate is HIGHER than .....beats per minute, which is the Upper Limit of your exercising heart range, please slow down and consult your doctor and ask whether he or she thinks exercise will be beneficial for you..*

6. Read Chapter 4, paying attention to page 18, the section entitled ***How to use the exercise planning and record sheets.*** Please note carefully that for this research project *you need to record your Resting Pulse Rate before any exercise sessions, and your Exercising Pulse Rate immediately after or during your exercise sessions.*

7. Read Chapters 5, paying particular attention to the section ***Injuries and how to avoid them***. This is most important for people who suffer from diabetes.

8. Read Chapter 6, carefully, it will be useful for you. We all lapse and get lazy and there will be times when you just don't feel like doing your exercise. That's the time to read Chapter 6 again.

9. Read pages 40 and 41 in **Chapter 7**. Go easy and at your own pace.

10. Please remember - for each day that you exercise, *fill out your EXERCISE PLANNING AND RECORD SHEETS* (starting on page 61), *your HEART RATE CHARTS* (on page 56),*and your WEIGHT LOSS OR GAIN.* (on page 58).

You will be contacted during the next twelve weeks and the information that you have collected will be processed. Remember that your name does not appear on any University records at all.

WALK YOUR WAY TO HEALTH

TIPS FOR THE TYPE II DIABETIC PATIENT

"Everybody's talking about a new way of walking." Remember these song lyrics? Well, it's true. Everyone is talking about walking. And they're not talking about a leisurely stroll. They're talking about regular and brisk walking ... how it's great for everyone—all shapes, all ages. Best of all, doctors everywhere are talking about how walking can be just the exercise you need to help control your Type II diabetes—the ideal way to a longer and healthier life.

THE EASIEST EXERCISE

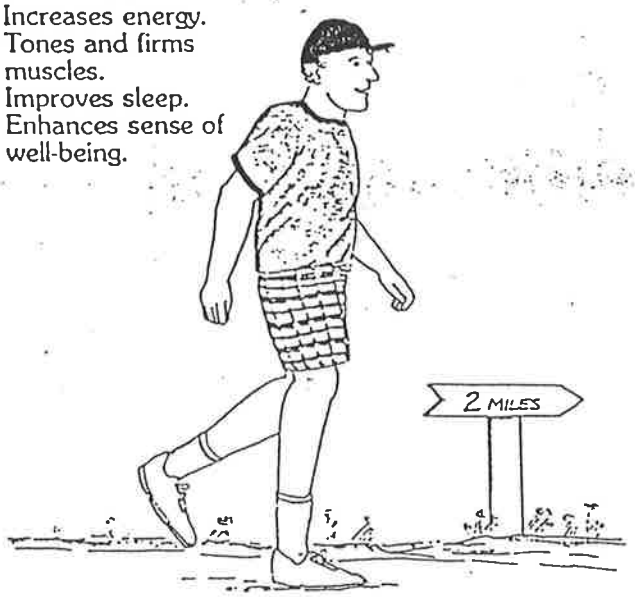
- Needs no lessons.
- Adapts anywhere, anytime, anyplace.
- Rates highest safety marks.
- Costs nothing.
- Fits into daily routine.
- Boasts low dropout rate.
- Requires less strength than other sports.

FOR SAFE WALKS

- Never walk barefoot.
- Wear properly fitted shoes (not tennis or street shoes, but shoes specifically designed for walking).
- Wear cotton socks.
- Check feet for injuries.
- Notify doctor if blisters or pain on walking develops.
- Wear loose-fitting clothes.
- Dress for the weather (hat and gloves in cold).
- Be alert to any symptoms of low blood sugar (weakness, dizziness, sweating, etc.).
- Carry a source of fast-acting sugar, such as orange juice or hard candy.
- Take extra fluids.

FOR OVERALL HEALTH

- Strengthens heart, lungs, and bones.
- Relieves stress.
- Builds strength and endurance.
- Increases energy.
- Tones and firms muscles.
- Improves sleep.
- Enhances sense of well-being.



ESPECIALLY FOR YOU

- Aids circulation.
- Helps lower and control blood sugar (glucose).
- Helps lose and control weight.
- Lowers blood pressure.
- Reduces blood-cholesterol levels.

ONE STEP AT A TIME

- Keep back straight, head erect.
- Take long, easy strides.
- Swing arms loosely at sides.
- Breathe deeply.

TRAIN, DON'T STRAIN

- Warm-up and cool-down (always begin at a slow pace, slow down again during the last five minutes of walk).
- Start a walking program at a comfortable pace.
- Slowly increase pace and distance.
- Aim for ½-1 hour at least 3-4 times a week.
- Even better: build up to an hour a day (5 miles).

BURN THOSE CALORIES

Miles (Level Walking) Per Hour*	Calories Burned Per Hour
2	150-240
3	240-360
4	360-420
5	420-480

*Generally, 20 city blocks equal one mile.

Provided as a professional service by Hoechst-Roussel Pharmaceuticals Inc., Somerville, New Jersey 08876.

SYMPTOMS OF HYPOGLYCAEMIA

LOW LEVELS OF GLUCOSE RESULT IN IMMEDIATE PROBLEMS SUCH AS CONFUSION, WEAKNESS, TIREDNESS, UNCONSCIOUSNESS, AND EVEN CONVULSIONS.

SYMPTOMS OF HYPOGLYCAEMIC REACTIONS

*	UN-COORDINATION	*	SWEATING
*	FEAR OF LOSING CONSCIOUSNESS	*	TREMOR
*	BLURRED OR DOUBLE VISION	*	WEAKNESS
*	SLURRED SPEECH	*	PALPITATIONS
*	HUNGER	*	NAUSEA
*	MIND CONFUSION	*	HEADACHE
*	ODD BEHAVIOUR	*	THIRST
*	DRYNESS OF MOUTH	*	STUPOR
*	COLD FEELING	*	VOMITING
*	INTENSE ANXIETY	*	VERTIGO

THE UNIVERSITY OF ADELAIDE

BOX 498, G.P.O., ADELAIDE, SOUTH AUSTRALIA 5001

Please address correspondence to

CONSENT FORM

1. I(please print) .....
hereby consent to take part in the research project entitled:

"QUALITY OF LIFE & EXERCISE MAINTENANCE IN TYPE II DIABETES MELLITUS".

2. I acknowledge that I have read the Information Sheet entitled:

"TYPE II DIABETES MELLITUS AND EXERCISE".

3. I have had the project, as far as it affects me, fully explained by the research worker. My consent is given freely.

4. I have been given the opportunity to have a member of my family, or a friend present while the project is explained to me.

5. I have been informed that the information I provide will be kept confidential.

6. I understand that I am free to withdraw from the project at any time and that this will not affect the medical advise in the management of my health.

7. I am aware that I should retain a copy of this Consent Form, when completed, and the relevant "Information Sheet."

SIGNED.....
DATE.....

NAME OF WITNESS(if required).....

SIGNED.....
DATE.....

I, **MAXWELL WILLIAM SIMMONS** have described

to.....
the nature of the procedures to be carried out. In my opinion he/she understood the explanation.

SIGNED.....DATE.....

STATUS OF PROJECT.....

CONSENT FORM - INFORMATION SHEET

Research Committee Identification Number.....
QEH Ethics of Research Committee Identification Number...

THE UNIVERSITY OF ADELAIDE

BOX 498, G.P.O., ADELAIDE, SOUTH AUSTRALIA 5001

CONSENT FORM

TRIAL OF A SELF MANAGED EXERCISE PROGRAMME AND MAINTENANCE ENHANCEMENT IN NON-INSULIN DEPENDENT DIABETES PATIENTS.

Ethics of Research Committee Identification number.....

Objectives of the study

This study is primarily an investigation of current exercise habits in middle aged Type 11 diabetes mellitus patients. The programme will investigate how self-managed exercise programmes affect your quality of life, your emotional feelings and how exercise maintenance programmes may increase your participation in exercise.

As you are a diabetes sufferer, you should be aware of the potential effects that exercise may have on your general health. Proper consultation with your doctor is necessary before you can start exercising. You should also understand the possible bodily reactions and feelings that may come from exercise participation and know how to cope with them should they develop.

As a participant of the study will be asked, in the privacy of your own home, to answer a series of questions based upon the questionnaire derived for the National Heart Foundation survey (1987), and on a series of selected questionnaires constructed to find out such details as your: exercise awareness; confidence and motivation to exercise; mood states, general health and current quality of life. If you participate, you will also be asked to undergo a simple blood pressure measurement, a normal fasting blood sugar test and finally, a simple 'Step test' designed to measure your resting heart rate.

The survey will be designed to run for approximately 18 months; the questionnaires, blood tests and blood pressure measurements would be taken approximately four times over that period.

You will be free to withdraw from the project at any time without prejudice to further treatment.

SIGNED:

NAME:
ADDRESS:
PRINCIPLE INVESTIGATOR

MAXWELL WILLIAM SIMMONS:
THE UNIVERSITY OF ADELAIDE.

Telephone: (08) 228 5333 Telegraphic Address: UNIVAD Telex: UNIVAD AA 89141

APPENDIX III:

ASSESSMENT PROTOCOL

SECTION 1:

PERSONAL AND DEMOGRAPHIC INFORMATION

Client identification Number _____

Date of interview 1.|__ |__ |8_|#1
Date of interview 2.|__ |__ |8_|#2
Date of interview 3.|__ |__ |8_|#3

1. SEX #1
   MALE [1]
   FEMALE [2]

2. DATE OF BIRTH #1
   .../.../...

3. MARSTAT #1
From the following, what is your present status
   Never married [1]
   Now married [2]
   Separated [3]
   Divorced [4]
   Widowed [5]

4. AUSBORN #1
What is the country of birth?
   Australia [1]
   United Kingdom [2]
   Europe [3]
   Asia [4]
   South America [5]
   North America / Canada [6]
   Africa [7]
   Middle East [8]

5. STATBORN #1
If youu were born in Australia,in which state were you born?
   Tasmania [1]
   Victoria [2]
   New South Wales [3]
   Queensland [4]
   Northern Territory [5]
   South Australia [6]
   Western australia [7]

6. MEDIC #1 #2

Are you currently taking any medication?

YES [1] NO [2]

What medication are you currently taking? (Record)

7. EDLEVEL #1

Please indicate the highest level of education you have completed.

Never attended any school	[1]
Attended primary school only	[2]
Attended some high school	[3]
Completed high school	[4]
University, CAE, IAT	[5]

8. EMPLOY #1

Which of the following best describes your employment status?

Employed full time	[1]
Employed part time	[2]
Not employed (not retired)	[3]
Home duties	[4]
Full time student	[5]
Part time student	[6]
Retired	[7]
Permanently unable to work	[8]

9. JOBCAT #1

Which of the following BEST DESCRIBES your current occupational status? (The exact job may not be listed, but tell me the one that comes closest. If you do part time work only, please indicate below your part time paid occupation)

[1] Professional,technical or related worker, architect, engineer, chemist, doctor, dentist, lawyer, clergy, teacher, nurse,etc.)

[2] Administrative, executive or managerial worker

[3] Clerical worker,(book-keeper, cashier, typist, etc)

[4] Sales worker, (insurance, real estate, auctioneer, commercial traveller, proprietor and shop assistant,etc)

[5] Farmer, fisherman, timber getter or related worker.

[6] Miner, quarryman or related worker.

[7] Worker in transport or communication,(driver of truck,taxi,delivery van,bus,railway engine, pilot, deckhand,conductor,bus inspector, telephone/telegraph operator, postman etc.)

[8] Tradesman, production process worker or labourer (carpenter, plumber,mechanic,electrician,tailor, machinist, factory worker,foreman, builders labourer)

[9] Service, sport or recreational worker,(fireman, policeman, barber, sportsman, photographer, undertaker,etc.)

[10] Member of the armed services

[11] Not currently doing full time or part time paid work

10. DIAGNOS #1

At what age were you first diagnosed as having diabetes?

11. EXLEVEL #1 #2
Do you believe that you are getting enough exercise?
YES [1]
NO [2]

12. NEEEX #1 #2
In the past two weeks, did you engage in **any** exercise ?
NO [1]
YES [2]

13. VIGEX #1 #2
In the past two weeks, did you engage in vigourous exercise-exercise which made you breath harder or puff and pant? (Eg vigourous sports such as football, netball, tennis, squash, athletics,jogging or running,keep-fit exercises,vigourous swimming etc.)
NO [1]
YES [2]

14. EXTYPE #1 #2

MODE	DURATION	FREQUENCY
1. WALKING		
2. WALKING/JOGGING		
3. CYCLING		
4. SWIMMING		
5. SKIPPING		
6. AEROBICS		
7. OTHER		

15. ACTIVITY #1 #2
How do you rate your physical activity that you are now getting compared to others your same age and sex?
compared to others I am :-

Extremely inactive ... Extremely active

1 2 3 4 5 6 7

16. SMOKED #1
Have you ever smoked cigarettes ,cigars or a pipe?
NO [1]
YES [2]

16. SMOKED #1 #2
Are you smoking now?
NO [1]
YES [2]

8. QUITSMOK #1 #2
Have you given up smoking?...#2.In the last three months?
NO [1]
YES [2]

9. SMOKENO #1 #2
How much do you smoke per day? Record)

SECTION II

SEVEN DAY PHYSICAL ACTIVITY RECALL QUESTIONNAIRE

CONSIDER THE LAST 5 WEEKDAY NIGHTS -SUNDAY - THURSDAY NIGHTS. AS A RULE - WHEN DO YOU NORMALLY GO TO BED? WHEN DO YOU NORMALLY WAKE UP?

1. On the average, how many hours did you sleep each night during the last 5 weekday nights (Sunday-Thursday)?

[ ]. [ ] HOURS.

NOW, CONSIDER FRIDAY AND SATURDAY NIGHTS. AS A RULE - WHEN DO YOU NORMALLY GO TO BED? WHEN DO YOU NORMALLY WAKE UP

2. On the average, how many hours did you sleep each night last Friday and Saturday nights?

[ ]. [ ] HOURS.

Now, I am going to ask you about your physical activity during the past 7 days; that is, the last 5 weekdays and last weekend, Saturday and Sunday.

We are NOT going to talk about light activities, such as slow walking, light housework, or non strenuous sports such as bowling, archery.

Please look at this list which shows some examples of what we consider moderate, activities. (*Interviewer: Hand subject list and allow time for the subject to read it over.*)

People engage in many other types of activities, and if you are not sure where one of your activities fits, please ask me about it."

3. Now consider MODERATE ACTIVITIES. In the last 5 weekdays, Monday to Friday, what MODERATE ACTIVITIES did you do and how many total hours did you spend doing these moderate activities or others like them? Please tell me to the nearest half hour.

[ ]. [ ] HOURS

4. Last Saturday and Sunday, what MODERATE ACTIVITIES did you do? how many hours did you spend on moderate activities (Probe: Can you think of any other sport, job, or household activities that would fit into this category?) Please tell me to the nearest half hour.

[ ]. [ ] HOURS

5. Now consider HARD ACTIVITIES. In the last 5 weekdays Monday to Friday, what HARD ACTIVITIES did you do and how many total hours did you spend doing these HARD ACTIVITIES or others like them? Please tell me to the nearest half hour

[ ]. [ ]

6.Last Saturday and Sunday, what HARD ACTIVITIES did you do? how many hours did you spend on HARD ACTIVITIES. (Probe: Can you think of any other sport, job or household activities that would fit into this category?) Please tell me to the nearest half hour.

[ ]. [ ]

7. Now consider VERY HARD ACTIVITIES. In the last 5 weekdays Monday to Friday, what VERY HARD ACTIVITIES did you do and how many total hours did you spend doing these VERY HARD ACTIVITIES or others like them? Please tell me to the nearest half hour

[ ]. [ ]

8.Last Saturday and Sunday, what VERY HARD ACTIVITIES did you do? how many hours did you spend on VERY HARD ACTIVITIES. (Probe: Can you think of any other sport, job or household activities that would fit into this category?) Please tell me to the nearest half hour.

[ ]. [ ]

SECTION III

QUESTIONNAIRE 2: SOCIAL SUPPORT FOR EXERCISE

This section is about people who are important to you. Please use the seven-point scale to give your answer to each question.

No, definitely not — Yes, definitely

1 2 3 4 5 6 7

1. Do you have people around you who are interested in your health and well being?

2. Would people who are important to you, support you in following an exercise plan?

3. Would people who are important to you, support you in trying to lose weight?

4. Would people who are important to you, encourage you to follow an exercise plan?

5. Would people who are important to you, accompany you should you carry out an exercise plan?

SECTION III

QUESTIONNAIRE 1: SELF-EFFICACY

In the following questions, exercising regularly refers to a deliberate session of exercise lasting for at least 20 minutes. Please answer the questions by telling me the value on the 0 to 100 scale that best describes how confident you feel about what you can achieve with exercising.

not at all confident — very confident

0 10 20 30 40 50 60 70 80 90 100

1. How confident are you that you will be able to organize your life so that regular exercise becomes a natural part of your daily activity?

2. How confident are you that you will be able to continue exercising during times like holiday trips, changes in work schedule or in your family and personal life?

3. How confident are you that you will be able to exercise regularly (at least 1 or 2 times a week) over the next 3 months?

4. How confident are you that you will be able to stick to your exercise programme when your family or work obligations are demanding more time of you?

5. How confident are you that you will be exercising regularly (at least 1 or 2 times a week), 12 months from now.

6. How confident are you that you will be able to get back to regular exercise after time off.

SECTION III

QUESTIONNAIRE 3: OUTCOME EXPECTANCIES OF EXERCISE.

The times below refer to the possible outcome of regular exercise. Please answer the questions by placing a circle around the point on the 0 to 100 scale that best describes what you think would be the most likely outcome if you were to exercise regularly (at least TWO times a week for about 20 MINUTES per session).

1. If I was to exercise regularly, I would probably have less time for my other interests.

NOT AT ALL CERTAIN — COMPLETELY CERTAIN

0 10 20 30 40 50 60 70 80 90 100

2. How important is it for you to find time for your other interests/

NOT AT ALL IMPORTANT — VERY IMPORTANT

0 10 20 30 40 50 60 70 80 90 100

3. If I were to exercise regularly, I would have more energy.

NOT AT ALL CERTAIN — COMPLETELY CERTAIN

0 10 20 30 40 50 60 70 80 90 100

4. How important is it for you to have more energy?

NOT AT ALL IMPORTANT — VERY IMPORTANT

0 10 20 30 40 50 60 70 80 90 100

5. If I were to exercise regularly, I would have less time for my family and friends.

NOT AT ALL CERTAIN — COMPLETELY CERTAIN

0 10 20 30 40 50 60 70 80 90 100

6. How important is it for you to find sufficient time for your family and friends?

NOT AT ALL IMPORTANT — VERY IMPORTANT

0 10 20 30 40 50 60 70 80 90 100

7. If I were to exercise regularly, I would look better.

NOT AT ALL CERTAIN — COMPLETELY CERTAIN

0 10 20 30 40 50 60 70 80 90 100

8. How important is it for you to look better?

NOT AT ALL IMPORTANT — VERY IMPORTANT

0 10 20 30 40 50 60 70 80 90 100

9. If I were to exercise regularly, I would be fitter.

NOT AT ALL CERTAIN — COMPLETELY CERTAIN

0 10 20 30 40 50 60 70 80 90 100

10. How important is it for you to be fitter?

NOT AT ALL IMPORTANT — VERY IMPORTANT

0 10 20 30 40 50 60 70 80 90 100

11. If I were to exercise regularly, I would be healthier.

NOT AT ALL CERTAIN — COMPLETELY CERTAIN

0 10 20 30 40 50 60 70 80 90 100

12. How important is it for you to be healthier?

NOT AT ALL IMPORTANT — VERY IMPORTANT

0 10 20 30 40 50 60 70 80 90 100

13. If I were to exercise regularly, I would lose or be able to control my weight.

NOT AT ALL CERTAIN — COMPLETELY CERTAIN

0 10 20 30 40 50 60 70 80 90 100

14. How important is it for you to lose or be able to control your weight.

NOT AT ALL IMPORTANT — VERY IMPORTANT

0 10 20 30 40 50 60 70 80 90 100

(cont.)

15. If I were to exercise regularly, I would be less moody.

NOT AT ALL CERTAIN — COMPLETELY CERTAIN

0 10 20 30 40 50 60 70 80 90 100

16. How important is it for you to be less moody?

NOT AT ALL IMPORTANT — VERY IMPORTANT

0 10 20 30 40 50 60 70 80 90 100

17. If I were to exercise regularly, I would get injuries.

NOT AT ALL CERTAIN — COMPLETELY CERTAIN

0 10 20 30 40 50 60 70 80 90 100

18. How important is it for you not to get injuries?

NOT AT ALL IMPORTANT — VERY IMPORTANT

0 10 20 30 40 50 60 70 80 90 100

19. If I were to exercise regularly, I would cope better with stress.

NOT AT ALL CERTAIN — COMPLETELY CERTAIN

0 10 20 30 40 50 60 70 80 90 100

20. How important is it for you to cope better with stress?

NOT AT ALL IMPORTANT — VERY IMPORTANT

0 10 20 30 40 50 60 70 80 90 100

QUESTIONNAIRE 4: SELF-MOTIVATION

Read each of the following statements. Please answer the questions by telling me the letter A,B,C,D or E that is the most characteristic of you. Please be sure to answer every item and try to be as accurate as possible in your responses.

A.	Extremely uncharacteristic of me:(very unlike me)
B.	Somewhat uncharacteristic of me:(a little unlike me)
C.	Neither characteristic nor uncharacteristic of me: (neither like nor unlike me)
D.	Somewhat characteristic of me:(a little like me)
E.	Extremely characteristic of me: (very like me)

A B C D E

1. I get discouraged easily.
2. I don't work any harder than I have to.
3. I seldom if ever let myself down.
4. I'm just not the goal-setting type
5. I'm good at keeping promises, especially the ones I make myself
6. I don't impose much structure on my activities
7. I have a very hard-driving, aggressive personality

Exercise Adherence - Type II. **Appendix: II**

SECTION III

QUESTIONNAIRE 5: GENERAL HEALTH QUESTIONNAIRE

We want to know if you have had medical complaints and how your health has been in general, OVER THE PAST FEW WEEKS. Please answer the questions by TELLING ME the answer which you think most nearly applies to you. Remember that we want to know about present and recent complaints, not those that you have had in the past. .

1. Have you over the past few weeks: been able to concentrate on whatever you're doing?

BETTER THAN USUAL	[1]
SAME AS USUAL	[2]
LESS THAN USUAL	[3]
MUCH LESS THAN USUAL	[4]

1. Have you over the past few weeks:lost much sleep over worry?

NOT AT ALL	[1]
NO MORE THAN USUAL	[2]
RATHER MORE THAN USUAL	[3]
MUCH MORE THAN USUAL	[4]

3. Have you over the past few weeks: felt that you are playing a useful part in things?

MORE SO THAN USUAL	[1]
SAME AS USUAL	[2]
LESS USEFUL THAN USUAL	[3]
MUCH LESS USEFUL	[4]

4. Have you over the past few weeks: felt capable of making decisions about things?

MORE SO THAN USUAL	[1]
SAME AS USUAL	[2]
LESS SO THAN USUAL	[3]
MUCH LESS CAPABLE	[4]

Exercise Adherence - Type II. **Appendix: II**

5. Have you over the past few weeks: felt constantly under strain?

NOT AT ALL	[1]
NO MORE THAN USUAL	[2]
RATHER MORE THAN USUAL	[3]
MUCH MORE THAN USUAL	[4]

6. Have you over the past few weeks: felt you couldn't overcome your difficulties?

NOT AT ALL	[1]
NO MORE THAN USUAL	[2]
RATHER MORE THAN USUAL	[3]
MUCH MORE THAN USUAL	[4]

7. Have you over the past few weeks: been able to enjoy your normal day-to-day activities?

MORE SO THAN USUAL	[1]
SAME AS USUAL	[2]
LESS SO THAN USUAL	[3]
MUCH LESS CAPABLE	[4]

8. Have you over the past few weeks: been able to face up to your problems?

MORE SO THAN USUAL	[1]
SAME AS USUAL	[2]
LESS ABLE THAN USUAL	[3]
MUCH LESS ABLE	[4]

(cont.)

Exercise Adherence - Type II. **Appendix: I**

9. Have you over the past few weeks: been feeling unhappy and depressed?

NOT AT ALL [1]
NO MORE THAN USUAL [2]
RATHER MORE THAN USUAL [3]
MUCH MORE THAN USUAL [4]

10. Have you over the past few weeks: been losing confidence in yourself?

NOT AT ALL [1]
NO MORE THAN USUAL [2]
RATHER MORE THAN USUAL [3]
MUCH MORE THAN USUAL [4]

11. Have you over the past few weeks: been thinking of yourself as a worthless person?

NOT AT ALL [1]
NO MORE THAN USUAL [2]
RATHER MORE THAN USUAL [3]
MUCH MORE THAN USUAL [4]

12. Have you over the past few weeks: been feeling reasonably happy all things considered?

MORE SO THAN USUAL [1]
SAME AS USUAL [2]
LESS ABLE THAN USUAL [3]
MUCH LESS ABLE [4]

SECTION III

QUESTIONNAIRE 6: PSYCHOSOCIAL ADJUSTMENT SCALE.

Please read the following statements which describe how you feel about certain areas of your life Please answer the questions by telling me the point on the scale between 1 and 10 which you think most nearly applies to you.

"HOW HAPPY AM I RIGHT NOW, WITH THIS ASPECT OF MY LIFE

Completely unhappy and unsatisfied									Completely happy and satisfied.
1	2	3	4	5	6	7	8	9	10

"HOW HAPPY AM I RIGHT NOW, WITH THIS ASPECT OF MY LIFE

1. Support and affection from family and friends.
2. Career (including retirement).
3. Your marriage.
4. Financial arrangements.
5. Relationships with your children (incl. grandchildren
6. Freedom.
7. Thoughts about your future.
8. Social activities.
9. Control.
10. Happiness in general.

SECTION III

QUESTIONNAIRE 7: PROFILE OF MOOD STATES

Below is a list of words that describes feelings people have. Please read each one carefully, then tell me one number to the right which best describes how you have been feeling during the past week including today.

NOT AT ALL = 1
A LITTLE = 2
MODERATELY = 3
EXTREMELY = 4

T02.	TENSE	0 1 2 3 4		D44.	GLOOMY	0 1 2 3 4	
F04.	WORN OUT	0 1 2 3 4		T22.	RELAXED	0 1 2 3 4	
D45.	DESPARATE	0 1 2 3 4		D05.	UNHAPPY	0 1 2 3 4	
D23.	UNWORTHY	0 1 2 3 4		F46.	SLUGGISH	0 1 2 3 4	
V07.	LIVELY	0 1 2 3 4		T26.	UNEASY	0 1 2 3 4	
D48.	HELPLESS	0 1 2 3 4		T10.	SHAKY	0 1 2 3 4	
T27.	RESTLESS	0 1 2 3 4		D58.	WORTHLESS	0 1 2 3 4	
V51.	ALERT	0 1 2 3 4		F29.	FATIGUED	0 1 2 3 4	
F11.	LISTLESS	0 1 2 3 4		D32.	DISCOURAGED	0 1 2 3 4	
D14.	SAD	0 1 2 3 4		V56.	FULL OF PEP	0 1 2 3 4	
F49.	WEARY	0 1 2 3 4		T34.	NERVOUS	0 1 2 3 4	
V15.	ACTIVE	0 1 2 3 4		D35.	LONELY	0 1 2 3 4	
D18.	BLUE	0 1 2 3 4		V60.	CAREFREE	0 1 2 3 4	
T16.	ON EDGE	0 1 2 3 4		F40.	EXHAUSTED	0 1 2 3 4	
D62.	GUILTY	0 1 2 3 4		D36.	MISERABLE	0 1 2 3 4	
F65.	BUSHED	0 1 2 3 4		D61.	TERRIFIED	0 1 2 3 4	
V38.	CHEERFUL	0 1 2 3 4		V19.	ENERGETIC	0 1 2 3 4	
V63.	VIGOROUS	0 1 2 3 4		T20.	PANICKY	0 1 2 3 4	
T41.	ANXIOUS	0 1 2 3 4		D21.	HOPELESS	0 1 2 3 4	
D09.	SORRY FOR THINGS DONE	0 1 2 3 4					

SECTION IV

SECTION 1: ROUTINE CARDIAC AND HYPERTENSION HEALTH CHECK

1. *HAVE YOU HAD ANY OF THE FOLLOWING COMPLAINTS IN THE LAST 2 YEARS?*

ANY PAIN OR DISCOMFORT IN YOUR CHEST?
NO [1] YES [2]***

ANY PRESSURE OR HEAVINESS IN YOUR CHEST?
NO [1] YES [2]***

A SHORTNESS OF BREATH DOING SIMPLE TASKS
NO [1] YES [2]***

2. *IN THE LAST TWO (2) YEARS HAVE YOU BEEN TOLD FOR THE FIRST TIME YOU HAVE ANY OF THE FOLLOWING?*

HIGH BLOOD PRESSURE	NO [1]	YES [2]***
ANGINA PECTORIS	NO [1]	YES [2]***
HEART ATTACK	NO [1]	YES [2]***
STROKE	NO [1]	YES [2]***
HIGH CHOLESTEROL	NO [1]	YES [2]
HIGH TRIGLYCERIDES	NO [1]	YES [2]

3. *ARE YOU HAVING TREATMENT FOR THE FOLLOWING?*

HIGH BLOOD PRESSURE?	NO [1]	YES [2]***
LOWERING FAT IN THE BLOOD?	NO [1]	YES [2]
ON A DIET CONTROL WEIGHT?	NO [1]	YES [2]

RECORD RESTING PULSE RATE AT THIS POINT.

*** REFER TO DOCTOR BEFORE ACCEPTING CLIENT IN PROGRAMME.

SECTION IV

MASS & HEIGHT: HARVARD STEP TEST

RECORD HEIGHT without shoes Record to nearest mm.
RECORD WEIGHT Record to nearest 100 grams
RECORD RESTING PULSE RATE

4 MIN OF STEPPING
CHECK FOR DISCOMFORT NO [1] YES [2]***

*** REFER TO DOCTOR BEFORE ACCEPTING CLIENT INTO PROGRAM.

RECORD EXERCISING PULSE RATE.

IS PARTICIPANT ABLE TO CONTINUE FOR THE FULL 4 MINUTES?

NO [1]*** Record maximum time.
YES [2]

*** REFER TO DOCTOR BEFORE ACCEPTING CLIENT INTO PROGRAM.

RECORD RECOVERY PULSE RATES:

FIRST RESTING PULSE RATE.
SECOND RESTING PULSE RATE.
THIRD RESTING PULSE RATE.
FOURTH RESTING PULSE RATE.
FIFTH RESTING PULSE RATE.
SIXTH RESTING PULSE RATE.

IS THERE ANY DISCOMFORT IN CLIENTS CHEST?
NO [1] YES [2]***
IS THE CLIENT PUFFING UNDULY?
NO [1] YES [2]***

RECORD MINUTES TO RECOVERY
UNDER 3 MIN [1] OVER 3 MIN [2]**

*** REFER TO DOCTOR BEFORE ACCEPTING CLIENT IN PROGRAMME

FOLLOW UP ON USE OF *GETTING FIT*

Concerning the book,GETTING FIT, did you find time to read it.
YES [1] NO [2]

and if you did, how much of it did you read?

All [1]: about 3/4 [2]: about 1/2 [3]: about 1/4 [4]: none[5]:

If you set yourself a goal for the 12 weeks can you remember what the goal might have been? (Record GOAL)

Can you recall what you did and what was happening to you over the past 12 weeks?

Say on weeks	1 & 2
Weeks	3 & 4
Weeks	5 & 6
Weeks	7 & 8
Weeks	9 & 10
Weeks	11 & 12

Did you find time to exercise at the recommended levels and if you did how many weeks did you stay with the recommendations.

0: 1: 2: 3: 4: 5: 6: 7: 8: 9: 10: 11: 12: >12
(Record under ADHERE, weeks of continuous exercise)

What specific exercise did you mostly try.
(Record under level attempted)

On average, for how long per session did you exercise
(Record under EXDUR2)

On average, for how many sessions per week did you exercise
(Record under EXFREQ2)

What were the factors that influenced you most in deciding to cease exercising from this book.
(Record under FACTORS)

What were the specific circumstances which stopped you from exercising from the book on a regular basis?
(Record under HRS)

If you did read the book what group of people do you think it would appeal to the most?(Record under PEOPLE)

Did you find it valuable? YES [1] NO [2]
Did you find it useful? YES [2] NO [1]

NIDDM.DAT SURVEY.
Demographic information FIRST *SECOND INTERVIEW.

Client Identification Number	CLIENT	3 [...]
Interview number	INTERV	1 [.]
Sex	SEX	1 [.]
Date of Birth	DOB	8 [..]:[..]:[..]
Married Status	MARSTAT	1 [.]
Australian Born	AUSBORN	1 [.]
State Born	STATBORN	1 [.]
*Medication	MEDIC	1 .....
Country of birth	ETHNIC	2 [..]
Educational level	EDLEVEL	1 [.]
Employment status	EMPLOY	1 [.]
Employment category	JOBCAT	2 [.]
Diabetes diagnosis	DIAGNOS	2 [..]
*Level of exercise	EXLEVEL	1 [.]
*Any exercise	NEEX	1 [.]
*Vigourous exercise	VIGEX	1 [.]
*Exercise type WALKING	EXTYPE1	6 { . } { . }
*Exercise type WALKING/JOGGING	EXTYPE2	6 { . } { . }
*Exercise type CYCLING	EXTYPE3	6 { . } { . }
*Exercise type SWIMMING	EXTYPE4	6 { . } { . }
*Exercise type SKIPPING	EXTYPE5	6 { . } { . }
*Exercise type AEROBICS	EXTYPE6	6 { . } { . }
*Exercise type OTHER	EXTYPE7	6 { . } { . }
*Comparative Activity	ACTIVITY	3 { . }
*Smoking history	SMOKED	1 [.]
Age started smoking	SMOKAGE	2 [..]
*Smoking quitted	QUITSMOK	1 [.]
*Cigs per day	SMOKENO	2 [..]

7-Day recall of physical activity FIRST,SECOND & THIRD Interview

Weeknight sleep hrs.	BLAIR1	6 { ... }.{ ..}
Weekend sleep hrs.	BLAIR2	6 { ... }.{ ..}
Weekdays moderate activity	BLAIR3	6 { ... }.{ ..}
Weekend moderate activity	BLAIR4	6 { ... }.{ ..}
Weekdays hard activity	BLAIR5	6 { ... }.{ ..}
Weekend hard activity	BLAIR6	6 { ... }.{ ..}
Weekdays very hard activity	BLAIR7	6 { ... }.{ ..}
Weekend very hard activity	BLAIR8	6 { ... }.{ ..}

DAYS	SLEEP	MODERATE	HARD	VERY HARD
Sunday				
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				

Self-efficacy questionnaire			FIRST & SECOND Interviews
Question 1	SLFEF1	2	[..]
Question 2	SLFEF2	2	[..]
Question 3	SLFEF3	2	[..]
Question 4	SLFEF4	2	[..]
Question 5	SLFEF5	2	[..]
Question 6	SLFEF6	2	[..]
Social support for exercise	**FIRST INTERVIEW ONLY:**		
Question 1	SOCS1	3	[.:.]
Question 2	SOCS2	3	[.:.]
Question 3	SOCS3	3	[.:.]
Question 4	SOCS4	3	[.:.]
Question 5	SOCS5	3	[.:.]
Outcome expectations of exercise			**FIRST & SECOND Interviews**
Question 1	OUTC1	2	[..]
Question 2	OUTC2	2	[..]
Question 3	OUTC3	2	[..]
Question 4	OUTC4	2	[..]
Question 5	OUTC5	2	[..]
Question 6	OUTC6	2	[..]
Question 7	OUTC7	2	[..]
Question 8	OUTC8	2	[..]
Question 9	OUTC9	2	[..]
Question 10	OUTC10	2	[..]
Question 11	OUTC11	2	[..]
Question 12	OUTC12	2	[..]
Question 13	OUTC13	2	[..]
Question 14	OUTC14	2	[..]
Question 15	OUTC15	2	[..]
Question 16	OUTC16	2	[..]
Question 17	OUTC17	2	[..]
Question 18	OUTC18	2	[..]
Question 19	OUTC19	2	[..]
Question 20	OUTC20	2	[..]
Self-motivation			**FIRST & SECOND Interviews**
Question 1	SELMO1	2	[..]
Question 2	SELMO2	2	[..]
Question 3	SELMO3	2	[..]
Question 4	SELMO4	2	[..]
Question 5	SELMO5	2	[..]
Question 6	SELMO6	2	[..]
Question 7	SELMO7	2	[..]

General Health Questionnaire — FIRST & SECOND Interviews

Question 1	GHQ1	1 [.]
Question 2	GHQ2	1 [.]
Question 3	GHQ3	1 [.]
Question 4	GHQ4	1 [.]
Question 5	GHQ5	1 [.]
Question 6	GHQ6	1 [.]
Question 7	GHQ7	1 [.]
Question 8	GHQ8	1 [.]
Question 9	GHQ9	1 [.]
Question 10	GHQ10	1 [.]
Question 11	GHQ11	1 [.]
Question 12	GHQ12	1 [.]

Psychosocial Adjustment Scale — FIRST & SECOND Interviews

Question 1	PSA1	3 { ... }
Question 2	PSA2	3 { ... }
Question 3	PSA3	3 { ... }
Question 4	PSA4	3 { ... }
Question 5	PSA5	3 { ... }
Question 6	PSA6	3 { ... }
Question 7	PSA7	3 { ... }
Question 8	PSA8	3 { ... }
Question 9	PSA9	3 { ... }
Question 10	PSA10	3 { ... }

Profile of Mood States — FIRST & SECOND Interviews

(USE POMS SCORING SHEET FOR RAW SCORING)

Tension-Anxiety score	POMS1	3 [...]
Depression-Dejection score	POMS2	3 [...]
Vigour-Activity score	POMS3	3 [...]

Name of General Practioner — FIRST INTERVIEW ONLY

Doctor	DOCTOR	.....
Address	ADDRESS	.....
Suburb	SUBURB	.....
Postcode	POSTCODE	.....

Body measurements — *FIRST,SECOND,THIRD Interviews

Resting Pulse Rate	MEAS1		3 { ... }
Weight	MEAS2		3 { ... }
*Height	MEAS3	3 { ... }	
Glycosylated hemoglobin	MEAS4	3 { ... }	
Dummy 1	MEAS5	3 { ... }	
Dummy 2	MEAS6	3 { ... }	
Dummy 3	MEAS7	3 { ... }	

Regular Health Questions — FIRST,SECOND & THIRD Interviews

Chest Pains	Heal1	1	[.]
Chest heaviness	Heal2	1	[.]
Shortness of breath	Heal3	1	[.]
High blood pressure	Heal4	1	[.]
Angina	Heal5	1	[.]
Heart Attack	Heal6	1	[.]
Stroke	Heal7	1	[.]
Cholesterol	Heal8	1	[.]
Triglycerides	Heal9	1	[.]
Treatment for high blood pressure	Heal10	1	[.]
Treatment for fats in blood	Heal11	1	[.]
Diet	Heal12	1	[.]

Harvard Step Test — FIRST INTERVIEW ONLY

Resting pulse rate	PULS1	3	{ ... }
Minutes of stepping	MINSTEP	3	{ ... }
Discomfort?	DISCOM	1	[.]
Exercising (4 min.) pulse rate	PULS2	3	{ ... }
First resting pulse rate	PULS3	3	{ ... }
Second resting pulse rate	PULS4	3	{ ... }
Third resting pulse rate	PULS5	3	{ ... }
Fourth resting pulse rate	PULS6	3	{ ... }
Fifth resting pulse rate	PULS7	3	{ ... }
Sixth resting pulse rate	PULS8	3	{ ... }
Discomfort in chest	PAIN	1	[.]
Undue Puffing	PUFF	1	[.]
Minutes to recovery	RECOVER	3	{ ... }

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