The role of exercise in the well-being of people with insulin dependent diabetes mellitus: perceptions of patients and health professionals

Elizabeth Marsden D.P.E., M.Ed.

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Summary

Insulin dependent diabetes mellitus (IDDM) is the commonest occurring childhood disease in developed nations. Its world wide incidence is increasing: today 11.5 million people are estimated to have the disease and it is likely to increase to 23.7 million in the year 2010. IDDM was recognised thousands of years ago and until the discovery of insulin in the twentieth century, a prolonged and distressing death was inevitable. During the last seventy years, insulin has been refined, blood glucose monitoring has become commonplace and the technology of injector devices developed but a cure has not been found. Unpleasant complications of the disease, especially those involving the cardiovascular system, are still a threat to every person with insulin dependent diabetes.

The Diabetes Control and Complications Trial (1993) has recently been completed and is the largest study carried out with this population to date. The results showed a marked decrease in the incidence of a variety of diabetic complications in those patients who were intensively treated (i.e. those patients whose glycosylated haemoglobin levels were stabilised at 7.2%). In order to achieve and maintain these blood glucose levels, a patient required a highly motivated and disciplined outlook. Traditionally, research examining the use of exercise in the management of insulin dependent diabetes, has concentrated only on its ability to lower blood glucose levels. Since the exercise effects on a metabolism which is insulin dependent can be highly complex, results did not always show that exercise could be successful in this area. Literature searches have shown that psychological and quality of life benefits of exercise have not been studied for this population. Neither has a longitudinal study been undertaken to find out if those with insulin dependent diabetes who have maintained regular exercise as part of their lifestyles, suffer less cardiovascular incidents than their diabetic contemporaries who have remained sedentary.

This research was undertaken in order to find out what perceptions both the health professionals and the people with insulin dependent

diabetes have about exercise and also to pilot an exercise counselling, prescription and testing protocol with sedentary diabetics in order to help them start exercising regularly. The work was carried out in three separate studies, each building on the knowledge and insights gained during the process.

Study 1 was a small quasi-experimental design with 14 young IDDMs (mean age =22.8yrs) who were sedentary but who were volunteers and wanted to become active. Baseline physical fitness measures were determined by a progressive load bicycle ergometer test. Percent body fat was measured using skin callipers and height, weight and blood pressures were recorded. Three psychological tests were applied:- Profile of Mood States; Physical Self Perception Profile and the Effects of Diabetes on Everyday Life Questionnaire. Each subject was given 60mins exercise counselling when s/he wrote a personal exercise contract and prescription (based on the ACSM (1991) prescription) that would be suitable for her/his own lifestyle. Subjects adhered to their own contract for four weeks after which they returned for re-testing. One subject failed to attend for re-test as he had moved away. Four subjects adhered to their exercise prescription but the remaining nine found lack of time for a 20-30 minute exercise session, three times per week although most managed two sessions. The results from the instruments used in the testing protocol suggested that these instruments are safe for people with insulin dependent diabetes. The exercise counselling was successful for educating for safe exercise and no instances of hypo- or hyperglycaemia were reported.

During the counselling sessions of Study 1, it became obvious that the subjects had had little encouragement or advice about exercising as a diabetic and lacked some basic understanding on how to exercise safely. There were no data available on the numbers of people with insulin dependent diabetes who were regularly physically active and no data on the barriers or motivations held by IDDMs towards exercise. After six months of piloting, the Exercise and Diabetes Questionnaire was produced. It was mailed to all insulin treated patients in four hospital clinics in the west of Scotland. The response rate was 73%, giving a total of 1,030 returns. Analysis showed that 51% of responders

were male and ages ranged between 10 and 83 years (mean age = 46.2 yrs). 28% stated that they were regular exercisers and 42% were sedentary, although 15% said they were thinking about becoming active in the next six months. Those stating that they were not interested/unable to exercise (pre-contemplators) had significantly fewer answers correct in the exercise and diabetes knowledge section of the Questionnaire. Patients of two of the hospital clinics answered significantly better than those of the other two but the total average knowledge score was only 69%. Some respondents showed a lack of understanding on the most basic issues for exercising safely.

The main barriers that patients perceived against being able to exercise as much as they would like were NOT diabetic ones but were similar to other populations: that of lack of time. The younger respondents (<35yrs) showed significantly higher scores on two sample t-tests for all barriers. Females and males showed no differences except for Mental Group barriers where females scored significantly higher. The ANOVA and Tukey Multiple Comparisons on stages of change and group barriers did show that people at different stages of change in their exercise habits exhibit different group barriers. Those regular exercisers (maintainers) showed significantly lower scores on all of the group barriers which probably explains why they have been successful in adhering to exercise. The contemplators, who have stated that they are thinking of taking up exercise, show high scores on all group barriers while those not interested in starting to exercise (pre-contemplators) only show high scores on Physical and Diabetic group barriers.

The three most motivating factors to exercise for this population are those concerned with physical well-being; the highest factor being "to prevent future diabetic complications". Males were significantly more motivated by group Challenge than female responders and the younger group (<35yrs) more significantly motivated on all group motivations than the older group. The sedentary group of pre-contemplators were significantly less motivated than the other stages of change for exercise categories for all group motivations.

Results from the clinic support, encouragement and advice section showed an overwhelming patient perception of a very poor service from their health professionals as far as exercise was concerned. Hospital b showed consistently higher scores than the other three clinics but still only half of the respondents gave a positive impression of exercise advice and support. Over 2/3 of all respondents reported a preference for an exercise advisor at their clinic.

In order to obtain a balanced picture, it was necessary to check the perceptions of the health professionals against those of the patients as research has shown that patients may believe they have not been given information from their doctors and nurses even when they have been, due to the stressful situation of hospital visits. Study 3 was designed to produce information about health professionals' real views and behaviours towards exercise both for themselves and for their patients. The methodology employed was that of focus groups which were taped, transcribed and analysed using qualitative and quantitative methods. It was clear from the results that the patients' perceptions of an inferior exercise education programme from the clinics was accurate. The health professionals freely admitted that exercise had been put last on the agenda, largely because the health professionals themselves did not understand or have knowledge of the possible protective value that exercise could have for their patients' cardiovascular, stress-reactivity and psychological well-being systems. They, like their patients, would value the assistance of an exercise advisor, someone who would take "ownership" and responsibility for exercise. Resource materials on exercise for IDDMs were either poor or nonexistent.

There is a clear need for a large scale randomised control trial with long term follow up on the physiological and psychological benefits of exercise for people with insulin dependent diabetes.

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The work in this thesis is dedicated to each person who is living with insulin dependent diabetes and striving daily to "play a poor hand well".

Declaration

This thesis is the work of the author (main researcher) and a research assistant under the direct supervision of the author.

Elizabeth Marsden

CHAPTER 1

Introduction

1.1. Setting the scene: Historical aspects

Frequent urination, constant thirst and great hunger are the classic symptoms of diabetes. They were recognised several thousand years ago by the Egyptians and Greeks. Bliss (1982) noted that first century writers described the disease as " a melting down of the flesh and limbs into urine" and a seventeenth-century surgeon termed diabetes as the "pissing evil". Its very name was derived from Greek and Latin words meaning siphon (diabetes) and honey (mellitus). In order for a diagnosis to be achieved the physician would taste the urine for sweetness until in the nineteenth century, chemicals had been developed for testing the presence of sugar in the urine. Treatment before 1923 was crude and consisted of attempts to control an uncontrolled metabolism through various harsh diets and bouts of exercise. But the progress of the disease was always downwards into dreadful weight loss due to the body's inability to metabolise its nutrients. Within twelve months of onset, most patients would lapse into a restless drowsiness and lungs would heave in desperation to expel carbonic acid in the form of carbon dioxide as their bodies were gradually overcome by acidosis. Unconsciousness soon became a deep diabetic coma from which there would be no recovery. The discovery of insulin in the 1920's was a result of intense scientific research, heated disputes for funding and a large amount of good luck. The discovery, accredited to Best and Banting, in the University of Toronto was very dramatic. Bliss (1982) described the early application of insulin to humans:

> "Those who watched the first starved, sometimes comatose, diabetics receive insulin and return to life saw one of the genuine miracles of modern medicine. They were present at the closest approach to the resurrection of the body that our secular society can achieve, and at the discovery of what has become the elixir of life for millions of people around the world." (p.11)

1.2. Defining the disease

Insulin dependent diabetes mellitus (IDDM), or type 1 diabetes, refers to the disease which ensues when the islets of Langerhans in the pancreas are unable to produce insulin. Type 2 diabetes, or non-insulin dependent diabetes mellitus (NIDDM), is a disease with similar symptoms but the pancreas is usually producing a little insulin which the body is unable to use as insulin sensitivity has been lost. Treatment is normally through diet, exercise and sometimes an oral medicine. Treatment for type 1 diabetes centres around a balance of subcutaneous injection of insulin, carbohydrate ingestion and exercise. Short term aims of treatment are directed at alleviating the diabetic symptoms recorded above and balancing blood glucose levels carefully. Too much insulin injected will result in a dangerously low blood glucose level (hypoglycaemia) which can cause unconsciousness and, in extreme cases, death. Too little insulin injected will result in high blood glucose levels (hyperglycaemia) and accompanying uncontrolled diabetic symptoms which can lead to diabetic complications in the future. These complications include cardiovascular events, nerve damage, eye damage and kidney damage.

1.2.1. Incidence rates

Insulin Dependent Diabetes Mellitus (IDDM) or type 1 diabetes ranks as the most common childhood disease in developed nations. It has an onset below the age of 20 years. World wide estimates for 1994 were presented at the 15th International Diabetes Federation Congress in Kobe, Japan by McCarty and Zimmet whose studies have shown in a world population of 5,638,219,000, insulin dependent diabetics account for 11,507,000. Highest reported incidence rates are those in Finland where approximately 30 cases per 100,000 head of population become insulin dependent per year. Lowest incidence rates are seen near the equator (e.g. Asia = 0.5 cases/ annum/100,000). Rates in the U.K. at present range between 8-21 cases/annum/100,000 depending on geographical area of residence. Scotland is presently showing an average incidence rate of 19 cases/ annum/100,000 (Metcalfe and Baum, 1991).

1.3. Modern developments in diabetes research

1.3.1. The Diabetes Control and Complications Trial

Results of the Diabetes Control and Complications Trial (DCCT) were presented at the 53rd American Diabetes Association meeting in June, 1993. This study is one of the largest clinical trials in diabetes research to date. It included observations on over 1,400 insulin dependent diabetic patients in North America for a total of nine years (mean study duration was 6.5 years). The effects of two different types of treatment regimes were studied:- intensive and conventional. The conventionally treated group received a standard insulin regimen of one or two daily injections of insulin; they performed daily self-monitoring of blood glucose and had a standard diet and exercise education. The clinical goal was no symptoms of hypo- (low) or hyper- (high) glycaemia. Patients visited hospital diabetes clinics every three months for a glycosylated haemoglobin reading (HbA1). HbA1 was not allowed to rise above 13%. The mean level of HbA1 for this group was 8.9%. The intensively treated group injected insulin at least three times per day or had infusion pumps. They performed self monitoring of blood glucose four times daily and attended the hospital diabetes clinic once every month for an educational update and a check of HbA1. The goals of this group were the same as the first group plus maintaining blood glucose levels as near normal as possible at all times. Pre-meal values were to lie between 3.9-6.7 mmol/l and post meal below 10 mmol/l. The mean HbA1 levels for this group were stabilised at 7-7.2%.

Overall, results showed that intensively treated patients had reduced risk of complications of diabetes over a mean time period of 6.5 years in the following manner:- retinopathy by 76%; neuropathy by 60%; nephropathy by 35-56% and cardiac and macrovascular events by 44%. There was, however, a marked increase in hypoglycaemic events in the intensively treated group. These results confirmed the beliefs of diabetes health professionals that those patients who allow blood glucose levels to remain higher than normal for a prolonged period are more likely to suffer the complications of the disease. There is, however, a fine line of balance between good control and hypoglycaemia which is often difficult to maintain. The researchers were keen to promote a full understanding of their results and not just the maintaining of glycaemic control. They stated that intensive therapy for insulin dependent diabetics is not simply a reflection of the insulin regimen but is a whole behavioural and educational package, one element of which involves insulin. The implications of resourcing and funding for such programmes in the U.K. places a burden on the NHS as bigger diabetes care teams are required and more contact time for each patient. The emphasis is on fitting diabetes care to the individual patient's lifestyle and supportive education being given in such a way that patients will be able to take responsibility for their own well-being.

1.3.2. Psychology recognition

Before the 1980's, diabetologists have concentrated on the treatment of the **disease** rather than the treatment of the patients. Bradley and Marteau (1986) noted that only one out of 139 papers presented at the 1985 British Diabetic Association meeting of the medical and scientific section focused on an aspect that embraced the social and psychological side of a diabetic's life. Their observation was summed up:-

> "An interested Martian visitor might have
> understood that diabetes was a disease affecting
> the pancreas but would have had few clues as
> to what kind of creature the pancreas was housed in!" (p.169)

In the last 10 years, there have been many more papers concerned with the psychological and sociological well being of people with insulin dependent diabetes as diabetologists are slowly recognising that a well controlled metabolism does not happen in a vacuum (Bradley and Gamasu,1994).

1.3.3. Exercise status in diabetes management

In the U.K. at the present time, however, the value of exercise in the well-being of insulin dependent diabetics takes a similar back seat as psychology did in 1985. When it is mentioned in research articles, it is in the context of glycaemic control or lipid profiles only. Exercise, along with diet and insulin, was recognised many decades ago as being important in balancing blood glucose levels and has been discussed extensively in the therapy sections of clinical diabetology textbooks ever since (Berger et al., 1990). But its therapeutic role in glycaemic control remains controversial. As glycaemic control has been the major concern for traditional diabetologists, exercise and its potential benefits in non-glycaemic areas physically, psychologically and sociologically have not been recognised. However, in 1988 the International Diabetic Athletes Association was established in the U.S.A. as a direct result of a growing interest in exercise and sports by diabetics themselves. This momentum has spread to many other countries, including the U.K. and there has been a marked increase in the number of publications about sports activities in journals edited for diabetic patients all over the world (Ruderman et al., 1993). This has re-awakened researchers' interest in the field but once again, they have been studying the physiological aspects alone.

1.4. Modern developments in exercise research and its application to insulin dependent diabetes

Pate and his many colleagues (1995) concluded that epidemiologic research in the non-diabetic population has shown that those individuals who remain physically active show higher levels of physical fitness and are protected to varying degrees from the risk of several chronic diseases, including coronary heart disease, hypertension, non-insulin dependent diabetes, osteoporosis, colon cancer, anxiety and depression. Blair et al's (1989) analyses showed a gradient in mortality across fitness ranges after adjusting for age and other risk factors from the quintile for least fit men of 64 per 10,000 person years to the quintile for most fit men of 18.6 per 10,000 person years. For women the results showed a similar decline from 39.5 to 8.5 respectively. The relationship between physical fitness, physical activity and exercise can be understood from Casperson's, Powell's and Christenson's (1985) definition of terms:-

> "**Exercise** is planned, structured and repetitive bodily movement done to improve or maintain one or more components of physical fitness"

"**Physical activity** is any bodily movement produced by skeletal muscle that results in energy expenditure" (p.127)

Cardiovascular disease is extremely common in type 1 diabetes and is three times higher than in non diabetic people (Tomlinson,1991). It is the leading cause of death in type 1 diabetic patients who by the age of 30 have a tenfold increase in relative mortality. Cardiovascular incidents account for 75% of all type 1 deaths at any age (McCarty and Zimmet,1994). Yet the American Coronary Pooling Project (1978) had estimated 18 years ago that physically inactive men increased their coronary heart disease risk by as much as those who smoked 20 cigarettes per day, ran a systolic blood pressure of more than 150 mm mercury or maintained a plasma cholesterol level greater than 6.9 mmol/l. Diabetes education programmes are, theoretically, designed to encourage patients to quit smoking, eat a healthy diet and to take some exercise in line with this and many other CHD risk factors research. To what extent diabetes education programmes actually promote regular exercise will be examined in this thesis.

Diagnosis of insulin dependent diabetes usually has a profound effect on the patient as it is a severe, life-threatening, chronic disease. From time to time, patients are more likely to suffer depression, anxiety and poor self-esteem than the general poulation (La Greca, Rapaport and Skyler, 1991). But symptoms of psychological ill health, such as depression, stress and anxiety, have also been correlated with lack of physical recreational activity in the general population (Stephens,1988). Crews and Landers (1987) carried out a meta-analysis of 34 studies and concluded that stress responses were lower in physically fit persons. No study has yet been reported on whether stress levels are lower in physically fit insulin dependent diabetics compared to their unfit contemporaries. Mutrie and Biddle (1995) have reviewed literature concerned with psychological effects of physical activity, both chronic and acute, in non diabetic populations. They have acknowledged that there is an increasing amount of evidence to suggest there are important psychological benefits for those who are regularly active but they issued a warning against firm conclusions being drawn at this time due to problems in research designs and instrumentation. Such warnings should be heeded by future researchers in psychological effects of exercise on insulin dependent diabetics.

People with insulin dependent diabetes do not, at this time, have a cure for their disease but neither is death imminent. Diabetes management, therefore, must be aimed at optimising their immediate and long term quality of life. The ability to be active and to reap the benefits of physical activity should be an accepted component of diabetes education and care and should be promoted as such. Deyo (1991), however, warned that widespread acceptance by the medical profession of the value of physical activity will only be gained when positive outcomes are demonstrated in randomised, controlled, repeatable studies.

1.5. Aims of this research

This research was designed to build upon the present understanding of insulin dependent diabetes mellitus, modern developments in its management (including education programmes) and the most recent research knowledge of exercise physiology and exercise psychology in both non diabetic and diabetic populations. The three main aims of this thesis are identified:-

* to pilot psychological, quality of life and physiological instruments for testing exercise responses of people with insulin dependent diabetes and to test procedures for initiating regular exercise in previously sedentary patients.

* to discover the present insulin dependent diabetic involvement in exercise and to explore their motivations to, and barriers against, exercise,

* to assess the extent to which insulin dependent diabetics receive education, encouragement and support in exercise from their diabetes clinics.

1.6. Statement of the problem

The majority of research on physical exercise and insulin dependent diabetes mellitus has been carried out by medical researchers whose aims have been to find out the medical effects of exercise. Uppermost in their minds have been the questions:- "Does exercise have an effect on blood glucose control, insulin sensitivity or lipid profiles?" The physical effects of exercise on people with type 1 diabetes must be of extreme importance and concern to anyone involved in this area so that subjects will be well prepared for the exercise session and, therefore, avoid hypo- or hyperglycaemic events. There are, however, the following interesting questions concerning exercise and diabetes that remain unanswered at present:

* Does exercise have an effect on the quality of life, social adjustment, self esteem and psychological profiles of people living with insulin dependent diabetes?

* Are type 1 diabetics especially worried when they begin an exercise session, in case they become hypoglycaemic and does the exercise reduce these anxieties?

* What kind of education/preparation, for someone who is insulin dependent, is needed before taking on an exercise programme?

* Are our diabetes clinics giving adequate exercise education/advice?

* How many IDDMs exercise regularly?

* What barriers and motivations to exercise do IDMMs have and how can "dropping out" be avoided once exercise has begun?

Diabetes researchers such as Bradley and Dunn have highlighted over the last 10 years the importance of psychological factors in the well being of IDDMS. Present understanding of exercise psychology research suggests that there may be a potential for regular aerobic exercise to develop and maintain psychological health for many populations. This research aims to examine the potential for regular, aerobic exercise to develop and maintain psychological well-being for people living with insulin dependent diabetes and to answer the questions listed above. The work in this research has been carried out through three separate but inter linked studies. Experimental, survey by postal questionnaire and qualitative research methods have been used.

1.6.1. Structure of this research.

This thesis contains three separate but interlinked studies. Chapter 1 serves to set out the background to, and main aims of, these three studies. Chapter 3 contains Study 1 and has an introduction, a literature review, method, results, discussion and conclusions section, each of which is specific to the aims of Study 1. Chapter 4 contains Study 2 and chapter 5 contains Study 3. Both of these chapters are constructed as similar self-contained units each with their own intoduction, literature review, method, results, discussion and conclusions section. There is a general literature review (chapter 2) which encompasses the basic insulin dependent diabetes literature and exercise literature and it serves as a general grounding upon which the three studies are built. Chapter 6 draws together the main findings of each study in discussion and presents final conclusions and recommendations of this muli-study work.

1.6.2. Aims of Study 1 (chapter 3)

Study 1(chapter 3) used a quasi-experimental design involving a small number (n=14) of young, well controlled insulin dependent diabetic patients from three west of Scotland hospital clinics. The aims were:-

* to devise and test the efficacy of an exercise counselling and prescription protocol for previously sedentary, insulin dependent diabetics (IDDMs),

* to examine a fitness testing protocol for its sensitivity and safety with IDDMs,

* to examine a battery of psychological tests for suitability

and sensitivity with IDDMs,

* to present various motivational techniques to encourage subjects to continue to exercise,

* to re-test subjects after 4 weeks of aerobic exercise.

The **limitations** of this study are that no control group was used and the study encompasses small numbers only. A large, well controlled study requires a grant of approximately £30,000.

1.6.3. Aims of Study 2 (chapter 4)

This study was a follow-on from many unanswered questions raised in Study 1 and took the form of a postal survey. It was directed at every insulin dependent diabetic registered with four west of Scotland hospitals.

The main aim was to construct, pilot and encourage a large response to an exercise and diabetes questionnaire which would answer the following questions:-

* How many IDDMs are in each of the stages of change categories for exercise?

* Do they have adequate knowledge to exercise safely?

* Do the clinics promote exercise?

* What barriers prevent IDDMs from exercising regularly?

* What motivations do IDDMs have for exercising?

The **limitation** of this study is that it is set wholly in one geographical area of the U.K.

1.6.4. Aims of Study 3 (chapter 5)

Study 3 (chapter 5) was a natural follow-on from Study 2 where many questions were raised regarding the health professionals' role in educating, supporting and encouraging their patients to take exercise as part of their health-related treatment. The qualitative methodology was that of a focus group, set within each diabetes care team's environment. The aims of this study were:-

* To find out the beliefs and attitudes of the health professionals towards promoting exercise with their patients,

* To ascertain the level of knowledge of the health professionals for exercise benefits and limitations both psychologically and physically,

* To discover whether exercise education was routinely included in the diabetes education programme in the diabetes clinics.

The **limitation** of this study is that it involves only four health professional grous (corresponding to the four target diabetes clinics). A total of at least ten focus groups would give a broader view of attitudes, beliefs and behaviour of health professionals in the U.K.towards exercise for their patients.

1.7. The value of this research

In 1994, there were a recorded 11.5 million insulin dependent diabetics world wide. McCarty and Zimmet have researched these figures as accurately as possible and studying the present epidemiologic transition in disease patterns, they predict that by 2010 there will be approximately 23.7 million people living with insulin dependent diabetes. Taking into account not only the economic impact of diabetes on health resources but also the emotional and physical problems encountered by those living with a chronic illness and especially its complications, a cure is always sought. While the discovery of insulin was an immediate life-saver, diabetics and their carers must still seek methods of minimising risks to the physical, psychological and social well-being of each patient.

The Position Statement of the American Diabetes Association (Diabetes Care,1991) was that physical activity has important physiological and psychological benefits for **all** people. They recommended, therefore, that exercise programmes should have a key role in the management of diabetes. Literature searches have continually failed to show research papers involved with type 1 diabetes and exercise except in the field of glycaemic control and related areas. There are no known studies on the effects of regular, aerobic exercise on psychological parameters or long term effects on the development of complications or on the quality of life of those millions of people living with insulin dependent diabetes mellitus.

Physical activity and regular, aerobic exercise costs little in financial terms and while it may not solve the problem of glycaemic control for type 1 diabetics, this research aims to increase the understanding of its place and importance in improving other areas of a patient's life, especially those areas concerned with quality and well-being.

CHAPTER 2

General Literature Review

2.1. Insulin Dependent Diabetes Mellitus

2.1.1. The physical perspective

Type 1 diabetes is conceptually a simple disorder that is due to the inability of the pancreatic β-cells of the islets of Langerhans to produce insulin. Without insulin, metabolic homeostasis rapidly deteriorates and acute symptoms of rising blood glucose, such as extreme thirst, weight loss, frequent urination, lethargy, blurred vision, hunger, dryness of mouth and skin, will become evident. Ketoacidosis and eventual death will result if insulin is not administered (Berger and Kemmer, 1990).

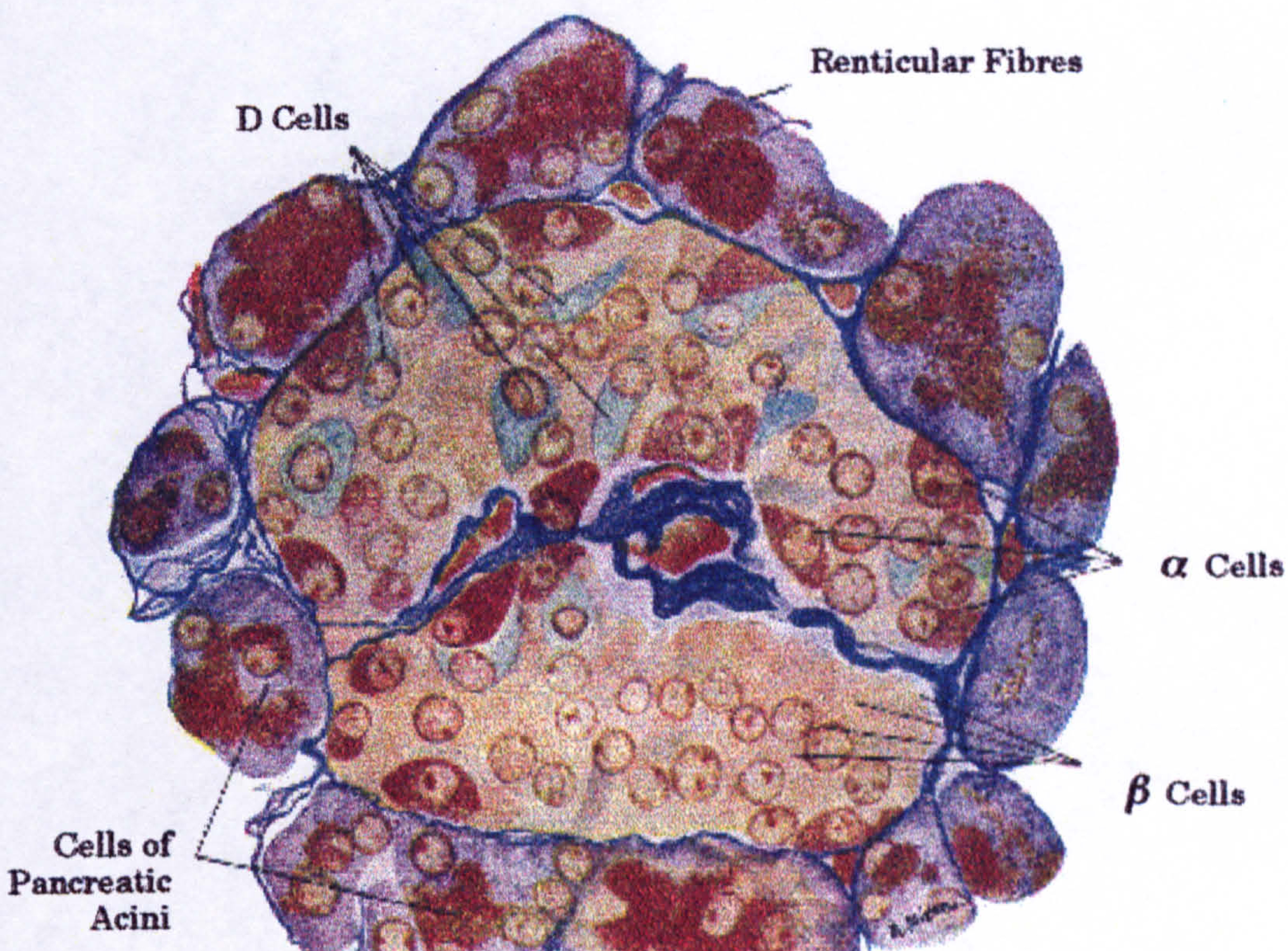


fig 2.0 Beta cells, in Islets of Langerhans, where insulin is manufactured
Diabetic Research (1980) British Diabetic Association

Insulin is a protein hormone and assists in transporting glucose into most cells. Nerve cells, intestinal mucosa, renal tubules, liver and red blood cells are exceptions (Mountcastle, 1980). The underlying metabolic defect in diabetes is the decreased ability to utilise carbohydrates either by oxidation or by conversion to fat or by storage as glycogen because of the lack of insulin. As glucose is not able to enter cells without insulin, it collects in the bloodstream and eventually spills out in urine. Fats are broken down by starving muscles with ketones being formed which also spill into the urine (Coram and Mangum, 1986).

The cause of insulin dependent diabetes is not yet fully understood. While it is not an inherited disorder, it seems likely that there is a susceptibility transmitted by at least ten different genes. Until recently, there were two theories about the predisposition of an individual with the above genetic patterning and his/her immune status. The first hypothesis stated that these inherited genes resulted in a compromised immune system which would be less able to resist environmental triggers such as viruses or toxins. Secondly, these genes were thought to result in defective immunoregulation whereby an auto immune attack may have been been triggered on the body's normal tissue (Bottazzo, 1984). Today, researchers tend towards combining both hypotheses. Research into unravelling these questions is ongoing.

Treatment for insulin dependent diabetes is designed to achieve as near normal blood glucose levels as possible. The ideal blood glucose level lies between 4 and 7 mmol/l and is achieved by careful balancing of insulin injected, carbohydrate ingested and amounts of energy expended by physical work. This balance or "diabetic control" has been revolutionised within the last 15 years by the availability of blood glucose self monitoring (Pickup and Williams,1991). This technique involves pricking a finger with a specially sharp lancet, collecting a drop of capillary blood on the sensitive end of a test strip, such as BM 20-800, which will change colour depending on blood sugar level. The strip can either be read by comparison of the colour change to the chart on the side of the container or by inserting the strip into a blood glucose meter. Technology has played a dramatic part also in providing new types of insulin and new instruments for administering insulin such as the "pen injector" and the continuous infusion pump, both of which have been designed to administer insulin more regularly and as near as possible in frequency as a non diabetic pancreas (Brooks, 1988). Figure 2.1. (Bucher,1987) shows the activity of insulin secretion in a nondiabetic subject. Insulin secretion matches perfectly the amount of glucose ingested, thus keeping blood glucose levels normal at 4-7mmol/l. The availability of fast, medium and slow acting insulins enable each diabetic to be treated with the best possible regime suited to his/her individual metabolism and lifestyle. It is far more likely nowadays that blood glucose levels will be kept within the normal range. Fig. 2.2.(Bucher,1987) shows an example of the action of long and short acting insulin treatment in the average day of an insulin dependent diabetic. The recently completed Diabetes Control and Complications Trial (DCCT, 1993) showed that keeping as near normal glycaemic control will offset many diabetic complications.

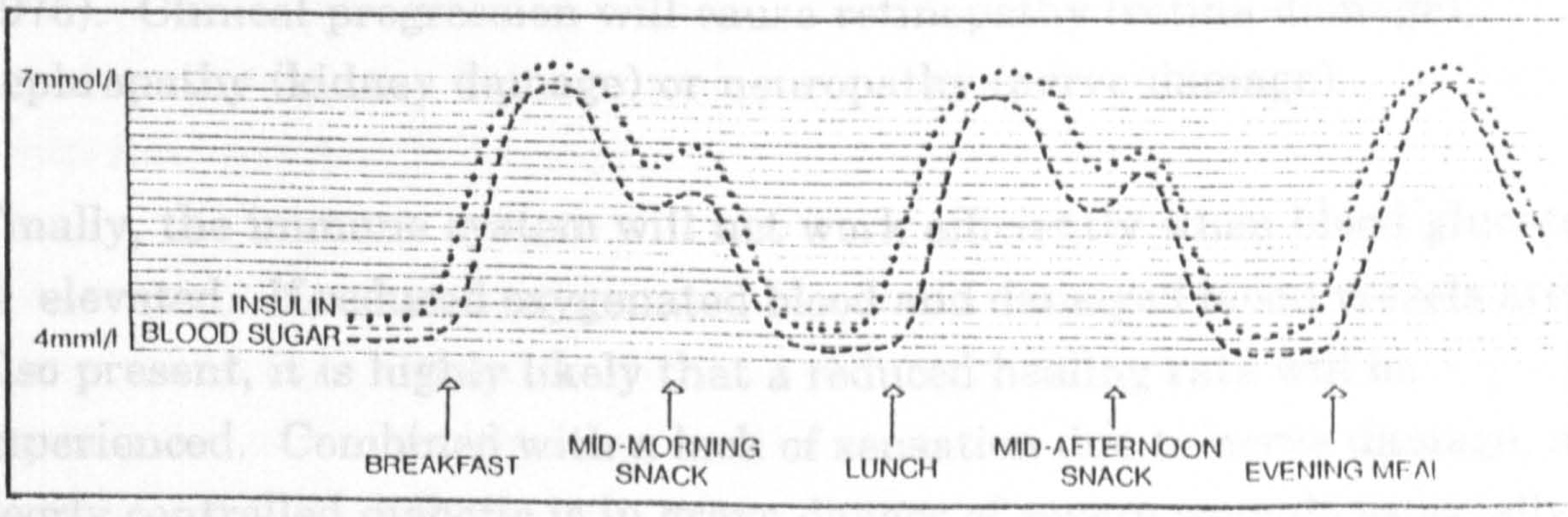


Figure 2.1. Insulin surges in nondiabetic, keeping blood glucose at 4-7 mmol/l. Boucher, B (1987) "Insulin" Balance, BDA, April

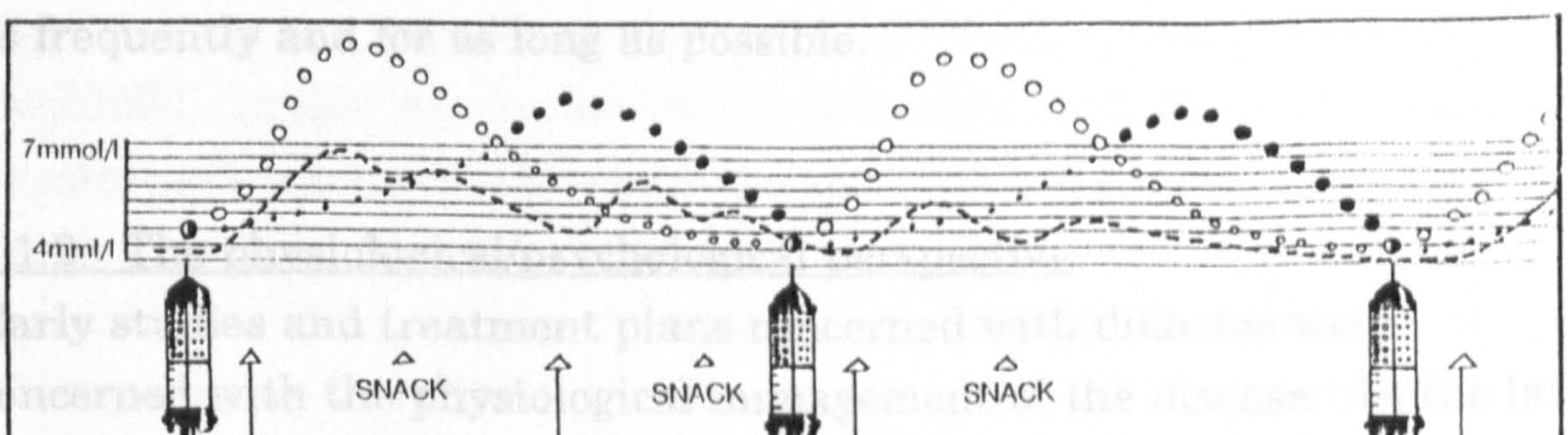


Fig. 2.2.Combined injections of clear (fast acting) and cloudy (slow acting) insulin. Boucher, B (1987) "Insulin" Balance, BDA, April

Poorly controlled patients face multiple complications, the most common of which is atherosclerosis (Rowland et al, 1992). It may manifest itself as cardiovascular disease or cerebrovascular disease. Heart and blood vessel problems are two to three times more frequent in people with diabetes (Berg, 1986). Blood and blood vessel changes are accompanied by a reduced amount of oxygen carried by the blood. The chemical composition of haemoglobin is altered in prolonged hyperglycemia and the transporting of oxygen by haemoglobin is reduced. Hyperglycemia also results in premature aging of red blood cells (Warrerman and Abumrad,1989).

Microangiopathy is also a complication of diabetes and results in alterations of the basement membranes of capillaries and the walls of arterioles and venules and appears to be specific to diabetes (McMillan, 1975). Clinical progression will cause retinopathy (retina damage), nephropathy (kidney damage) or neuropathy (nerve damage).

Finally, the immune system will not work efficiently when blood glucose is elevated. If reduced oxygenated blood and damaged blood vessels are also present, it is highly likely that a reduced healing rate will be experienced. Combined with a lack of sensation due to nerve damage, a poorly controlled diabetic is in grave danger of severe wounds especially on the feet where they may remain undetected for some time (Broadstone, 1987). As so many physiological functions are affected by prolonged blood glucose elevation, it can clearly be understood why people with diabetes and all who are involved with their care must strive for normoglycaemia as frequently and for as long as possible.

2.1.2. The physiological/psychological perspective

Early studies and treatment plans concerned with diabetes were concerned with the physiological management of the disease. In the last decade, health professionals have begun to realise that the psychological well-being of their patients will have an important effect on successful diabetes management (Padgett,1988). There are two major aspects of psychological well-being in insulin dependent diabetes. The first is concerned with diabetes as a life-threatening, chronic disease and the implications and responsibility of continuous self care throughout a person's life. The second aspect is peculiar to the disease itself; the fact that a very high (hyperglycemia) or a very low (hypoglycemia) blood glucose level may cause specific psychological effects for the duration of time that blood glucose levels remain in an extreme condition (Gonder-Frederick, Cox and Bobbitt, 1989).

Cox and colleagues (1985) discovered that, contrary to earlier beliefs, blood glucose symptoms (physical and especially psychological) have consistently been found to differ from person to person. Reported case studies and patient testimonies (Service, 1983) have tended to link negative feelings and behaviours such as irritability and awkwardness or passivity and withdrawal with low blood glucose. Hepburn (1993) has identified the neuroglycopenic mechanism as a main underlying physiological mechanism in hypoglycemia. This occurs due to the lack of an adequate supply of glucose to the brain and, even during short episodes, can disrupt brain function and behaviour.

Counterregulatory hormones such as epinephrine are secreted during hypoglycemia in order to stimulate hepatic glycogenolysis and thus raise glucose concentration once again (Clarke et al, 1979). Thus, many hypoglycemic symptoms such as trembling, dizziness, sweating etc. reflect sympathetic arousal. Research has shown that sympathetic arousal can both precipitate and perpetuate emotional reactions such as nervousness, fear and irritability (Manstead and Wagner, 1981).

Physiological mechanisms underlying high blood glucose levels and emotional changes are unclear at this time and little is known about hyperglycemia and its effect on the central nervous system. Gonder-Frederick (1989) has reviewed some literature and recorded patient's reports of the effects of hyperglycemia. She has reported a variety of effects ranging from feelings of frustration, aggressiveness and, conversely, to feelings of being "sharp" and more relaxed.

Gonder-Frederick and her colleagues employed a within-subject, repeated measures protocol with 34 subjects in order to identify moods and symptoms related to blood glucose levels for each individual and to examine the extent to which positive and negative mood items related to low and high blood glucose levels. They found that both moods and physical symptoms were idiosyncratically related to blood glucose levels and that persons reporting positive mood states with high blood glucose levels always reported positive states. Similarly, those reporting negative mood states with high glucose levels always reported negative states. The mood-blood glucose relationship tended to remain qualitatively consistent. Moods most commonly reported when subjects were showing hyperglycemia were energeticness, alertness, relaxation and contentedness. Some hyperglycemic subjects reported negative feelings of anger, aggressiveness or sadness. Hypoglycemia caused most subjects to feel either anxious, worried, nervous, frightened or frustrated. Five subjects, however, did not report negative mood states at very low blood glucose levels. In this study, subjects were more likely to report an awareness of feelings when their blood glucose levels were high although the expression of nervousness at low blood glucose levels were also quite common.

The implication of such a relationship between mood states and glucose fluctuations may be of great importance in the management of insulin dependent diabetes. Surwit, Feniglas and Scovern (1983) revealed the natural desire to feel well may prompt insulin dependent diabetics to maintain high glucose levels rather than risk the anxiety and nervousness generally experienced when blood glucose is at the lower end of the spectrum. Cox and colleagues (1987) verified that poor metabolic control is likely to be related to avoidance and fear of hypoglycemia.

2.1.3. The psychological/sociological perspective

The diagnosis of diabetes mellitus is that of a serious, life-threatening disease. The patient and his/her family may react initially with anger, disbelief, anxiety, grief, resentment or challenge. Their lives will not be the same again. La Greca, Rapaport and Skyler (1991) succinctly sum up such global life changes:-

> "The presence of diabetes changes one's self image and creates internal and external conflicts related to the demands of the treatment program, the fear or presence of debilitating complications and the fear of shortened life." (p.403)

There are several predictable crises in the lives of those with insulin dependent diabetes. At the time of onset, individuals and their families have reported overwhelming emotions of anxiety, depression and stressfulness (Jacobson et al, 1986) and require much support from their diabetes clinic at this time. Adjustment to diabetes will be affected by such support plus the individual's own coping mechanisms, personal attributions, support of friends and the absence or otherwise of other competing life crises. LaGreca (1991) pointed out that pressures involved in reaching and maintaining metabolic balance are time consuming, require exaggerated attention to the details of life and disrupt its natural flow. Lustman and colleagues (1992) have found that the prevalence of depression is significantly higher in the diabetic population compared to the general U.S. population. They also found that while depression is more common generally in medically ill people, diabetes appears to be at the high end of the continuum of depression-symptom severity in the medically ill.

The emergence of the complications of the disease are a predictable crisis of diabetes. Coping strategies which have been adequate for many years may suddenly be under severe strain. Re-emergence of anxiety, depression and sometimes, guilt, are frequently reported (Dunn and Turtle, 1985). Family members may also be particularly affected by this development. For instance, a wife is likely to be affected by worsening impotence; a close blood relative by the need for a kidney donation.

Those life events which may be somewhat challenging to non-diabetics take on a special problem-solving perspective to those with a demanding treatment regime. Adolescence, pregnancy, menopause and any illnesses will require careful handling for insulin dependent diabetics. Bradley and Gamasu (1994) have asserted the importance of recognising the individualistic ways in which diabetics will react to life events and therefore the importance of monitoring psychological well-being alongside metabolic control if unhappy, dissatisfied patients are to be avoided. It is a possibility that stress and unhappiness can affect metabolic control directly by the secretion of counterregulatory hormones which block insulin effects and encourage production of blood glucose, or indirectly by affecting the diabetic's motivation to continue good self-care.

Consequently, when an individual with diabetes goes through stressful life events, diabetic control will often be disrupted (LaGreca, 1991). The sociological, psychological and physiological aspects of a diabetic's life are inter linked, as they are in a non-diabetic. The importance of this relationship in diabetics, however, may be that of prolonged life or early death.

2.2. Dynamics, outcomes and effects of regular, aerobic exercise on health

It can clearly be seen from literature already reviewed in this chapter, that having insulin dependent diabetes will affect a person's life physically, psychologically and socially. Every diabetic is at a higher risk of suffering from cardiovascular disease (Berg,1986), depression (Lustman, 1992), anxiety and stress reactions due to swings in blood glucose levels (Gonder-Frederick et al., 1989), stress related to facing the complications of the disease (Dunn and Turtle, 1985) and a threat to a healthy self image (LaGreca, Rapaport and Skyler,1991). Research into the effects of regular exercise in the general population has shown that it can make a major contribution to illness prevention, disease management and mental health (Bouchard et al, 1990). Stewart and colleagues (1994) carried out a 2 year longtitudinal study on 1,758 patients with one or more chronic conditions. They discovered that greater levels of exercise are associated not only with better physical functioning but also with better mental health. A consensus position of the Centre for Disease Control and the American College of Sports Medicine now states that lack of physical activity is a major risk factor for heart disease (Pate et al.,1995).

Regular, aerobic exercise has been chosen in this research for several reasons. Results of studies before 1990 tended to suggest that in order for improved psychological profiling to occur, a degree of physical fitness was needed (Goldwater and Collins, 1985; McCann and Holmes,1984; Roth and Holmes,1987). Moses et al (1987) had found, however, that the high aerobic intensity group (more fit) in their experiment did not reduce anxiety while the moderate intensity group (less fit) did. Explanations for this were not forth coming. Then, Doyne et al (1987) showedimprovements in depressed women undertaking either an aerobic intervention or an anaerobic intervention. However, in the case of improved cardiovascular fitness, experts are agreed that regular,aerobic exercise is necessary. It is also easier to fit in walking, cycling or running to everyday life and these activities take little skill learning and are deemed "safe' for beginners. Finally, it has been chosen for its safety with insulin dependent diabetics. Anaerobic activities such as weight lifting require care for diabetics due to the rise in blood pressure experienced (Berg,1986). There is a possibility that this could put a strain on a compromised cardiovascular system and preciptate nephropathy (Nordgren, Freyschuss and Persson,1994). Insufficient studies have been carried out to validate this theory but many diabetes consultants are unhappy to allow their patients to take part in any activity that could involve some measure of risk. Effects of regular, or chronic, exercise compared with one bout of exercise (acute) , is much easier to assess with insulin dependent diabetic subjects as they require time and practice in adjusting insulin dose and diet to exercise sessions (Gordon, 1993).

2.2.1 Metabolic dynamics of exercise in non-diabetic persons

During periods of intense exercise, muscle demand for glucose may rise twentyfold. In order to cope with this demand, major cardiovascular and metabolic responses occur in a highly integrated manner. Increased respiration, circulation and cardiac output and redistribution of blood flow ensures carbon dioxide removal and increased delivery of oxygen to the working muscles (Wasserman and Vranic, 1987).

Metabolic dynamics for the regulation of energy sources is complex. The system is primarily monitored and regulated by the pancreas which produces hormones to regulate carbohydrate metabolism and maintain normal blood glucose levels. Alpha cells within the pancreas secrete glucagon; beta cells secrete insulin and delta cells secrete somatostatin. The major functions of these hormones is to increase or decrease transport mechanisms and to ensure a balance of blood glucose at all times. A base level of insulin is required to facilitate the transport of glucose from the blood stream into the working cells. During intense exercise when the working muscles are using large amounts of glucose, the pancreas monitoring the falling level of blood glucose, will decrease insulin secretion and increase the counterregulatory hormones to stimulate hepatic glucose release. If blood glucose levels rise towards the peak of the normal range (7mmol/l), the pancreas will increase insulin secretion which, in turn, will cause hepatic glucose production to cease (Armstrong, 1991)

2.2.2. Metabolic dynamics of exercise in people with IDDM

As the beta cells in the pancreas of an insulin dependent diabetic no longer secretes insulin, blood glucose balance even at rest but especially during exercise is severely compromised. Exercise in an untreated or poorly controlled diabetic serves to speed up metabolic deterioration. With no insulin present, appropriate amounts of glucose from the blood stream fail to enter working cells. Hepatic glucose production continues unchecked with no insulin to stop the mechanism. Glucose levels in the blood stream will rise causing hyperglycemia but the muscle is still unable to utilise any of the prolific blood glucose. The muscle cells, unwilling to starve, begin to break down fatty acids to use as fuel. This lipolysis results in the production of ketone bodies. If exercise continues, so does lipolysis with the result that plasma ketone levels rise sufficiently that they begin to spill into the urine. This ketonuria is a precursor to acidosis which will follow if exercise does not cease and adequate amounts of insulin administered. This situation can be avoided by testing blood glucose **before** exercise begins. If blood glucose levels are high (over 14mmol/l) then it is imperative that the diabetic test the urine for the presence of ketone bodies. This is a simple test and would normally be performed using a ketone sensitive stick such as Ketostix, following the makers recommendations (Balance and Control of diabetes, 1980, BDA). If ketones are present, exercise must not be undertaken until metabolic control is regained by administering the necessary amount of insulin. However, in a well controlled IDDM, a prescribed amount of insulin will be injected several times a day to match the carbohydrate intake and the lifestyle of the individual. Periods of exercise threaten the delicate balance achieved by the treated diabetic unless certain procedures are adopted (Landry and Allen, 1992). These procedures are outlined in 2.2.3.
The gradual decline of endogenous insulin in an exercising non-diabetic cannot easily be copied by the exercising diabetic who has administered subcutaneous insulin. If too much insulin is injected, hepatic glucose production will be halted but glucose uptake at the muscle will be facilitated by the presence of insulin. Consequently, hypoglycemia results and the exercising diabetic will be forced to stop and may even pass out.

Such unpleasant occurrences can be avoided by careful planning. Figure 2.4 illustrates the metabolic responses to exercise in individuals with differing insulinization (Vitug et al, 1988)

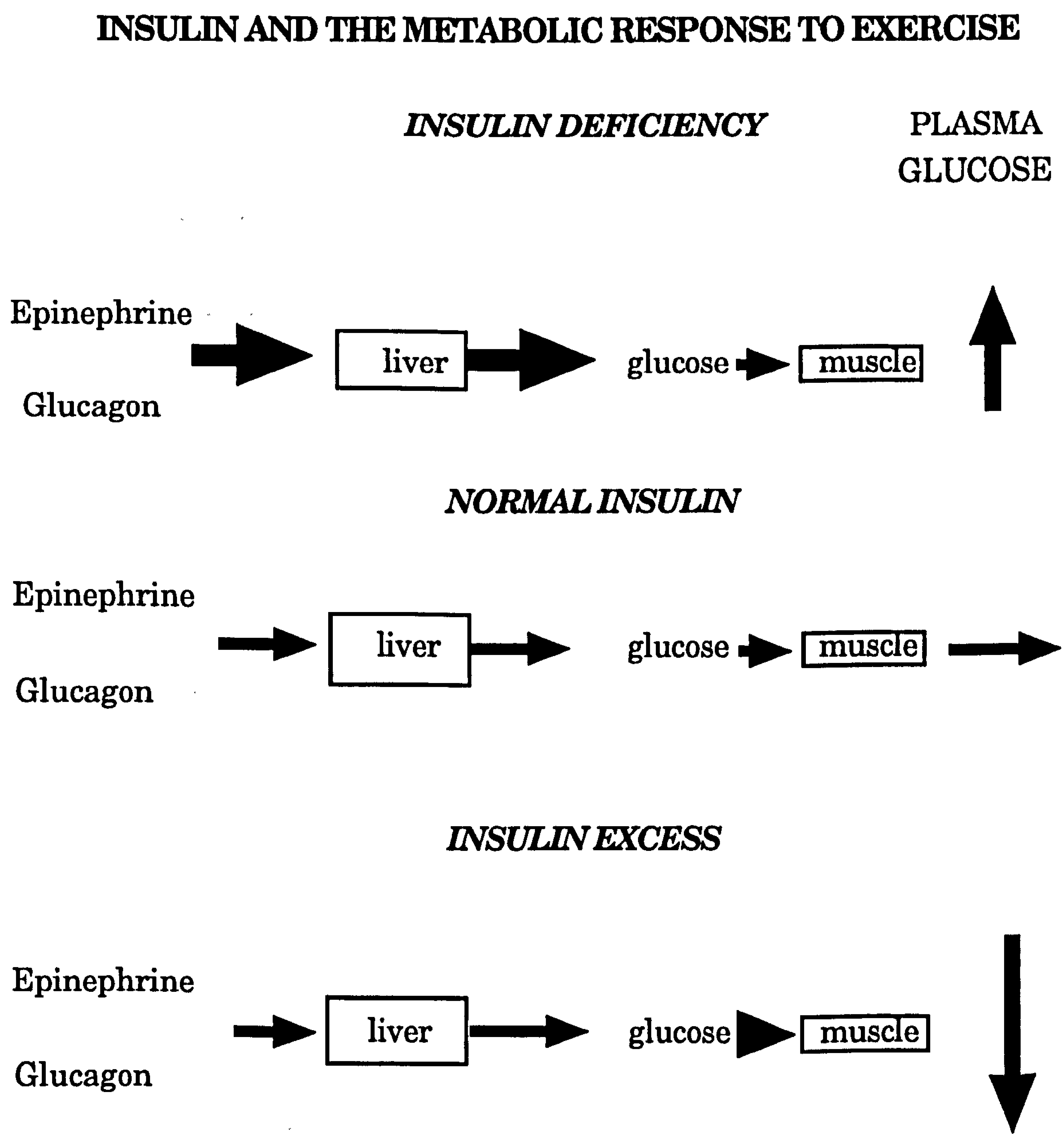


Fig 2.4. Various glycaemic responses to exercise based on the degree of insulinization (Vitug et al.,1988)

2.2.3. Recommended adjustments for planned exercise

There are short, medium and long acting insulins with their particular peak time reactions. It is important for an individual to work out his/her own responses to his/her type of insulin. Exercise can be avoided at peak reaction times or extra carbohydrate ingested before exercise or insulin reduced by 20-40% of the amount usually injected at the previous injection time. The most important tool for assisting each individual to work out how his/her system works is blood glucose monitoring (Berg, 1986). Post-exercise hypoglycemia must also be considered. Depletion of muscle and hepatic glycogen stores by intense exercise will cause the body to attempt to replenish them during rest. Glucose uptake from the bloodstream occurs at a high intensity and the exercise induced insulin sensitivity means that blood glucose levels will begin to drop. Unless the diabetic has ingested more carbohydrate after exercise, s/he will be in danger of hypoglycemia for up to 24 hours after exercise (Larsson, 1984).

The description of ketonuria given earlier is a contraindication to exercise. To avoid such a deterioration of metabolic control, each diabetic planning to exercise must test blood glucose beforehand. If the level is showing high at around 14mmol/l and ketones are present in the urine, exercise must not be undertaken at all until better metabolic control is achieved. If ketones are not present, it is likely that insulin levels are adequate enough for exercise to take place and thus aid in blood glucose lowering but the exercising diabetic in this state will need to avoid vigorous exercise and keep a careful check that blood glucose levels are not increasing (Jette, 1984).

Intensity and duration of exercise will affect metabolic responses and should be carefully considered when making adjustments for planned exercise. Exercise of long duration (more than 60 minutes) may necessitate ingesting slow acting carbohydrate and reducing insulin dose beforehand. Prolonged activity such as half marathons or full marathons will probably require ingesting glucose (in the form of liquid) during the activity. Gordon(1993) stressed the importance for each individual diabetic to learn his/her own personal responses to different types of exercise and to be willing to test blood glucose frequently in the initial stages of this learning process. He offers the following examples of adjusting carbohydrate for various exercise intensity between 60% and 75% of maximum heart rate (approx 12/13 on Rate of Perceived Exertion, Borg 1970) once blood glucose levels are known:-

a) Exercise duration = less than 15 minutes
* Pre-exercise insulin dose : unlikely that a change is required
* Diet : if blood glucose is less than 5mmol/l eat 10-15gms carbohydrate
* Post exercise : self monitor blood glucose; if lower than 5mmol/l, ingest 10-15gms carbohydrate

b) Exercise duration = 15-30 minutes
* Pre-exercise insulin dose : if you intend to exercise within 3 hours of short-acting insulin dose, reduce dose by 10%
* Diet : if blood glucose is less than 6mmol/l, ingest 10-15gms of carbohydrate
* Post exercise : self monitor blood glucose; if lower than 5mmol/l, ingest 10-15gms carbohydrate.

c) Exercise duration = 30-45 minutes
* Pre-exercise insulin dose : if you intend to exercise within 3 hours of short acting insulin dose, reduce that dose by 20%.
* Diet : if blood glucose is less than 6mmol/l, ingest 20-30gms carbohydrate
* Post exercise : self monitor blood glucose; if lower than 5mmol/l, ingest 10-15gms carbohydrate, more if necessary

d) Exercise duration = 45-60 minutes
*Pre-exercise insulin dose : if exercise is within 3hours of short acting insuin dose, reduce dose by 30%
* Diet : if blood glucose is less than 6mmol/l, ingest 10-15gms carbohydrate
* During exercise : slow down or stop briefly, ingest 10-15gms carbohydrate every 20 minutes.
*Post exercise : self monitor blood glucose; if less than 5mmol/l, ingest 10-15gms carbohydrate, more if necessary.

2.2.4. Physical outcomes of regular aerobic exercise for IDDMs

Well controlled insulin dependent diabetics gain many benefits from regular aerobic exercise, as do non-diabetics. As diabetes *per se* is regarded as an independent cardiovascular disease risk factor, cardiovascular benefits gained may be even more important than in the non-diabetic population (Berg, 1986; Horton,1988). There are also risks involved with exercise for the insulin dependent diabetic who has poor metabolic control (as described above) and/or who is showing manifestations of diabetic complications such as retinopathy. But for the diabetic in good metabolic control, the physical benefits are many (Coram and Mangum, 1986; Berg,1986; Landry and Allen,1992).

a) Improved circulorespiratory fitness

Maximum ventilation and frequency occur in pulmonary function as does the body's ability to use oxygen. Costill and colleagues (1979) discovered that diabetics increase their VO2 max and gain more mitochondria and oxidation-facilitating hormones after training as do non diabetics. Cardiovascular function also improves, as in non diabetic subjects, with increased stroke volume, cardiac output, oxygen-carrying capacity of the blood, capillarization of lungs and muscle fibres and increased dissociation of oxygen from haemoglobin so that more oxygen is delivered to the tissues (Dietzel, 1976).

b) Reduced risk factors for cardiovascular disease

Ruderman and Schneider (1992) have found that trained diabetics have reduced levels of low density lipoprotein cholesterol and triglycerides and increased levels of high density lipoprotein cholesterol. Weight reduction (Stein et al, 1984), uric acid and blood pressure reduction, increased fibrinolysis and VO2 max. as the result of exercise training have been cited by Berg (1986) and other authors as important developments experienced by IDDMs in the battle of reducing risk factors for this population. McCargar, Taunton and Pare (1991) studied the effects of exercise training on 14 insulin dependent males who were previously sedentary. After 12 weeks of training, the waist-to-hip ratio had reduced, insulin requirements were reduced and heart rate at a steady workload was reduced. Hypertension, found much more frequently in diabetics who may suffer both vascular disease and diabetic nephropathy as a result, has been reduced and the reduction maintained in individuals regularly exercising (Schneider et al, 1986).

c) Greater muscle fitness and joint flexibility

Increased strength, muscle mass, muscle endurance and flexibility are important benefits of training as in the non-diabetic population (Miller, Sherman and Ivy, 1984).

d) Improved metabolic systems (hypoglycemia/hyperglycemia effects)
Muscle fibres and the liver in a trained IDDM hold greater stores of glycogen so that more work can be performed before hypoglycemia occurs. Trained muscles also depend to a greater extent on the oxidation of fat as energy supply so that hepatic glucose supplies are not depleted easily (Maynard, 1991). Ketones are formed in untrained diabetic runners at a much earlier stage than trained diabetic runners (Berger et al, 1977). Costill, Miller and Fink (1980) found that trained marathon runners who took no insulin 24 hours before a 90 minute run, did not form a significant amount of ketones either during or afterwards.

e) Reduced insulin requirements
Insulin receptor sites can be found on the cell lining of most tissues in the body. Their purpose is thought to be that of attracting insulin circulating in the bloodstream to bond to the surface of the receptor and thereby "fixing" it to the outside membrane. Insulin then becomes the facilitator in the uptake of glucose. There is an increase in the number and sensitivity of insulin receptors in trained diabetic subjects and so the volume of injected insulin required by these fit IDDMs is lessened (Pedersen and Bak, 1990).

f) Improved blood glucose control
In a review article by Richter, Ruderman and Schneider (1981), both increases and decreases of blood glucose have been reported to follow exercise sessions in insulin dependent diabetics. The pre-exercise metabolic control of the subject is of crucial influence in the effects of exercise, as explained earlier. However, there are studies that show improved glycaemic control after a period of training (Strattonet al, 1987; Kriska et al, 1989 ; Smith and Casso, 1989) and yet others which dispute any such effect on blood glucose levels (Wallberg-Henricksson, 1986; Zinman et al. 1984). While this issue is of extreme importance to the insulin dependent individual striving to prevent future diabetic complications of the disease, it is still contentious.

2.2.5. Psychological outcomes of regular aerobic exercise in IDDM

Insulin dependent diabetic people face the possibility of more risk factors both physically and psychologically than non diabetic populations. Mood states are under threat due to extremes of blood glucose levels (both high and low) and facing a chronic, life-threatening disease places the diabetic at risk of anxiety, depression, low self image and a general malaise as described earlier. Yet, literature searches have failed to find any studies on the psychological effects of regular exercise with this population. As early as the 1970's, researchers such as Larsson (1977), Vranic and Berger (1979) and latterly Landry and Allen (1992) have fleetingly mentioned that exercise may assist in the general well-being of a diabetic patient but there are no reports, to date, of controlled studies.

Vasterling, Sementilli and Burish (1988) hypothesised that aerobic exercise may provide psychological benefits, especially by stress reduction, in diabetic patients. Following an extensive examination of the literature in non diabetic populations, they came to the conclusion that diabetics could probably also reduce stress emotions (anxiety, hostility and depression) experienced after difficult life events if they were regular exercisers. They cited studies showing improved psychological profiles after exercise with cardiovascular (Roviaro et al,1984) and haemodialysis (Carney et al, 1986) patients and suggested the same benefits would be found with the diabetic population.

Landry and Allen (1992) suggested that aerobic exercise taken regularly may be useful in improving quality of life, ideal body weight, self image, lipid profiles and hypertension for diabetics. While they were able to quote studies showing improved physiological systems, they were unable to quote studies showing work done on psychological systems. Similarly, Vranic and Berger (1979) mentioned that regular exercise may relate to reduction of anxiety states in diabetics but were unable to cite any studies. Berg (1986), himself an insulin dependent diabetic, writes :-

> "The psychological effects of exercise may be just as important as the more readily measured physical and physiological effects. The realisation that participation in physical activity, including vigorous sport, can be engaged in safely and even beneficially may do much

> to create a positive feeling about life. Physically active diabetics may even be encouraged to maintain a higher degree of control of their condition so that they can maintain a vigorous lifestyle." (p. 428)

It seems that these researchers would expect future work to determine psychological effects of exercise with people who have insulin dependent diabetes would show exercising diabetics acheiving psychological gains. The gains postulated range from lessened anxiety, depression and stress levels to improved self image and quality of life. As no such study has yet been completed, it may be of value to carefully examine the stage of understanding presently enjoyed by exercise psychologists on the benefits of regular aerobic exercise in non diabetic populations.

2.2.6. Psychological outcomes of regular, aerobic exercise in clinical (but not diabetic) populations

Martinsen (1995) has recently reviewed those studies carried out in Europe that seek to find out the effects of exercise, both aerobic and anaerobic, among patients with clinical depressive disorders. Recent developments in diagnostic criteria have improved standardisation but he warned that older studies suffered from inaccurate diagnoses of clinical depression. He posed the question of whether exercise effects will vary between the sexes, between ages and among different social classes; issues which have been, so far, largely ignored. He cited studies by Martinsen, Medhus and Sandvik (1985) and Mutrie (1988) which showed that exercise is associated with a reduction in depression of clinically depressed patients. Along with other North American studies, these two studies showed that aerobic exercise was better than no treatment but not significantly better than other forms of therapeutic treatment.

The possibility of regular aerobic exercise having an "inoculation" effect against depression in a vulnerable population was shown by Gotestam and Stiles (1990) and may be of interest for the diabetic population who are more at risk of depression as shown earlier. Of equal importance is the study by Martinsen, Sandvik and Kolbjornsrud (1989) which showed lower incidence of relapse into depression by those remaining physically active.

Few studies have examined the effect of physical activity on people with anxiety disorders. On reviewing the literature, Martinsen (1995) noted that no controlled studies had been carried out but in uncontrolled studies, it seemed that generalised anxiety disorder may respond well to exercise intervention but that phobias showed no lasting improvement (Martinsen, Sandvik and Kolbjornstrud,1989). Two separate studies by Martinsen, Hoffart and Solberg (1989) showed that both depression and anxiety can be reduced by either aerobic or anaerobic exercise. The researchers concluded that an increase in aerobic fitness is not necessary in order to enjoy psychological gains. Several mechanisms for mediating these gains have been suggested (mastery, self-efficacy, time-out) but, as yet, the mystery remains unsolved.

2.2.7. Psychological outcomes of exercise in non clinical populations

Since the majority of insulin dependent diabetic people are free living, non-clinical members of the general population, it is important to review the latest literature in this area for the free-living, non-clinical, general population. Mutrie and Biddle (1995) explain that there is little evidence documented on the effects of exercise on psychological health in the non-clinical population. It has been more difficult to measure mood states which are not extreme and researchers have been traditionally more interested in measuring physiological outcomes. Anecdotally, regular exercisers have reported feelings of well-being after exercise (Mutrie and Biddle (1995); Callen,1983) and regular exercisers who have become sedentary, even for a few days, have reported feeling irritable and listless (Summers et al. 1982;Tooman, Harris and Mutrie,1985). Once exercise habits were resumed, a more positive mood state ensued.

a) Acute exercise effects

Raglin (1990) has examined studies on effects of a single bout of exercise (acute exercise) and on the effects of a regular programme of exercise (chronic exercise). He has concluded that acute exercise or quiet resting can reduce state anxiety which remains reduced for a longer period after exercise (up to 4 hours) has ceased (Raglin and Morgan, 1987). Biddle and Mutrie (1991) reported similar results in another study (Bahrke and Morgan, 1978) which included walking on a treadmill, meditating or resting. Results showed all three treatments reduced state anxiety and the researchers concluded that all three were distractions from everyday life. Biddle and Mutrie suggest that this conclusion may be too simplistic and attention must be paid to a possible Hawthorne effect or the possibility that the Spielberg State Trait Anxiety Inventory employed may be an incorrect instrument for measuring the real exercise effects which may only be somatic anxiety linked and not cognitive anxiety linked (as in meditation). They also cite Berger and Owen (1988) whose study led them to suggest that different types of exercise may have different effects on mood e.g. whether the activity is competitive, predictable, rhythmic etc. Intensity of exercise and beginning levels of fitness may also have an affect on state anxiety in an acute exercise session (Steptoe and Bolton,1988).

There is clearly more work to be done in this area before valid conclusions can be drawn on the effects of acute exercise. In the case of the effects with an insulin dependent population, it may be important to remember that individuals who are unaccustomed to exercising will not know the effects of exercise on their personal metabolism and even if they are given careful advice about insulin dose and carbohydrate compensation, they are still likely to have elevated anxiety levels as they embark on an exercise session in case hypoglycaemia sets in. After safely completing the session, their state anxiety could be expected to drop considerably as they have managed to "get through" the session with no hypoglycaemia and this may present false conclusions about the efficacy of exercise itself.

b) chronic exercise effects

Chronic exercise is generally accepted as being an exercise programme lasting for more than 6 weeks and involving between 2 and 4 sessions per week. Designs of chronic exercise studies have suffered from lack of rigour in sample size, random assignment and control groups. However, results of studies that have been carried out show a tendency for chronic exercise to reduce both state and trait anxiety (Blumenthal et al,1982) and depression (North, McCullagh and Tran, 1990). In his review of the literature, Raglin (1990) asserted that in general, significant psychological improvements have been noted in moderately depressed subjects after an exercise programme but changes in "normal" subjects are either of a smaller magnitude or not measurable at all. He cited Dishman (1985), Morgan and O'Conner (1989) and Raglin and Morgan (1985) to substantiate his conclusions. He continued by hypothesising that even though improvements in depression and anxiety may be difficult to measure in non-clinical subjects, regular exercise may help to prevent the onset of both these negative traits in the general rough and tumble of life.

Crews and Landers (1987) conducted a meta-analysis of 34 studies and concluded that aerobically fit subjects had a reduced psychosocial stress response compared to either a control group or baseline values. Conversely, Sinyor et al (1986) found no differences on heart rate or self-report responses to a laboratory stressor between an aerobic trained, anaerobic trained or a control group after a 10 week programme. The researchers suggested that the wide variability in degree of fitness improvement in the aerobic group may have accounted for the lack of between group difference. Roth and Holmes (1987) assigned 55 college students who had experienced a large number of negative and stressful life events in the preceding 12 months to one of three groups:- aerobic training, relaxation or control group. Within 5 weeks of beginning the programme, the aerobic group were showing improved aerobic fitness and reductions in depression measures (using the Beck Depression Inventory) compared with the other two groups.

Moses et al (1989) designed a study involving 94 volunteers randomly assigned to high, moderate or low intensity aerobic training for 10 weeks (one supervised session and three unsupervised sessions per week). Physiological measures showed the high intensity group to have developed most gains in fitness but the moderate intensity group showed improved measures on a tension/anxiety POMS scale and a coping deficit scale while the other two groups did not. The previously held assumption (Brown et al., 1978) that psychological gains are directly proportional to the gains in fitness levels is refuted by this study. It becomes clear that the relationship between chronic exercise and psychological effects is complex and that improved experimental designs and instruments must be developed. Perhaps of equal importance must be the exploration of the underlying mechanisms.

The improved understanding of self esteem and its relationship with exercise participation is an example of such exploration. Sonstroem and Morgan (1989), realising that earlier studies of self esteem improvement with exercise and sport activity, were too simplistic have developed a model consisting of physical self-efficacy, physical competence and acceptance; self esteem is arranged hierarchically from specific to general factors. In 1991, Sonstroem and colleagues concluded that changes in self efficacy were related to self esteem through perceived self competence and that the model is only an interim model which may be expanded or altered after more research. Fox and Corbin (1989) building on the understanding that self esteem is a global concept consisting of hierarchically structured dimensions, developed another measure relating to physical exercise and self esteem which they named the Physical Self-Perception Profile (PSPP). Essentially, this profile is a measure of physical self-worth with the following subdomains:- sport competence, body attractiveness, strength, and condition. Data was obtained on North American college students in order to devise the construct and the authors are now collecting data on other populations. It is too soon to assess the value of this measure but the new developments in this area are promising.

While questions about experimental designs and valid measuring instruments remain in debate, the American National Institute of Mental Health (Morgan and Goldston, 1987) and the International Society of Sport Psychology (1992) have endorsed the following position statements:-

* Exercise is associated with reduced state anxiety.
* Exercise is associated with reductions in mild to moderate depression
* Long term exercise is associated with reductions in traits such as neuroticism and anxiety.
* Exercise results in the reduction of various stress indices.
* Exercise has beneficial emotional effects across all ages and in both sexes.

While noting the growing body of evidence that supports the psychologically therapeutic effects of exercise, researchers must still acknowledge problems in design and instrumentation in studies and strive to overcome them while seeking to understand the nature of these therapeutic effects (Mutrie and Biddle,1995).

2.3. The care and education of people with insulin dependent diabetes

The most important part of treatment in many chronic diseases is that carried out by the patient him/herself in collaboration with the diabetes health care professionals. Assal and colleagues noted that as early as 1875, Dr. Bouchardat recommended that diabetic patients monitor their glucosuria and adhere to a strict diet and exercise programme. Similarly, Joslin (1919) recognised the need for the patient and doctor to work alongside each other in controlling diabetes and suggested that every patient be educated sufficiently to carry out the necessary treatment. In 1985, however, Assal and colleagues from the World Health Organisation Collaborating Centre for Diabetes Education, asserted that the quality of diabetes care has, in general, remained poor. They pointed out that it took nearly 50 years for the beneficial effects of patient education to be seriously taken on board by diabetologists. Tomlinson (1992) was adamant that patient education is a necessity in diabetes care as it can enhance the quality of metabolic control, improve the safety of treatment, increase social and psychological well-being through empowerment, reduce complications and reduce costs. He cited two North American studies (Laugharne, 1977; Miller, 1972) which showed that patient education programmes had resulted in a large reduction in admissions and length of stay in hospital. These studies also showed episodes of diabetic ketoacidosis being cut to a quarter and lower limb amputations being reduced by half. Williams and Leing (1990) reported that diabetes in terms of health care costs in the United Kingdom at this time is around one billion pounds per annum. Advances in treatment plans and educational packages that will lead to a reduction in such spending will obviously be of great benefit to the NHS.

Most insulin dependent diabetics will have been diagnosed by their GP in the first instance then immediately referred to hospital to be stabilised. Traditionally, the stabilisation occured by several days spent in hospital where the patient would receive his/her basic education of self care (insulin injections, diet, blood glucose monitoring etc). Once metabolic control was acheived, the patient was discharged and would return to the hospital diabetes clinic as an outpatient within several weeks. When the consultant deemed the patient to be adjusted to life as a diabetic, appointments to the diabetes clinic may only occur for annual review when s/he is given a complete examination and educational update, if there is time. Dornan (1994), studying the BDA's survey of 1984 on provision of care for the average diabetic, realised that less than 10 minutes was available for the patient by the consultant at the annual review and only 20 minutes available for a new patient. Dornan, himself a diabetes consultant, maintains that twice this amount of time is required to do an adequate job. Both types of patient require educational back-up which they normally receive from the specialist diabetes liaison sister, chiropodist and dietician. Special appointments and attendance at specialist clinics such as diabetes pregnancy, diabetes renal and diabetes age-banded clinics are arranged for the patient, depending on need. Immediate "trouble-shooting" advice may be gleaned from the patient's GP, if s/he has any special training or interest in diabetes, but most such consultations would be done at the hospital usually by the specialist liason sister, who can be extremely successful in the problem-solving and educative process (Tomlinson, 1992). The standard of care received by patients, however, is extremely varied throughout the country and recent NHS changes have not, so far, resulted in good quality of care for everyone (Williams, 1994).

2.3.1. Patient education: the complexity of behaviour change

Although diabetologists have the opportunity to attend a specially designed education course in Ipswich, research suggests that an average diabetes patient education programme consists of the transfer of information from the health professional to the patient in a similar manner that s/he would have experienced traditional schooling. Anderson (1986) refers to this method as the "Bucket Theory"; the educator has the full bucket of knowledge while the patient's bucket is empty. When the patient's bucket is filled with knowledge from the teacher, s/he will become compliant and well-controlled and everyone is then supposed to be satisfied. Anderson (1986), however, strongly advises that the diabetes world learns to kick the "Bucket Theory" and replace it with an educational programme that brings about behaviour change.

Assal et al (1985) suggested several reasons why the traditional diabetes education system followed this model. Physicians' hospital training was largely geared towards crisis intervetion and and not patient education. Many doctors, whether consciously or unconsciously, object to sharing knowledge with patients as this may result in having to give up power and authority. Others do not believe that patients are really able to understand and cope with their own treatment and they cannot tolerate mistakes that patients will inevitably make. Assal and colleagues are quick to point out that similar mistakes on the part of the physician are readily excused. Physicians also tend to object to working as just one partner in a team of health professionals or within a treatment partnership together with the patient. Most physicians do not actually realise that patient education skills need to be **learned**. Beckman and Frankel (1984) highlighted the difficulties that patients face in asking questions - the most basic issue in communication. In 70% of the 52 consultations studied, the doctor interrupted the patient within 18 seconds of the patient beginning to talk. In only one out of the 52 consultations, was the patient ever allowed to complete his/her opening statement. Coles cited the study of Blau (1989) which showed much better patient satisfaction occured in consultations where they were allowed to speak. He has also observed that diabetic patients developed higher blood sugar levels when the health professionals took control of the consultation and did not allow questions. Blau (1989) also showed that when patients were allowed time to speak, rather than consultations taking more time, issues were more quickly explored and dealt with.

The diabetes nurse specialists do undergo education training and do spend time improving their liaison skills with the patients. But when attempts are made to change a health professional-centred education method to one where the patient is encouraged to speak and express feelings, Coles (1990) notes that most health professionals interpret information in terms of their own biotechnical knowledge, rather than the patient's experience and meaning of diabetes. Once again, the health professional tells the patient what s/he assumes the patient needs to know in order to become compliant and, therefore, well controlled. There are, however, two flaws in such assumptions; knowledge of diabetes does not necessarily lead to action ie. compliance or conrol (Dunn et al,1984) and compliance does not necessarily lead to good metabolic control (Glasgow, 1991). Harris and Linn (1985) explained that adherance to medical advice (compliance) as far as insulin dose and diet is concerned, should affect metabolic control but metabolic control is also subject to stress, psychological distress, shifting metabolic needs and changes in exercise patterns. Compliance is a complex matter and researchers have not been able to come to a universal definition of compliant behaviour, nor to distinguish whether it is a good behaviour or an unhealthy behaviour, as different circumstances demand different behaviours in order to maintain optimum health in its broadest sense (Bott et al, 1994).

Lockington and colleagues (1987) assessed the knowledge of 79 insulin dependent diabetics and their glycosylated haemoglobin levels (a measure of blood glucose levels over time which is generally accepted as giving the clearest picture of longer term metabolic control). While there was no statistical significance through linear correlation on these two measures, the researchers concluded that their analysis provided support for the concept that for good blood glucose control, a minimal level of knowledge is necessary, above which other factors such as attitudes and motivations are more important.

2.3.2. Issues for consideration in a modern diabetes education programme

The majority of literature in the 1990's echoes those sentiments of Cole (1990) who believes that the patient must be the central player in diabetes education which should have two main aims. The first aim of a diabetes education programme is concerned with preparing patients to receive information and secondly, to assist them use that information in the most effective way for their own wellbeing.

The chosen educational environment is crucial for preparing people with diabetes to receive information. Initial diagnosis is a particularly bad time for people to be able to process information as they are likely to be suffering from shock. Patients are often unaware that they have been given specific information, even though the health professionals know that they have been (Travis,1993). They are unlikely to be able to process the given information effectively unless the health professional (educator) is able to understand what the particular "meaning" of diabetes is for that particular patient (Anderson,1986). Diabetes and its treatment has no objective meaning which is shared by all the people having it e.g. not being allowed to freely eat sweets may, for one person, mean controlling his/her diabetes and is deemed as a good thing but for another diabetic it means having to give up his/her favourite food and is deemed as a bad thing. To another patient it is both good and bad. Anderson cited Horosz (1975) who had explored the philosophy that the ability to create meaning is the source of human freedom which may be used to define and change the understanding of any of life's occurences, including having and managing diabetes. Responsibility relates to the source of meaning and an individual is accountable for his/her understanding of life and the behaviour it induces. A patient may not be aware that s/he creates meaning of diabetes for him/herself and the best educational environment is that which enables him/her to recognise his/her capacity for both generating and altering the meaning of diabetes. The educator becomes a facilitator in changing the meaning of diabetes so that patient attitude and behaviour enables the patient to secure a good quality of life. Anderson (1986) emphasised that the atmosphere of the educational environment must be one of genuine acceptance, openness and faith in the capability of the patient to change the meanings which have remained counter-productive to good quality of life. If patients are criticised and judged, they will behave defensively, covering up true thoughts, feelings and problems.

The importance of encouraging patients to talk and ask questions freely, is re-iterated by Coles (1990) who forsees problems for patients in employing the basic technical skills required if they feel uncomfortable in admitting ignorance or failure. The work of Gillespie and Bradley (1988) on causal attributions of doctors and patients in a diabetes clinic further demonstrated the importance of doctors actually listening to the causal attributions held by patients which were frequently different from those held by the health professionals. In 1987, Gamasu and Bradley developed an attributions scale for control of diabetes. This scale was used to compare the attributions of 286 insulin dependent diabetics and their health care professionals. Staff tended to rate patients as having less personal control over positive outcomes ($t= 2.94$; $df= 338$; $p<.01$) and tended to emphasise chance to a greater extent than did patients ($t= -4.32$; $df= 338$;

p<.001). Staff tended to rate negative outcomes as being more foreseeable by the patients than the patients did themselves ($t= -3.1$; $df= 346$; $p<.01$). If doctors and patients hold inappropriate causal attributions about diabetes management, incorrect treatment recommendations will be made. Patients, in turn, are likely to either ignore the treatment or follow it to the absolute detail but either way, they will be unhappy and disatisfied. If the patient holds inappropriate attributions and the doctor makes sensible treatment plans, these are unlikely to be understood or followed by the patient. If doctors were trained to ask simple but revealing questions such as "What do you think is the cause of the problem?" rather than the normal "What seems to be the problem?", a great step forward would be made in the whole process of diabetes education and management programmes (Gillespie and Bradley, 1988).

Evaluation of the success of a diabetes education programme requires a value-judgement on the meaning of "success". The ultimate aim of diabetes care is the longevity of the diabetic, coupled with a good quality of life, which for many means living without debilitating complications of the disease and with a minimal of restrictions in everyday life. In the light of the recently completed Diabetes Control and Complications Trial (1993), glycaemic measures should be kept in the normal range for as long and as often as possible in order to minimise future complications.

Dunn and his colleagues (1985) had tried an educational group intervention programme with 340 patients over two days. Mean knowledge scores increased by 25% but many patients were failing to comprehend underlying principles and remained unable to anticipate and prevent negative consequences. A multivariate analysis of interaction effects showed that the programme did produce changes in attitude which were genuinely associated with metabolic improvement. Feeling better as a criteria for educational success was questioned by the results as those patients who were feeling more emotional about their diabetes, showed a bigger improvement in glycosylated haemoglobin. This confirms the predictions from the Health Belief Model (Rosenstock,1974; Mainman and Becker,1974) that those patients recognising the severity of their disease and holding strong beliefs that the recommended treatment will have a positive outcome on their disease, will be the most compliant patients.

2.3.3. The place of exercise in the diabetes education programme

The inclusion of exercise education within a diabetes education programme would appear to be very variable within the U.K. although it is recommended in the St. Vincent Declaration (1995) as being one of the items in a good diabetes treatment plan. Literature searches have failed to show any surveys conducted into the place of exercise in national diabetes education programmes. The importance, or otherwise, of exercise within any education programme appears to be dependent on the interest and expertise of those health professionals delivering the programme. Many diabetologists in the U.K. have forgotten that Joslin, an early pioneer of diabetes treatment, held exercise in as high esteem as insulin and diet and illustrated the relationship by using a triangle, each corner of which was taken by these three essential areas of diabetes management. The Joslin Centre in Boston, Mass. U.S.A. continues to uphold the importance of exercise in the management of diabetes (Joslin Diabetes Centre Pubs. 1995). Evidence suggests, however, that exercise has lost its status in diabetes management in the U.K. and is mentioned only briefly within the European St. Vincent Declaration (1995) and as a result, many people with diabetes may be missing some very useful benefits for their well-being both now and for their future.

CHAPTER 3

A pilot study of exercise counselling, prescriptions and physical and psychological instruments for people with IDDM

3.1. Introduction

Evidence from the literature suggests that there may be both benefits and problems occurring when an insulin dependent diabetic begins to exercise aerobically following a previous sedentary lifestyle. The aims of this study were to find out if:-

a) The exercise counselling and prescription protocols employed will be understood sufficiently to promote adherence to a safe exercise regime for insulin dependent diabetics,

b) The physical fitness testing protocol is suitably progressive for insulin dependent diabetics and will not cause hypoglycaemia,

c) The psychological and quality of life tests employed are sensitive and reliable for use with insulin dependent diabetics.

The most important issue was to present an exercise programme that was, primarily, **safe** for a population who have insulin dependent diabetes. Using motivational and educational tactics, the study aimed also at encouraging the subjects to continue exercising regularly for four weeks, making the necessary adjustments to insulin and carbohydrate intakes and to blood glucose monitoring. Instruments, not previously used with people with insulin dependent diabetes, were tested for their sensitivity and suitability for measuring physiological, psychological and quality of life peramaters both before and after an exercise programme.

3.2. Literature Review

3.2.1.Special Considerations for safe exercising

Richter and Galbo (1986) termed exercise as a "perturbation of metabolism". The ability of exercise to alter blood glucose levels may be of extreme significance to a poorly controlled diabetic. When blood glucose levels rise outwith the normal range (4-7mmol/l) and ketones are beginning to form in the urine, a diabetic's metabolism is out of control. Engaging in exercise at this point will result in a further rise in blood glucose due to the hepatic response. This response occurs when the working muscles become very short of glucose due to the lack of circulating insulin in a poorly balanced metabolism. Insulin is necessary to transport glucose to the working cells. The working muscles translate their lack of energy source as the lack of glucose in the blood stream, not lack of glucose transporting insulin. Messages to the brain from the muscles request more glucose and thus the brain responds by instructing the liver to release glucose immediately from the supplies in the liver. This extra glucose released causes blood sugars to rise even further and yet the working muscles are still unable to receive this glucose due to the lack of the transporter-insulin. Unless the exerciser injects the required amount of insulin, the diabetic exerciser may begin to feel very ill and to be at risk of severe metabolic disturbance (Berg,1986). Exercise will only decrease blood glucose levels when there is sufficient background insulin present in the blood stream. A good recommendation by Gordon (1993) is that diabetics do not exercise when blood glucose measures are above 14mmol/l (300mg%) and ketones are present in the urine. This safety precaution is frequently not understood, and therefore not adhered to, by the diabetic population (Berg,1986). Many diabetics are, in fact, accustomed to allowing their blood glucose levels to run too high before engaging in exercise in order to avoid a hypoglycemic event.

Hypoglycemia is a very unpleasant occurrence and at the forefront of many diabetics' minds when thinking about exercise (Frier and Fisher, 1993). Symptoms are caused by an inadequate supply of glucose to the brain and in severe episodes, irreparable damage can be sustained by both the brain and the nervous system (Gordon,1993). When an insulin dependent diabetic is well controlled (i.e. blood glucose levels at 4-7mmol/l) with adequate amounts of plasma insulin, hepatic glucose output is inhibited. Exercising muscles will take up peripheral glucose and it is essential, therefore, that the diabetic will begin the exercise period with slightly elevated blood glucose by ingesting 15-30gms of carbohydrate for every 30 minutes of moderately intense exercise to prevent the onset of hypoglycemic symptoms (Vitug et al,1988).

Koivisto and Felig (1978) recommended that insulin dependent diabetics shift their injection sites to a non-exercising part of the body to prevent the development of hypoglycemia due to increased absorption rates from an exercising body part. However, Kemmer et al (1979) were unable to confirm these findings and since Berger et al (1982) demonstrated that absorption from the abdomen was in fact quicker than that of the arm or leg, it was concluded that moving the injection site would not necessarily guard against exercise-induced hypoglycemia and that blood glucose monitoring was probably the most significant precaution available to diabetics today.

Robbins and Carleton (1989) reminded readers that before the advent of blood glucose monitoring techniques became available to insulin dependent diabetics, many of their physicians urged them to adhere to a strict regime of meals and insulin injections, leaving no room to accommodate the changes in metabolism brought about by exercise. They underlined the fact that athletes with diabetes were a "rare breed". Gordon(1993) also emphasised the importance of blood glucose monitoring **before** exercise. This simple procedure empowers a diabetic to decide whether s/he is in good metabolic balance or whether adjustments to insulin or carbohydrate are necessary before embarking on his/her chosen exercise. Berg (1986) advised diabetic exercisers to consider the energy costs of their specific exercise period so that more accurate estimations are made of the carbohydrate requirements. He emphasised the difficulties involved in such an estimation and stated clearly that it could only be a "rough guide" as each person would respond differently to exercise *per se* and individuals would even respond differently themselves from day to day. For this reason, he recommended that diabetics engaging in prolonged exercise periods such as half marathons, must also be prepared to monitor blood glucose **during** the exercise and to take fast-acting glucose straightaway if blood glucose levels were dropping towards hypoglycemia.

Several hours after completion of a period of exercise, an insulin dependent diabetic is still vulnerable to the blood glucose lowering effects of exercise and must therefore be aware that hypoglycemia may occur many hours **after** exercise is completed. MacDonald (1987) found it occurring 6 to 15 hours after exercise and suggested two main reasons for this. Firstly, it may be related to hepatic glycogen depletion. Secondly, the exercise may have caused an increased insulin sensitivity which will, in turn, increase absorption of glucose by the working tissues. Vitug et al (1988) advised inexperienced exercisers to carry out blood glucose monitoring **after** the exercise session and then again several hours later. If blood glucose was found to be dropping , they suggested ingestion of a slow acting carbohydrate and continued blood glucose monitoring every few hours. More experienced exercisers have more idea how their metabolism reacts to exercise but must still be aware of the possibility of delayed-onset hypoglycemia especially if the exercise period was more strenuous than normal (Robbins and Carleton,1989).

Maynard (1991) underlined that diabetes does carry an exercise risk because of hypo- and hyperglycemia. He also reminded health professionals and educators that anyone with diabetes mellitus of long duration who is anticipating starting an exercise programme, may have other significant exercise risks present. For this reason, s/he should be screened carefully by his/her own physician before starting. Armstrong (1991) could see no reason for performing a diagnostic exercise stress test or for restricting physical activity with individuals under the age of 35 who had been clear of pathological complications. However, he did advocate the use of a sub maximal exercise test for developing a suitable exercise prescription for each would-be diabetic exerciser.

3.2.2. Physiological Testing

a) Aerobic Capacity

The aim of testing the aerobic system is to measure the maximal rate at which oxygen can be uplifted from the environment and used by the mitochondria of the contracting muscle cell. McKirnan and Froelicher (1987) showed that this transport system is capable of supporting a level of metabolism that is ten fold that of the system at rest. This VO2 max measure is considered to be the most accurate assessment of aerobic power (Nordrehaug et al., 1991) and is a useful indication of one aspect of an individual's physical fitness level. However, this maximal test involves an intense exercise protocol which takes an individual to the point where maximal oxygen consumption is achieved but is often not practical or desirable for the health and well-being of a particular subject (Davidson,1994). Consequently, a large number of sub maximal tests have been developed to predict VO2 max from oxygen consumption and/or heart rate at various sub maximal workloads.

Estimating maximum oxygen uptake relies on making a prediction from some other form of measurement at sub maximal exercise levels and the normal method is to use the assumed linear relationship between heart rate and either the oxygen consumption or the equivalent work rate (Maritz,1961). Extrapolation of data from sub maximal values to predict maximal value relies on three assumptions:- 1) that the linear relationship between heart rate and oxygen consumption or work rate is true; 2) that there is a constant mechanical efficiency when calculating oxygen cost from workload; 3) that the prediction of maximal heart rate is accurate.

Examination of these assumptions in order, clarifies the statement that predicting VO2 max by sub maximal methods is less accurate than by maximal methods (Nordrehaugh et al., 1991). Shephard (1984) argued that there is normally a statistically insignificant divergence from the linear relationship of heart rate and oxygen consumption/work rate although Nordrehaugh and colleagues (1991) warned that individual variability of oxygen consumption increases with decreasing intensity of the workload. For this reason, it is best to set the final workload at a level which will increase a subject's heart rate to approximately 75% of his/her predicted maximum. Thomas et al.,(1992) found that mechanical efficiency was not constant for cycle ergometry (4-5% variability) nor for stepping (10% variability). Shephard (1984) reported that treadmill walking or jogging showed 10% variability also. Astrand and Rodahl (1986) warned that there could be considerable individual variation (+10 or -10 beats per minute, at least) in predicted heart rate using the equation of 220-age.

The original method for predicting VO2 max from sub maximal tests was performed by Astrand and Rhyming (1954) whose subjects exercised on a bicycle ergometer under a workload estimated to raise their heart rates to between 125 and 170 beats per minute. Maximum oxygen uptake was estimated using a specially designed nomogram. Coleman (1976), however, reported that extrapolation of a best straight line from 4-6 points on a VO2/heart rate plot to predict VO2 max. was far more accurate than the Astrand-Rhyming nomogram which relied on the values from one workload only. Estimated errors for the extrapolation of the actual VO2 max were 8% whereas the nomogram yielded errors of 15%.

In this study with previously non-exercising subjects who also have insulin dependent diabetes, the choice of the most appropriate instrument for measuring their baseline aerobic capacity took into account several factors. Some studies have shown that even young people with diabetes tend to have lower aerobic capacities than non diabetic people of similar age and size (Sterky,1963; Baran and Dorchy,1982). It was necessary, therefore, to employ a test which would be able to offer initial low workloads. Grant et al (1992) suggested that cycling required less energy cost than treadmill protocols as their subjects showed lower heart rates, lower blood pressure and less leg fatigue. Cycling has also been reported as more comfortable for heavier individuals and less threatening for unfit individuals than other aerobic tests. As reported earlier, Thomas (1992) had tested cycling for mechanical efficiency and found its variability to be lower than either the treadmill or stepping protocols. Whilst predictive tests are less accurate than direct measurement of VO2 maximum (Shephard,1984), they are valuable for showing improvements due to a specific training programme (Astrand and Rodahl, 1986) which is one of the main aims of this study.

Subjects in this study came from three different hospital clinics and were geographically separated by many miles. Testing was carried out in their locale and the bicycle ergometer was chosen as being the most suitable instrument for testing aerobic capacity of this particular population because of the reasons already given and also because the testing equipment was easily transported to each site. The Glasgow University Physical Education Fitness Testing protocol (Appendix 1) was followed as it gave three steady state points on a VO2/HR plot to predict VO2 max.

rather than values from just one workload (Coleman,1976).

b) Percent Body Fat

Many researchers in the last twenty years have noted the importance that exercisers in the general population have placed on body composition. Bruce and Humphries (1982) were certain that for many, it was the most important component of physical fitness and that women consistently ranked weight control as the most significant reason for exercising.

Landry (1992) underlined the importance that ideal body weight and shape can play in improvement of self image for a person with diabetes. The balance of insulin intake and carbohydrate ingestion is an ongoing activity and the metabolic disruption of diabetes can often result in overweight. Exercise is the third factor in this "juggling game" for insulin dependent diabetics (Marsden, 1988). Maynard (1991) stressed the importance that exercise plays in weight loss for diabetics and advised that it be considered as part of the treatment plan especially if fat loss is a goal for a particular patient. Berg (1986) reminded his readers that diabetes tends to predispose patients towards cardio vascular problems and that changing the lipid profile through regular exercise may have enormous benefits. Lamb (1984) pointed out that obesity is associated with increased risks of heart disease, high blood pressure and kidney disease. It follows, therefore, that diabetes and obesity together increase the incidence of cardiovascular problems greatly. For these reasons, monitoring the change in percent of body fat in a diabetic who begins to exercise is important.

There are two primary methods of measuring percent body fat . The first, hydrostatic weighing, demands very specialised and expensive equipment. It is also an unpleasant experience for those not accustomed to it. The second is much easier to perform in a laboratory with trained personnel and it involves measuring body fat with skin calipers. It is also inexpensive, quick and not unpleasant. However, hydrostatic weighing is the most accurate measure for persons above 40% body fat while skinfold calipers match in accuracy for persons between 15 and 40% body fat.

Durnin and Womersley (1974) carried out body fat assessments on 481 men and women and discovered that while it was possible to make an assessment of body fat on skinfold measures taken at one body site only, it was possible to make a large error on some people due to unusual fat distribution. It was their recommendation, therefore, to use four sites to measure skinfolds:- triceps, biceps, supra iliac and subscapular. They have devised widely used tables to predict percent body fat taking into account both age and sex.

Watson (1983) insisted that calculations used to convert skinfold measures to percent body fat should be those developed on subjects of the same sex, race and developmental status. His work led him to propose the following skin caliper sites as the most accurate predictors for males aged 18-30 years when compared to their hydrostatic measures :- abdomen, front thigh, triceps, buttocks, lower back and biceps. Anderson and Ross (1986) argued that measurement of the front thigh was particularly unreliable due to the difficulty of successfully lifting the adipose tissue from the underlying fascia and they found that the triceps, subscapular, abdomen and median calf were reliable predictors of percent body fat when the **same** researcher performed the measures and repeat measures. They did find that skin caliper measures compared favourably with ultra sound techniques but became less reliable with increasing subcutaneous adipose thickness (over 40% body fat).

The validity of skinfold measurements in predicting the percent of body fat relies on two assumptions. The first is that subcutaneous fat contains a constant proportion of body fat over all ranges of body weight. Secondly, it is assumed that the sites of measurement are representative of all subcutaneous fat. Skinfold calipers measure a double thickness of skin folded and compressed adipose tissue. In order to predict percent body fat from these measures, a set of further assumptions must be made (Martin et al.,1985) :-a) there is constant compressibility; b) skinfold thickness is either negligible or constant; c) adipose patterning is fixed; d)proportions of internal to external fat is fixed.

Clarys and colleagues (1987) undertook the Brussels Cadaver Analysis

Study (CAS) using 32 cadavers' skinfold measures and compared them with the results of total body fat obtained by complete dissection and analysis. The study disproved assumptions a,b,c and d (above) and assumption (e) was questionable as correlations between skinfold measures and internal adipose tissue was not significant. The researchers in the CAS study, however, did suggest that as skinfold measures were so inexpensive and non invasive, they could be useful if certain factors were noted. They suggested that more work should be carried out to find the best possible sites. At present, the biceps, triceps, suprailiac and subscapular are commonly used. They also reaffirmed that technicians using the skin calipers should be experienced and that the same technicians should measure the same subjects in repeated measures. Finally, calculations used in predicting percent body fat from skinfold measures must be population specific.

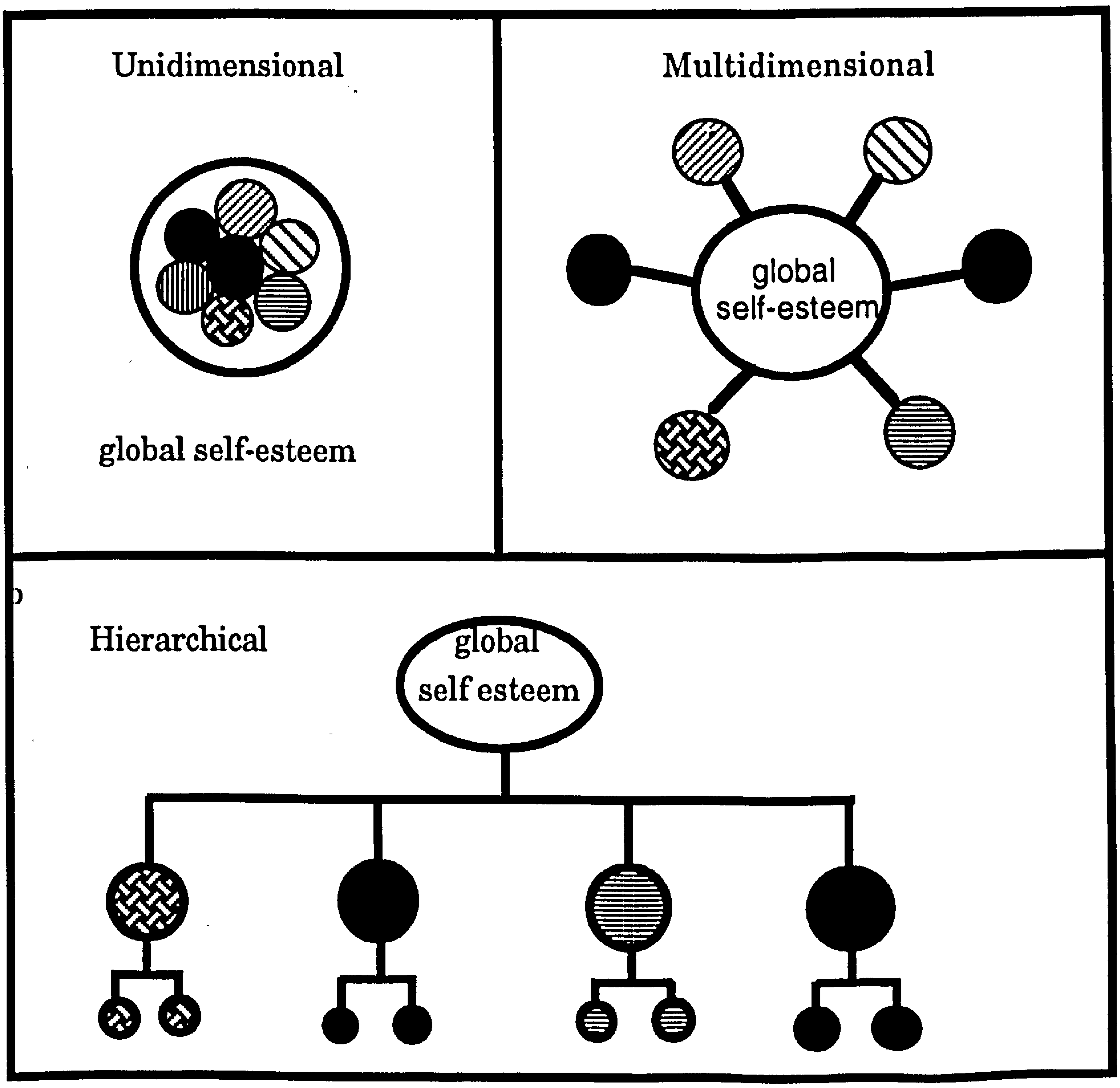
Skinfold caliper measurements of the triceps, biceps, subscapular and suprailiac sites were chosen for predicting the percent of body fat of the subjects in this study for four reasons. The researcher was experienced in this method and was able to make reliable measurements. The other methods outlined in the literature above were expensive and the specialised equipment was not available for this study. Population specific charts were available for calculating the percent of body fat from skinfold measures of this population. The skinfold caliper method is non invasive, nor dangerous nor unpleasant.

3.2.3. Psychological Tests

a)The Physical Self Perception Profile (PSPP).

Self-esteem has long been recognised as an important part of psychological well-being. It can be defined as the evaluative part of self-concept (Fox,1989). Three main models of self-esteem have been suggested :- unidimensional, multidimensional and hierarchical. The unidimensional model was the main model for many years and was measured by inventories resulting in true/false answers and then the score was totalled (Coopersmith,1967). The unidimensional model has been criticised for ignoring the complex relationships between, and different weightings of, the elements involved in an individual's self-regard (Harter,1983). Rosenberg (1979) recognised that "global" self-esteem may be the sum of many complex parts and relationships between these parts. The multidimensional model has become much more acceptable than the unidimensional model as it takes into account the fact that an individual judges him/herself differently in different areas of his/her life and so separate subscales are used to evaluate each area or domain as well as considering overall or global self-esteem (Harter,1988). The hierarchical model was first hypothesised by Shalveston and colleagues (1976) and presented with global self esteem at the apex supported by other domains and subdomains at lower levels. This model allowed for changes in global self esteem produced by changes in lower domains. The structure of the hierarchical model has been tested by several researchers and Fox and Corbin (1989) cited that Marsh and Shalveston's (1985) work showed a strong support for the dimensionality of the model. The three models are shown in fig.3.0. below.

Figure 3.0. Three models of self esteem structure (Fox and Corbin,1989)



The hierarchical model is especially interesting as it allows for lower level perceptions, which are attached to specific and changeable behaviour, to be measured. Not only can global self esteem be measured with this model but also subdomains, depending on the research question. Harter (1985) preferred considering self esteem on an individual level where a subject attached personal, importance weightings to different subdomains and discounted the importance of other subdomains where s/he encountered less competence.

The emergence of The Physical Self-Perception Profile (PSPP) by Fox (1990) took into account self-perception content and tested dimensionality and the hierarchical model. Fox was interested in the mechanisms of self-esteem changes through exercise and whether self-perception was a factor in predicting exercise choice and persistence. Fox and Corbin (1989) had worked with 1,191 college students in order to construct an hypothesised three-tier hierarchical organisation of self perception (figure 3.1.)

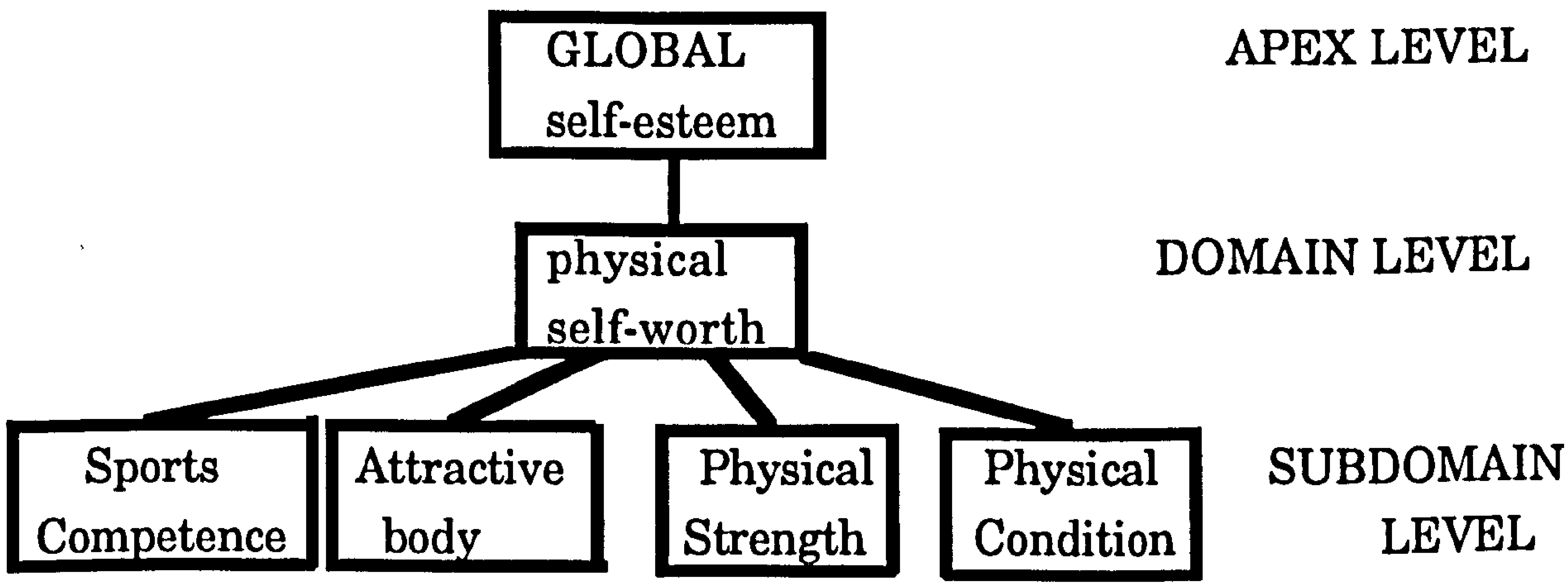


Figure 3.1. Hypothesized three-tier hierarchical organization of self-perceptions (Fox and Corbin, 1989)

Reliability and validity tests were carried out on the PSPP with college student populations (Fox, 1989) and obese subjects (Fox, Mucci and Dirkin, 1990). Internal consistency reliability was addressed for each of the subscales using Cronbach's Alpha (Cronbach,1951). Reliabilities are consistently high for males and females with a range of .81 to .92. Test-Retest reliability correlation coefficients showed a range of .74 to .89 over a two to three week period. Fox (1989) tested the PSPP with a sample of

Illinois University students for susceptibility of socially desirable responses by correlating item and subscale scores with the short form of the Marlow-Crowne Social Desirability Scale (Reynolds, 1982). All correlations, except for two items, were not significant ($p<.05$). The problems of social desirability seemed to have been avoided in this particular sample.

The population for this research (study 1) were aged between 18 and 35 years of age with a mean age of 22.77 years. This approximates fairly closely with one of the college populations of Fox and Corbin. This instrument promised to be the best for this age group in picking up changes occurring after beginning exercise and so it was adopted for this study. The PSPP not only relates to physical performance but also to a subject's perception of physical attractiveness which may be under threat when an individual is firstly diagnosed as having insulin dependent diabetes (La Greca et al.,1991). However, no work, to date, has been carried out using the PSPP with a diabetic population. The PSPP questionnaire can be found in Appendix 2.

b) The Profile of Mood States , (Bipolar Form -POMS-BI). Lorr and McNair (1984) constructed POMS-BI after a series of experiments to assess all of the factor analytically established mood states reported in both normal and psychiatric populations. The majority of instruments available measured only the negative aspects of mood states for clinical settings (POMS-unipolar, Beck Depression Inventory). A further disadvantage with using instruments like the Beck Depression Inventory was the reliance the scales placed on somatic symptoms which could be confused with symptoms of poor diabetic metabolic control rather than depression per se (Lustman et al., 1988a). POMS-BI was intended to measure both positive and negative elements and so could be used successfully with normal populations also. Dunn (1993) reviewed studies which examined emotional adjustment to the diagnosis and subsequent management of diabetes. He cited studies testing for anxiety (Wells et al.,1989), depression (Lustman et al., 1988b) and anger (Deshields et al., 1989). The diabetic subjects almost always showed poorer mood states than subjects suffering other chronic diseases. Since POMS-BI incorporates scales to measure these mood states along with confusion, tiredness and unsureness, it seemed an appropriate instrument to use with this group of diabetics. Finally, Lorr and McNair specifically stated that this instrument would successfully assess mood change resulting from techniques such as relaxation, meditation and other therapies.

However, some exercise psychologists have used POMS-BI to assess the effect of exercise on mood states and found only limited improvements detected by this instrument (Moses et al.,1989 and Mutrie and Biddle, 1995). Mutrie et al (1991) reported that their subjects' baseline scores on POMS were within one-half of a standardised mean and that because these subjects appeared to already be psychologically healthy, there may have been little room for improvement. From Dunn's (1993) review, it seemed likely that diabetic subjects would not have such high baseline measures and that POMS-BI would be a suitable instrument for this study. Mayou (1989) had used the instrument successfully with IDDMs.

Lorr and McNair tested each bipolar mood state for reliability by administering test-retest questionnaires to 66 university students and found that there were no significant differences in mean scores for any item.

Lorr and McNair (1984) cited validity studies carried out by McMahon and Davidson (1985) on 243 male inpatient alcoholics. The researchers aimed to study personality disorders as measured by the Millon Clinical Multiaxial Inventory and mood as measured by POMS-BI. Correlations of moderate strength were found between the Compulsive-Conforming and the Passive-Aggressive scales of the MCMI and measures of Depression, Anxiety and Anger on POMS. The Schizoid, Avoidant and Borderline scales related only to Anxiety and Depression. The Histrionic-Gregarious and Narcissistic scales correlated positively with the Vigour mood scale. All of these correlations were supportive of the construct validity of POMS-BI. A copy of the POMS-BI questionnaire can be found in Appendix 3.

c) Quality of Life

At present, there is no consensus on the definition of quality of life (Meadows,1991). The literature covers many components ranging between functional ability, quality of social interaction, psychological well-being, somatic sensation (pain), and life satisfaction. Bowling (1991) offered the following definition for both outpatients and inpatients:-

> "Quality of life is a concept representing individual responses to the physical, mental and social effects of illness on daily living which influences the extent to which personal satisfaction with life circumstances can be achieved. It includes perceptions of well-being, a basic level of satisfaction and a general sense of self-worth."(p9)

Naess (1987) postulated that an individual enjoying a high quality of life will be active, will be able to relate to others, has a good self-esteem and experiences a basic mood of happiness. He considered each of these four areas to be equally important and that an individual's realm of activity would include both personal and role functioning. Bulpitt and Fletcher (1990) pointed out the importance of selecting an assessment instrument which is appropriate to the condition and treatment of the specific population under survey. Schipper (1983) also underlined that the content of a quality of life measure must reflect what is important to the patient. Meadows (1991) went even further and stated that in the process of

> "operationalizing the concept of the quality of life for diabetics, we need to be sensitive to the complexities of the management regime and the demands that it places on the individual patient"(p194)

He believed that an assessment instrument should address how much diabetes affects life at work, at school and in recreational, social, sexual and social areas. It should also take into account the attitudes and behaviours of significant others. The content of such an instrument should also be sensitive to an individual's age and stage of life. Meadows advocated that a definition of quality of life should be represented as a multi-dimensional concept covering at least a person's psychological state, role functioning, social support system and physical well-being.

Schipper (1983) discussed several methodological considerations in the development of a good instrument. Firstly, he stated the importance of a short inventory that is repeatable and can be shown to be both reliable and valid. Secondly, each component must be easily understood by every subject and thus necessitates a general rather than a specific approach to component content. Thirdly, the instrument must be sufficiently sensitive to pick up changes due to intervention programmes. Schipper (1983) also pointed out the difficulty involved with comparing one subject's quality of life with another and suggested that each subject's baseline measure be used so that individuals serve as their own internal control.

Meadows (1991) examined several quality of life measures designed for the diabetic population and found several weaknesses. The Diabetes Quality of Life inventory was designed for the large Diabetes Control and Complications Trial and reported by Jacobson et al (1988) contained 46 items and was, therefore, quite long and there was a lack of conceptual basis of the individual domains. Some items also appeared to be age and culture specific. Hornquist's (1989) measure was conceptually soundly based but, at present, requires translation into English and piloting in English-speaking cultures. Meadows himself was working on the Diabetes Health Profile but at the time of this study, it was not available for use.

Mayou's Effects of Diabetes on Everyday Life Questionnaire (EDELQ,1990) was specially designed for use with people with diabetes and was designed to be compact and easily understood by diabetic adults. It was adapted for his study on the basis of pilot interviews with diabetic subjects from a questionnaire used in previous studies of heart disease patients (Mayou and Bryant, 1987). This instrument was chosen for Study 1 because it was short, easily understood, specifically designed for people with diabetes and available at the time of the study.

Since Mayou had used his instrument in a semi-structured interview situation and not as a paper and pencil questionnaire as in this study, a simple reliability test was carried out using 30 patients from the three west of Scotland clinics. After a period of two weeks, each patient was asked to fill in a second questionnaire. The scores of the first test were plotted against the scores of the retest. The mean of test 1 was 15.29 with standard deviation of 14.43. The mean of Test 2 was 16.38 with standard deviation of 14.15. The correlation coefficient of these scores was 0.972 which shows a high test-retest reliability.

Each of the 30 patients was well known to the specialist diabetes sisters who then checked each of their patients' answers carefully to see how valid they felt these questions and their patients' answers were. In their subjective opinion, they believed the questionnaire to be a good indicator of their patients' quality of life as they perceived it. The complete Questionnaire can be found in Appendix 4.

3.3 Methodology

This study was intended to be a small experimental pilot study which would test the suitability of two physiological and three psychological testing instruments on a population of young insulin dependent diabetic non-exercisers. Each subject was given the battery of tests before beginning an exercise programme and then four weeks later. Of equal importance was the testing of an exercise counselling protocol specially designed for this population.

3.3.1.The subjects:

Subjects were volunteers and were patients at either Gartnaval, Crosshouse or Ayr diabetic clinics in the west of Scotland, where ethical permission and support of the Diabetes Consultants had been granted. The subjects had all been diagnosed as having insulin dependent diabetes mellitus (IDDM). Subjects had been diagnosed for more than two years and their metabolism was relatively stable. Surveys of subjects who have been diagnosed for less than two years may encounter difficulties as there still may be unstable insulin secretions from the pancreas (the"honeymoon period") often found in newly diagnosed diabetics (Berg, 1986). No subject had been diagnosed for longer than twenty years and showed no signs of early diabetic complications, such as retinopathy, nephropathy, neuropathy or cardiovascular problems. They were carefully examined by their doctors and found to be in good health. They were aged between 17 and 35 years. There were eight men and six women subjects in this pilot study and they had not been exercising in the last six months. Each subject was adept at self monitoring blood glucose techniques. Their insulin regimes varied between twice daily insulin injections using a normal hypodermic needle and four times daily using a pen injector device.

3.3.2.Instruments

a) Physiological Instruments

i) The Glasgow University Physical Education Department Fitness Assessment protocol did not involve exercising to exhaustion and seemed to be suitable for a population of insulin dependent diabetics not accustomed to regular exercise.

ii) The estimate of maximum oxygen uptake was made from sub-maximal work loads on a Monark 818 exercise bicycle ergometer as recommended by Pollock (1984) and heart rate measures were taken using the Sports Tester P.E. 3000 made by Polar Electric DY.

iii) Estimate of percentage body fat was calculated according to the method discussed by Durnin and Womersley (1974) by measures of skinfold thicknesses at four different body sites using skinfold calipers made by Holtain Ltd.

iv) Weight and height measures were recorded by using portable bathroom scales and wall tape measures and blood pressure readings were carefully checked to see that they lay within the normal range before proceeding to the bicycle ergometer activity.

b) Psychological Instruments

i) The Physical Self Perception Profile (PSPP) designed by Fox in 1989 was employed to assess perceptions of sports competence, body attractiveness, strength, physical condition and a general measure of physical self worth.

ii) The Profile of Moods States, Bipolar Version (Lorr and McNair,1984) was used to measure six bipolar subjective mood states.

iii) The Effects of Diabetes on Everyday Life Questionnaire (Mayou, 1989) was chosen as the best available quality of life measure for insulin dependent diabetics.

3.3.3. Procedure

Once the Ayrshire and Gartnaval Ethics Committees granted approval of the study, the Diabetes Consultants in the three hospitals began to look for suitable volunteers at their out-patient clinics. On finding a patient who fulfilled the predetermined criteria (between 17 and 35 years old, has had diabetes for at least 2 years but not more than 20 years, is not a regular exerciser and does not have any diabetic complications) a brief explanation of the study was given and if the patient agreed to participate her/his name and address was sent to the researcher. Initial contact with the volunteer was made by telephone, wherever possible, and an appointment was arranged in one of the following centres:- the Glasgow University Fitness Assessment lab (Gartnaval patients), the Physiotherapy Unit at Ayr Hospital (Ayr patients) or the Diabetes Day Centre at Crosshouse Hospital (Crosshouse patients). Each volunteer was informed that the first meeting may take between an hour and ninety minutes. The test was carried out by the author who has experience and knowledge of the effects of exercise on insulin dependent diabetes mellitus. An easily digestible form of glucose was kept close at hand in case any subject began to feel hypoglycemic at any point during the testing procedure. Provision was made for each IDDM to test blood glucose levels before beginning exercise and again after completing the bicycle ergometer test.

An "Explanation of the Research Study" (Appendix 5) was firstly given to the patient. If the patient agreed to take part s/he was asked to sign the "Informed Consent Form" (Appendix 6) and s/he then became a subject of the study. The battery of psychological tests (POMS., PSPP ,EDELQ) were presented to the subject in that order with relevant information about how to complete each one. Each subject was given a quiet and private place in which to complete all the forms. There was no time constraint.

On the POMS-BI questionnaire, each mood state was represented by a scale running between a negative and positive pole and the questionnaire listed 72 adjectives in a cyclical order. The subject was asked to decide to what extent s/he has "felt like this" in the last seven days. The choices were:- Much like this / Slightly like this / Slightly unlike this / Much unlike this.

The scales were bipolar and the score, therefore, was the sum of the positive item scores minus the negative item scores. A hand stencil was used in the scoring procedure and the total score was given as positive scores minus negative scores plus a constant of 18. This allowed all possible scores to be positive and the range was 0-36. The mood states measured by this instrument were as follows:-

Composed / Anxious
Agreeable / Hostile
Elated / Depressed
Confident / Unsure
Energetic / Tired
Clearheaded / Confused

The PSPP questionnaire (Appendix 2) required the subject to choose which one of two statements best described her/him and then to tick a box to indicate to what extent the statement described her/his self perception e.g."sort of true for me" or "really true for me". There were six statements belonging to each sub domain of the PSPP and six belonging to a fifth sub scale which was designed to measure overall self-worth (PSW) and so each subject had thirty statements for which a response was required. Fox (1989) warned that even with a population of well-educated college students in the USA, there was a 2-4% chance of more than one box being ticked on any one question and therefore, explanations of required procedure should be carefully and clearly given beforehand. Subjects normally have taken between 20 and 30 minutes to complete the PSPP questionnaire.

The EDELQ was composed of two parts. The first asked the respondent about his/ her feelings about diabetes and to rate answers on a Likert scale ranging from "strongly agree" to "strongly disagree". Scoring ranged from -2 to +2 on each item with "uncertain" scored as 0. The second part

DAMAGED TEXT IN ORIGINAL

of the questionnaire covered difficulty that the respondent experienced at work, leisure and in family life over a previous three month period. Answers were recorded by marking one box per item and the choices were "not affected at all", "slightly affected", moderately affected" and "greatly affected". Scores again ranged from -2 to +2 but in this section there was no provision for scoring zero. An overall score for quality of life was obtained by summing all scores.

On completion of the psychological tests, the subject was then weighed and height was measured and recorded. Skinfold calipers were used to measure thickness of subcutaneous fat deposits at the biceps, triceps, sub scapular and suprailiac sites.

Finally, each subject underwent six to eleven minutes of cycle ergometer pedalling at suitable and progressive workloads to raise the heart rate to 75% of the estimated maximum. A short time of familiarisation was allowed at the beginning. A test was then carried out on a bicycle ergometer in accordance with Astrand and Rhyming's method (1954) to determine an estimated value of VO2 max. The protocol is illustrated in appendix 7.

A specially designed exercise pack (Appendix 8) was given to the subject on completion of all the tests. The researcher then carefully went over "Medical Directions for Coping with Exercise" so that each subject would have enough knowledge about diabetes and the effects of exercise upon the metabolism in order to exercise safely. Practice was given for taking the heart rate using the carotid artery. The subject's target heart rate was calculated as 60-80% of the age related heart rate maximum using Fox and Mathews (1981) calculation of 220 minus age as the maximum heart rate. When the researcher was certain that these facts were understood, the subject was then encouraged to make an exercise contract for him/herself by using the Exercise Prescription Chart. Some motivational tactics were discussed and it was made very clear to each subject that s/he should telephone the researcher at any time should there be a problem or something not understood. Finally, the exercise pack containing six "Exercise Log" sheets (one for each week of the study), was examined and some time was spent ensuring that the subject knew how to fill in the required information.

Each subject was given the researcher's home and work telephone numbers so any extra counselling needed could be obtained immediately.

Subjects were then required to exercise in the mode and at the time they chose for three times per week for at least 20 minutes as outlined by the American College of Sports Medicine (1986). Each subject was telephoned once per week by the researcher so that exercise levels could be checked and any problems solved. Also, a new exercise prescription was discussed for the following week unless the subject decided to repeat his/her previous week's prescription.

At the end of four/six weeks, each subject made an appointment with the researcher at one of the centres used in the initial consultation. The battery of psychological tests were presented as before. The physiological tests were carried out using the same procedure employed at the beginning of the study. Some time was then spent with each subject to find out what problems, if any, had been encountered in the practical exercise sessions, following the medical advice for exercise or with completing the exercise log. The six exercise logs from each subject were collected for analysis.

Each subject was thanked for participating in the study and encouraged to continue exercising on a regular basis by discussing further motivational tactics suitable for the individual subject and his/her lifestyle. These tactics included making an exercise contract, setting long and short term goals, exploring exercise likes and dislikes, choosing to exercise with other family members, friends or a group and examining suitable personal rewards (Biddle and Mutrie,1991).

3.3.4. Collection of Data

Data was collected from each subject at their nearest testing venue (Ayr hospital, Crosshouse hospital or Kelvin Hall) after making initial contact by phone. Data collected from both the psychological and physiological instruments before the subjects began their exercise programmes were held in a sealed envelope until the intervention programme was completed and the second set of measures had been taken. The physiological data were fed into a BBC computer and percent of body fat and estimated VO2 max were calculated using the Glasgow University Fitness Assessment disc. For calculating percent body fat, the disc used the Siri Equation i.e.

$$\% \text{ body fat} = (4.95/\text{density} - 4.5) \times 100$$

The body density equation was outlined by Durnin and Womersley (1974) and takes into account the subject's age.

Estimated VO2 max was calculated on disc by using the linear extrapolation method outlined by Wilmore (1977). The programme uses information about bicycle workload in Watts and the average heart rate in beats per minute during the last minute of that load. It works on a predicted maximum heart rate of 220-age.

The psychological questionnaires were scored by hand, using the methods recommended by the appropriate authors and described in methodology. Data was entered into a computer. The statistical package, Minitab, was used to analyse both psychological and physiological data.

3.4. Results

Fourteen patients volunteered to participate in this four week exercise programme. Each subject had been diagnosed as having insulin dependent diabetes for at least two years but no more than twenty years. No subject was a regular exerciser (i.e. no one exercised more than once a week on a regular basis). Subjects were between 17 and 35 years of age and adept at home blood glucose monitoring. Subjects were patients from either Ayr, Crosshouse or Gartnaval Hospitals. The results will be considered in three parts :- (a) those concerned with the exercise counselling and prescription protocols for safe exercising for IDDMs; (b) physiological testing procedures and results; (c) psychological testing procedures and results. This study was designed as a pilot study to test both the appropriateness of the instruments used for this population as well as the results obtained by the instruments.

3.4.1. Analysis of Data

Descriptive data was collected on each subject for age, sex, length of time since diagnosis and which hospital diabetes clinic s/he attended. Physiological and psychological measures were taken before the exercise programme and then again when the four weeks of exercise had been completed. The changes were plotted on scattergrams and the response variables were regressed individually against the number of exercise sessions completed (explanatory variable) using the statistical package Minitab 8.1. Means and Standard Deviations of pre- and post measures of POMS-BI and PSPP were compared with means of other non-diabetic populations.

3.4.2. Description of subjects

Eight males and six females volunteered to take part in this study. They were individually screened by their consultants at their diabetes clinics to check that there were no diabetes complications present and that the subjects were sufficiently healthy to undertake moderate intensity exercise. The mean age of subjects was 22.77 years with a standard deviation of 5.43 years. The mean length of time for diagnosis of diabetes was 6.31 years with a standard deviation of 4.46 years.

Each subject had an acceptable glycosylated haemoglobin count which was checked by his/her consultant before attending the first exercise testing and counselling session and each subject was experienced at home blood glucose monitoring.

All subjects successfully completed the physiological and psychological testing protocol. All subjects were given 30-45 minutes of exercise counselling, a personal exercise prescription and an exercise log to be completed every week. 13 of the original 14 subjects completed the four week's exercise programme and returned for the second physiological and psychological testing session. One male did not return and could not be contacted as he had moved house and left the area.

3.4.3. The exercise counselling and prescription protocol

The exercise counselling was designed to educate the subjects for safe exercise as an insulin dependent diabetic. For 13 subjects, it was successful as no hypoglycemic episodes occurred either during the exercise periods or following them. Blood glucose levels recorded on the exercise logs showed good control throughout the research period.

The exercise prescription was successful with regard to safety as there were no reports of injury, discomfort, hyper- or hypoglycemic episodes. However, it was only fully adhered to by four female subjects who completed all 12 exercise periods successfully. Three male subjects completed at least 10 exercise periods. Two females reported only completing two exercise sessions as they became infected with a cold virus and were not well enough to exercise until the final study week. One other male spent 10 days in hospital in the middle of the study but managed to complete six exercise sessions. The remaining three males completed five, six and seven exercise sessions.

3.4.4. Physiological testing protocol

Table 3.0.(below) shows the results of the pre and post exercise programme physiological tests. Using paired T-tests, significant reduction in mean percent body fat ($p<0.001$) was found after the exercise programme. No significant difference was found in either mean diastolic or mean systolic blood pressures or in VO2 max.

TABLE 3.0. **Results of Physiological Tests for Insulin Dependent Diabetes Mellitus (N=13)**

TEST	Pre Exercise		Post Exercise		Change (Pre/Post)		Paired T-Test
	Mean	SD	Mean	SD	Mean	SD	(p Value)
% BODY FAT	19.4	10.5	17.7	10.3	1.77	1.42	0.0008
VO2 MAX	37.0	10.5	39.5	9.5	2.38	2.99	0.07
DIAS. BP	76.0	6.4	74.5	6.4	0.62	3.99	0.59
SYST. BP	116.8	7.9	116.3	6.7	0.62	3.33	0.52

a) percent body fat

After the post-exercise measures were taken, the difference between pre and post measures of percent body fat were plotted on a scattergram against the number of exercise sessions completed. A linear regression equation was then calculated using the response variable (% body fat) and the explanatory variable (no. of exercise sessions). A stepwise regression calculation showed that the number of exercise sessions completed explained 45.85% of the variance in body fat. No other variables were found which added to this explanation.

b) estimated maximum oxygen uptake

The paired t-tests showed no significant difference in pre and post-exercise measures (p=.07) although there was an improvment in mean value.

3.4.5. Psychological testing protocol.

Every subject successfully completed this battery of psychological tests even though it required about 30 minutes of intense concentration. One subject found difficulty with the reading of the PSPP Questionnaire but was able to complete the boxes once the text was read to him.

Three psychological instruments were employed in this study. Mayou's Effects of Diabetes on Everyday Life Questionnaire (1989) had been both designed for, and used with, insulin dependent diabetics in earlier studies. The pre and post measures of this and the other psychological instruments can be seen in Table 3.1. The PSPP scores have been illustrated separatly for males and females as recommended by Fox and Corbin (1989). Also shown in this table are the differences between pre and post exercise programme measures and the p value using a paired T-test for each value. The table shows that there was a significant improvement (p=0.001) in the mean quality of life score using this instrument. The linear regression equation using the difference between pre- and post test scores and number of exercise sessions completed showed a significant relationship (p=0.015). A stepwise regression equation showed that 43% of the variance in perceived quality of life can be explained by the number of exercise sessions completed and a further 19% by increased confidence as shown by the POMS instrument.

Table 3.1. shows that the mean improvement in the composed/anxiety scale was found to be significant (p=0.05) using a paired T-test. All other scales showed a mean improvement although they were not significant using the paired T-test.

TABLE 3.1. **Results of Psychological Tests for IDDMS (N=13)**

TEST	Pre Exercise Mean	Pre Exercise SD	Post Exercise Mean	Post Exercise SD	Change (Pre/Post) Mean	Change (Pre/Post) SD	Paired T-Test (p Value)
EDELQ	22.8	11.9	27.7	9.6	4.9	4.37	0.001
POMS							
A/C	16.20	9.32	21.46	5.09	2.9	5.0	0.05
A/H	17.93	8.64	23.00	6.06	2.3	4.6	0.09
E/D	18.53	9.48	23.08	5.65	1.9	5.1	0.2
C/V	15.53	9.21	22.73	5.33	4.3	9.4	0.13
E/T	17.27	8.26	22.08	8.84	2.15	8.52	0.38
C/C	19.33	10.81	24.62	6.08	2.15	6.4	0.25
PSPP For Males							
SPORT	15.1	2.9	15.0	3.2	-0.1	0.9	0.7
CONDITION	11.0	2.4	11.4	2.5	0.43	3.3	0.74
BODY	12.7	2.8	13.7	2.2	1.0	2.7	0.37
STRENGTH	14.4	3.2	15.7	3.0	1.3	1.1	0.02
PSW	12.7	2.0	14.0	2.3	1.43	1.2	0.02
PSPP For Females							
SPORT	10.7	1.6	12.7	2.0	2.0	1.1	0.006
CONDITION	10.7	2.1	12.9	2.3	2.3	2.7	0.09
BODY	11.3	3.6	12.0	2.0	0.5	2.7	0.7
STRENGH	13.3	3.7	15.2	3.5	2.0	3.5	0.2
PSW	11.0	1.9	13.0	1.7	2.5	1.6	0.01

Each element of POMS-BI was used as a response variable in a linear regression calculation with the number of exercise sessions as the explanatory variable. The following results were obtained:-

*Composure was significantly related to exercise (p=0.01) with 47% explained by the number of exercise sessions completed.

*Agreeableness was also significantly related to exercise (p=0.04) with 33% explained by the number of exercise sessions completed.

*Confidence was significantly related to the number of exercise sessions completed (p=0.018) with 41% explained by this and a further 21% by increased EDELQ.

*Clearheadedness was significantly related to the number of exercise sessions completed (p=0.041) with 33% explained by this.

*Depression and Tiredness were not significantly related to the number of exercise sessions completed (p=0.08 and p=0.08 respectively)

Lorr and McNair (1984) have provided a table of norms for the elements of POMS-BI for outpatients and normals. The pre-exercise and post-exercise means of IDDMS are compared to the outpatients and normals means in Table 3.2. and shown graphically in figure 3.2.

Table 3.2. **Mean POMS Scale Scores for Pre and Post Exercise for IDDMS, Out Patients and Normals**

.	Insulin Dependent Diabetes				Out Patients		Normals	
	Pre-Exercise		Post Exercise					
SCALE	Mean	SD	Mean	SA	Mean	SD	Mean	SD
COMPOSED	16.20	9.32	21.46	5.09	16.78	9.66	22.60	7.83
AGREEABE	17.93	8.64	23.00	6.06	23.31	8.66	27.61	6.46
ELATED	18.53	9.48	23.08	5.65	16.94	10.37	23.18	7.40
CONFIDENT	15.533	9.21	22.23	5.33	16.46	8.42	21.90	7.13
ENERGETIC	17.27	8.26	22.08	8.84	17.34	9.62	20.11	8.86
CLEARHEADED	19.53	10.81	24.62	6.08	21.32	9.38	24.13	7.08

The means of the IDDMs pre-measures for composure, agreeableness, confidence, energy and clearheadedness were either lower than or similar to the outpatient population means. The elated means for IDDMs pre-exercise sessions was higher than that of the outpatient. However, after the exercise had been completed, the means reported for the IDDMs on the confidence, elated, energy and clearheaded scales either equalled or surpassed those means reported for the normal population.

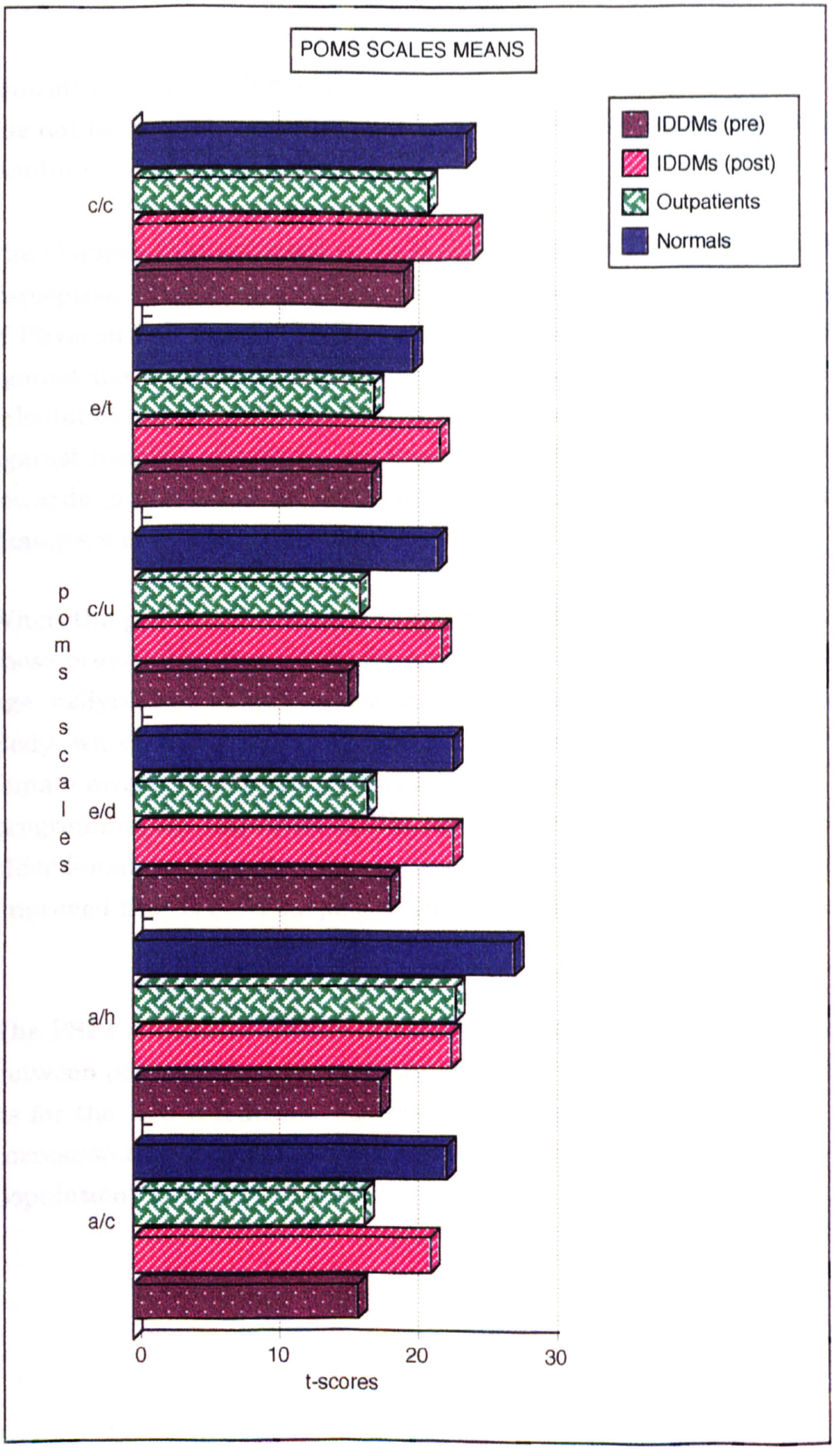


Figure 3.2. POMS means for pre/post exercise programme for IDDMs, normals, outpatients.

Literature searches have shown that the Physical Self Perception Profile has not been used previously with a population diagnosed as having insulin dependent diabetes.

The changes that occurred in each sub-domain of the Physical Self Perception Profile after the exercise programme and the global measure of Physical Self Worth (PSW) were plotted individually on scattergrams against the number of exercise sessions completed. Linear regression calculations were performed for the changes in each PSPP sub-domain against number of exercise sessions completed. Whilst there was a trend towards improvement in each sub-domain for both males and females, no changes were found to be significant.

When the pre-exercise means of the female IDDMs were compared to those provided by Fox (1989) for a population of older college females (mean age =23yrs) and obese females, it can be seen that with the exception of Body, which was greater, all IDDM means were similar to the obese female means (Table 3.3). However, after four weeks exercise programme, the improved IDDM results took their means closer to the older female college students means. The post-Strength mean was so improved that it even surpassed that for the older college females (fig 3.3.).

The PSPP measures for the male IDDMs also showed an improvement between pre- and post-exercise programme (fig 3.4.) but it is not so marked as for the IDDM females. All male means are higher than the corresponding female means for every sub-domain in their respective populations (see Table 3.4.below)

TABLE 3.3. PSPP Scales Means and Standard Deviations for Females

SUBSCALE	Insulin Dependent N=6 Pre-Ex. Mean	SD	Post-Ex. Mean	SD	Older College Students N=150 Mean	SD	Obese N=422 Mean	SD
SPORT	10.7	1.6	12.7	2.0	13.4	4.2	11.3	3.7
CONDITION	10.7	2.1	12.9	2.3	13.4	4.1	10.3	3.1
BODY	11.3	3.6	12.0	2.0	12.7	4.5	8.6	2.6
STRENGTH	13.3	3.7	15.2	3.5	14.0	4.0	13.5	3.9
PSW	11.0	1.9	13.0	1.7	13.6	4.1	10.6	3.1

TABLE 3.4. PSPP Subscales Mean and Standard Deviations for Males

SUBSCALE	Insulin Dependent Males (N=7) Pre Exercise Mean	SD	Post Exercise Mean	SD	Older Male Students (N=75) Mean	SD	Obese Males (N=136) Mean	SD
SPORT	15.1	2.9	15.0	3.2	16.9	4.0	14.8	3.2
CONDITION	11.0	2.4	11.4	2.5	17.2	4.1	11.6	3.0
BODY	12.7	2.8	13.7	2.2	16.2	3.8	10.3	3.3
STRENGTH	14.4	3.2	15.7	3.0	15.8	3.7	16.8	4.1
PSW	12.7	2.0	14.0	2.3	17.4	3.7	13.4	3.2

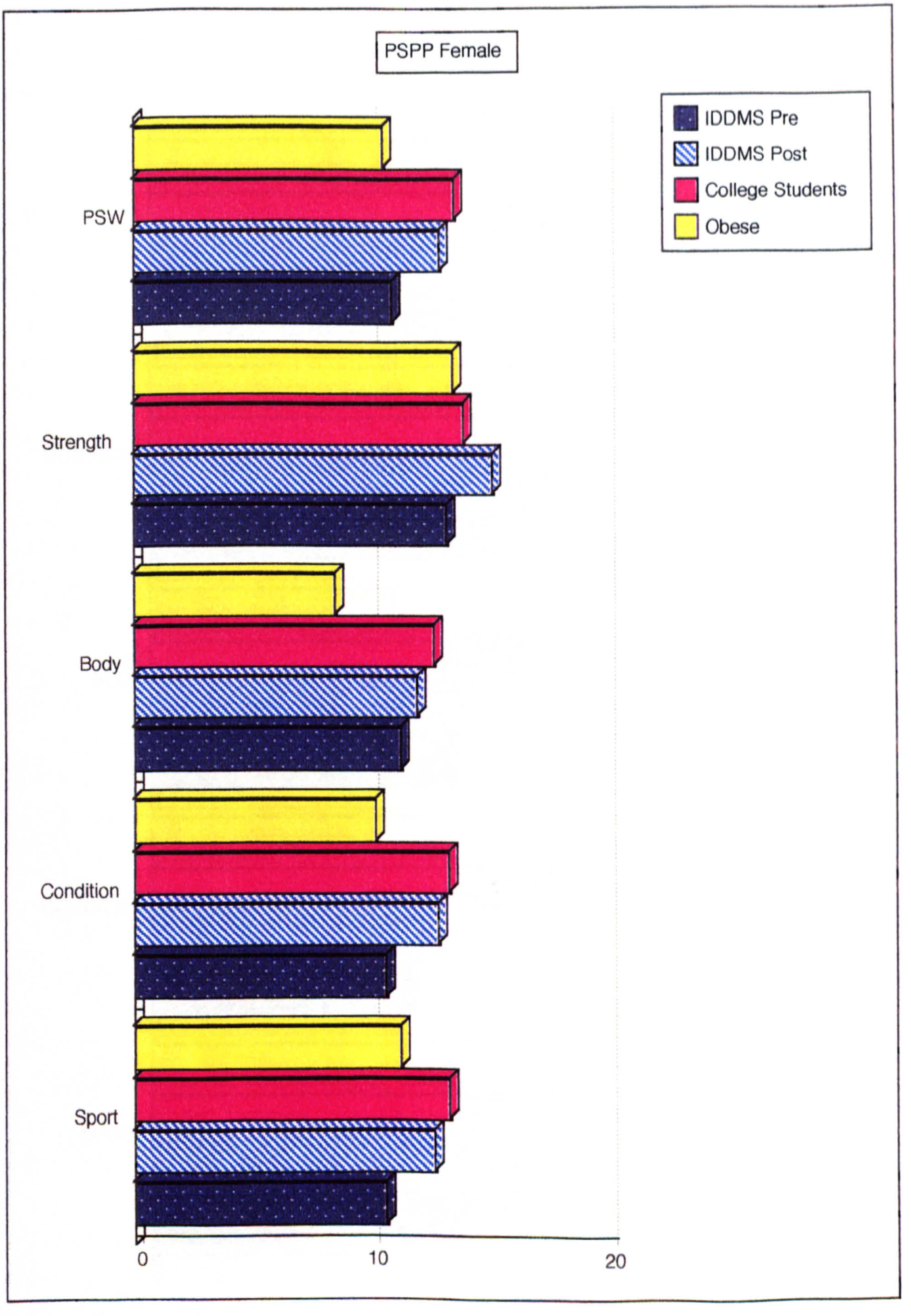


Figure 3.3. PSPP Scores for female college students, obese females and female IDDMS before and after an exercise programme.

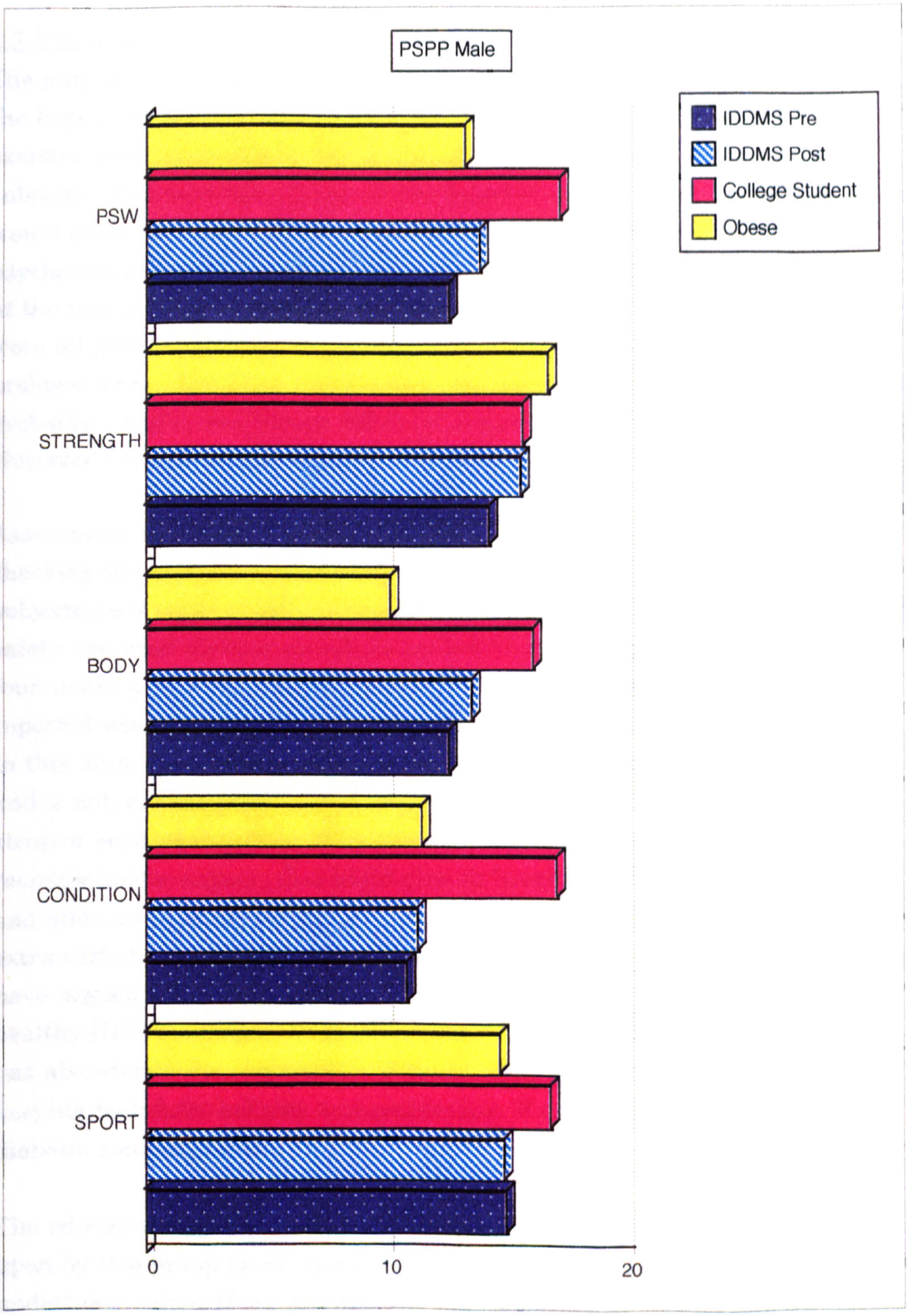


Figure 3.4. PSPP Scores for male college students, obese males and male IDDMS before and after an exercise programme.

3.5 Discussion

The purpose of this study was to test the three research aims outlined at the beginning of the chapter. Aim (a) involved the counselling and exercise prescription protocols employed to promote safe exercise for the subjects. The overriding factor in the experiment was that the subjects would encounter safe exercise and that at no time would their physical or psychological health be put at risk. After the initial exercise counselling at the test centres, they were counselled once a week by telephone and they were all given the option of calling the researcher at any time should a problem arise. The close contact of the subjects with the researcher was probably a highly motivating factor for the subjects to stay with the study. However, one subject did drop out due to moving out of the area .

Assessment of the success of the exercise counselling was carried out by checking the exercise logs of each subject and also by discussion with the subjects on a regular basis. The exercise logs yielded proof of the physical safety and good diabetic metabolic control of all subjects throughout the four weeks of the exercise programme. Not one hypoglycemic event was reported which was surprising as the literature has suggested difficulties in this area when an insulin dependent diabetic first begins to exercise and is not, at that point, aware of how his/her metabolism will react to a stressor such as exercise. However, the subjects showed an excellent response to the request that blood glucose monitoring be carried out before and after an exercise period with the necessary adjustments made in extra carbohydrate ingestion and lower insulin units injected. Physicians have argued for many years that blood glucose monitoring is essential for healthy IDDMs (Berger,1979) The recently completed DCCT study (1993) has also shown the importance of using blood glucose monitoring in keeping metabolic balance and postponing, if not eradicating, future diabetic complications.

The education input for safe exercise was also well understood and acted upon by this group as no exercise log showed evidence of exercise being undertaken when blood glucose was higher than 13.9 mmol/l and no evidence of subsequent hyperglycemia.

The exercise prescription of exercising three times per week for at least 20 mins at between 60-85% maximum heart rate (ACSM, 1986) was only adhered to by 4 subjects, however. Only 7 subjects managed to complete two exercise sessions or more per week. Some failures to exercise were unavoidable (e.g. illness) but other subjects said that they had found it difficult to actually get the time to fit in three exercise sessions of 20 minutes within a week. These subjects believed that they probably exercised in shorter bursts in their everyday lives and if all this had been added up, it may have been as much as their original prescription had requested. It may be easier to use the more modern prescription recommended by the Centre for Disease Control and the American College of Sports Medicine (1993) for people with very busy lives. This prescription allows a summing of all the periods of activity rather than the original recommendation of three 20-30 minute periods.

Aim (b) stated that the two elements of the physical fitness testing protocol were suitable and safe for insulin dependent diabetics who were unused to exercise. The workloads used on the bicycle ergometer raised the subjects' heart rates sufficiently without causing any distress and the progressive increase in workload did not result in any hypoglycemic events. The test and the protocol were therefore safe for this population. The four weeks of exercise training did not result in any significant changes in VO2 max with these subjects although there was a trend towards improvement. This result would be expected as a longer period of training is required before significant changes would occur in the cardiovascular system (Larsson, 1984). Several individuals did show a remarkable improvement in the post-exercise estimated VO2 max (4-9 ml/kg/min). This may be due to familiarisation and increased mechanical efficiency of pedalling during a second test. These subjects had chosen to cycle as their main exercise mode throughout the four weeks experimental period.

The significant reduction in percent of body fat ($p=0.01$) found in this group of IDDMs after only four weeks of exercise may have several explanatory factors. The usual expectation that regular aerobic exercise of moderate intensity will burn sufficient calories over a period of time to result in a reduction of fat in the fat cells may be one factor. However, it would normally be expected that three months of regular exercise would be necessary to achieve a significant reduction. However, this population were generally lowering their amount of insulin injected and this in turn would cause a reduced need for carbohydrate ingestion. The exercise would also be using up more supplies of carbohydrate in the body and there would be less available for storage. Anxiety and depression were also reduced (as shown by POMS results) which, in turn, may have resulted in less "comfort" eating which often accompanies both of these emotional states, especially in young diabetic females (Steel et al.,1989, 1990)

Research aim (c) stated that the psychological instruments used were both sensitive to changes and appropriate for the insulin dependent population. Three instruments were used but only one, the Effects of Diabetes on Everyday Life Questionnaire, had been designed specifically for the research population. While it related directly to specific issues on diabetes and the effects that this chronic disease may have on an individual's life, it had not undergone any stringent psychometric examination. It only had been used by Mayou (1989) as a guide to semi-structured interviews with his patients. It was, however, the best available questionnaire at the time this pilot study was carried out. In order to assist in the acceptability of this questionnaire for this study, a series of small reliability and validity tests were carried out using IDDM patients at the west of Scotland clinics involved in the study. The results of these tests proved to be sufficiently satisfactory that it was adopted for use in this particular study. Changes in subjects' perceived quality of life after the exercise programme was completed were picked up by this questionnaire and shown to be significant when regressed against the number of exercise sessions. However, with the emergence of a new quality of life questionnaire for people with diabetes and the sound conceptual arguments and psychometric testing that it has undergone (Meadows, 1993), it would be prudent to pilot this new instrument in a similar study before assessing which would be the most appropriate to use in a similar pilot, or major, study in the future.

The Profile of Mood States-Bi (Lorr and McNair, 1984) is a recognised reliable and valid measure of six bipolar mood states and has been used with diabetics previously (Mayou, 1987) although not in a study involving changes of mood states after exercise. In the present pilot study, POMS has been shown to be sensitive in recognising changes in all mood states after exercise, four of them to a significant level. Other studies (Mutrie et al.,1991; Moses et al.,1989) have reported POMS-BI showing significant changes in several mood states after exercise, although the exercise intervention programmes have been of a longer duration than four weeks. However, when the means of the mood states of this group at the beginning of the study were compared to the means of a "normal" population, they were lower. It would follow, therefore, that the improvement of the IDDM's mood states were likely to be greater than in a population which had started with higher scores.

Of those POMS scales showing significant improvement after the intervention programme, only between 33% and 47% could be explained by the number of exercise sessions using a stepwise regression equation. This suggests that a large percent of the improvement observed must be due to other unknown factors. It is possible that the subjects were greatly affected by the special attention and close contact received during the research period by the researcher who had aimed to reassure and motivate the subjects throughout the study. In a future study it would be necessary to have a control group who did not exercise but who still received the same amount of the researcher's attention.

The Physical Self Perception Profile (Fox, 1989) had not previously been used with a diabetic population. The initial self perceptions, with the exception of the sub-domain of body attractiveness, of this IDDM population were as low as the means for an obese population which Fox (1989) reported as being lower than his other non-obese populations. Whilst no changes were shown to be significant on the PSPP after the exercise sessions had been completed, all scores showed an improvement and the means of the male and female IDDMS moved closer towards the means of a normal population of college students of a similar mean age (23 years) to that of the IDDMS (22.7yrs). Since this instrument had not previously been used with IDDMS, it is necessary to pilot it with larger numbers of IDDMS involved on a longer exercise intervention programme to see if it will be sensitive enough to pick up changes in self-esteem. As it was not designed for insulin dependent subjects, there is the possibility that this instrument does not address certain issues that are important in the self-esteem of a person with diabetes or is sufficiently sensitive to record changes in the self esteem of diabetics. The development of psychological assessment instruments for insulin dependent diabetics is still in its infancy and the choice of such instruments for this study was very limited. However, it would be interesting to use the PSPP with a larger number of IDDM subjects who would exercise for 3-6 months so that a more accurate result of the sensitivity of the PSPP with IDDMS could be gained.

The purpose of this pilot study was to test physiological and psychological instruments and an exercise counselling and prescription protocol on a population of insulin dependent diabetics. It was also interesting to examine the test results after a period of four weeks of regular aerobic exercise to see whether the measures had changed and if so, in which direction. All (except Sport on the PSPP for males) of the individual results showed an improvement after the exercise intervention programme and the means of each test showed a positive shift. The changes that were recorded as significantly improved when regressed against the number of exercise sessions were the percent of body fat, the Effects of Diabetes on Everyday Life, Composure, Agreeableness, Confidence and Clearheadedness. However, caution must be exerted when considering results from a very small sample which has a limited age-range with no diabetic complications in evidence and from a population sufficiently motivated to volunteer. Also, there was no control group and so no causal inferences can be drawn. The shortness of the exercise intervention period must also be taken into account when considering the results that had not shown a significant improvement. Qualitative material gleaned from the closeness of the contact between the subjects and researcher may be equally important as any quantitative results and indeed, it may have been that contact that influenced some of the psychological test results. The subjects volunteered because they had either previously not had enough confidence to start an exercise programme as an IDDM without expert help or that they knew that they needed someone to motivate them to get started. These subjects were, therefore, self-selected and may be quite untypical of the majority of IDDMs.

3.6 Recommendations and future directions

Research has shown that little work has been undertaken in exercise counselling or prescription for people with insulin dependent diabetes. No work has been done with this population in the piloting of psychological or quality of life instruments for use in exercise programmes. The results show a positive shift in these measures and a major study is strongly recommended. The Profile of Mood States (Lorr and McNair,1984) is a widely used instrument with good reliability and validity and has been shown to be sensitive to this population. The Effects of Diabetes on Everyday Life (Mayou, 1989) whilst showing sensitivity in this study, lacks reliable psychometric testing and the Diabetes Health Profile (Meadows, 1991) should be piloted in a similar study before possibly being adopted in a major study. The Physical Self Perception Profile (Fox, 1989) is the most suitable questionnaire available at this time but should be piloted with a similar population undergoing a longer exercise intervention period before being adopted in a major study

It would be interesting to study the effects on percent body fat of a similar experiment with many more IDMM subjects, taking readings with skinfold calipers after four, eight and twelve weeks of aerobic exercise. By taking measures at three different time intervals, it would be possible to judge whether reduction in percent body fat was rapid in this population at the beginning of starting to exercise and then plateaued as the metabolism became accustomed to exercise or whether percent body fat was lost gradually over all three time intervals. Small numbers of subjects exercising for only four weeks in a pilot study do not give a reliable picture but the results in reduction of percent body fat in this pilot study show a trend which should be examined in a major study.

Previous studies of the effects of exercise on an insulin dependent diabetic population have examined changes in VO2 max, blood lipid profiles and metabolic control. The thrust of this study has been the examination of how the person who has diabetes can be motivated to begin and continue an exercise programme and what instruments can be used to measure psychological and quality of life parameters. However, the improvement of cardiovascular fitness with related health benefits is also recognised as being extremely important to the future morbidity and mortality of the person who is diabetic. The estimation of VO2 max using the progressive protocol recommended by Astrand and Rodahl (1986) using a bicycle ergometer was safe for this population and should be adopted in a major study along with the estimation of percent body fat using skin calipers. It is recommended that the skinfold measures be taken at four weekly intervals during a 3-6 month exercise intervention study to find out at what rate percent body fat is lost.

This author was unable to develop the pilot study into a large, controlled main study due to lack of funding. However, with evidence in the literature suggesting important health benefits for nondiabetics, the diabetes funding agencies are strongly recommended to consider pursuing this line of research for health benefits of those people with diabetes who already have a compromised health status. With insights gained from spending time listening to young insulin dependent diabetics, the author proceeded to Study 2 where further lines of investigation were undertaken..

CHAPTER 4

From the horses' mouths.....behaviour, beliefs and feelings about exercise

4.1 Introduction

During the time spent counselling and working with the young insulin dependent diabetics in Study 1, it became apparent that most had not possessed the correct knowledge to exercise safely. They also seemed to have lacked encouragement to take on board regular exercise as part of their attempts to live a healthy life with diabetes. They were generally unaware of the health benefits, both physiologically and especially psychologically, that they could gain from regular exercise.

Literature searches have failed to disclose figures to indicate how many insulin using diabetics are regular exercisers and there does not seem to be a consensus within diabetic clinics about educating patients to exercise. It seems that this part of diabetes care and education is often left to last or missed completely. Some health professionals, who themselves are interested in exercise and believe in its special value for diabetics, do include it in their diabetes education sessions but, anecdotally, this seems to be the exception and not the rule. This study (Study 2) was devised to ascertain the facts, as far as was possible, about diabetic participation in regular aerobic exercise. The following research questions were set:-

a) what percentage of insulin dependent diabetics are in each of the stages of change categories for exercise ?

b) do they have adequate knowledge to exercise safely?

c) do diabetic clinics encourage, educate and support their patients in exercise ?

d) what are the main barriers that prevent insulin dependent diabetics from exercising ?

e) what motivates insulin dependent diabetics to begin and maintain regular exercise?

The aim of Study 2 was to contact all patients with insulin dependent diabetes in four large west of Scotland diabetes clinics and to pose the questions listed above. An Exercise and Diabetes Questionnaire, based on the following literature review, was subsequently created.

4.2 Literature Review

4.2.1. Defining exercise

The impact of regular, aerobic exercise on health for people with or without insulin dependent diabetes was fully examined in chapter 2. The American College of Sports Medicine issued guidelines in 1978 for the type, duration and intensity levels of exercise required to gain or maintain physical fitness. These were subsequently reviewed in 1990. These guidelines recommended that for health and training benefits, an individual should engage in vigorous intensity exercise (60-85% maximum heart rate) for at least 20 minutes and that these sessions should be repeated at least three times per week. Depending upon the fitness and body weight of the individual, this intensity could be reached through rhythmical, aerobic activities which use large muscle groups. Examples of this type of exercise is swimming, running, canoeing and cycling. For the more unfit and heavier individual, the recommended intensity could be achieved through brisk walking alone. When compiling the Diabetes and Exercise Questionnaire, the "gold standard" for exercise prescription was still held as that of the American College of Sports Medicine (1990) and the definition of a regular, aerobic exerciser was given as:-

> Regular aerobic exercisers are those people who exercise at least 3 times per week for no less than 20 minutes so that they are slightly out of breath. The exercise is usually either brisk walking, swimming, cycling, jogging, keep-fit, canoeing, football or running games.

Since completing this study (Study 2), new guidelines have been issued by the Center for Disease Control along with the American College of Sports

Medicine (1993). As these new guidelines affirm that health benefits can be achieved by an **accumulation** of shorter bouts of exercise. A future attempt at the definition of a regular, aerobic exerciser would need to be revised in light of this new evidence. Pate et al (1995) offers the following information in light of the most recent research:-

* caloric expenditure and total time of physical activity are associated with reduced cardiovascular disease incidence and mortality
* there is a dose/response relationship for this association
* regular physical activity provides substantial health benefits
* intermittent bouts of activity totalling 30 minutes per day, provide beneficial health and fitness effects.

4.2.2 Stages of Change

The percentage of people with insulin dependent diabetes who exercise regularly has never been recorded in the United Kingdom. The British Diabetic Association Information Science Department, on request by the author, ran a search but were unable to provide any figures at this time (August,1995). Although exercise has been recognised as one of the three elements of the diabetes triad (Joslin, 1923), experts in the field do not **know** whether the diabetic population is, or has been, physically active. One of the aims of the Exercise and Diabetes Questionnaire was to determine the physical activity levels of this population.

Sallis and Hovell (1990) proposed a framework for studying exercise behaviour. The three main stages are shown below in figure 4.0:-

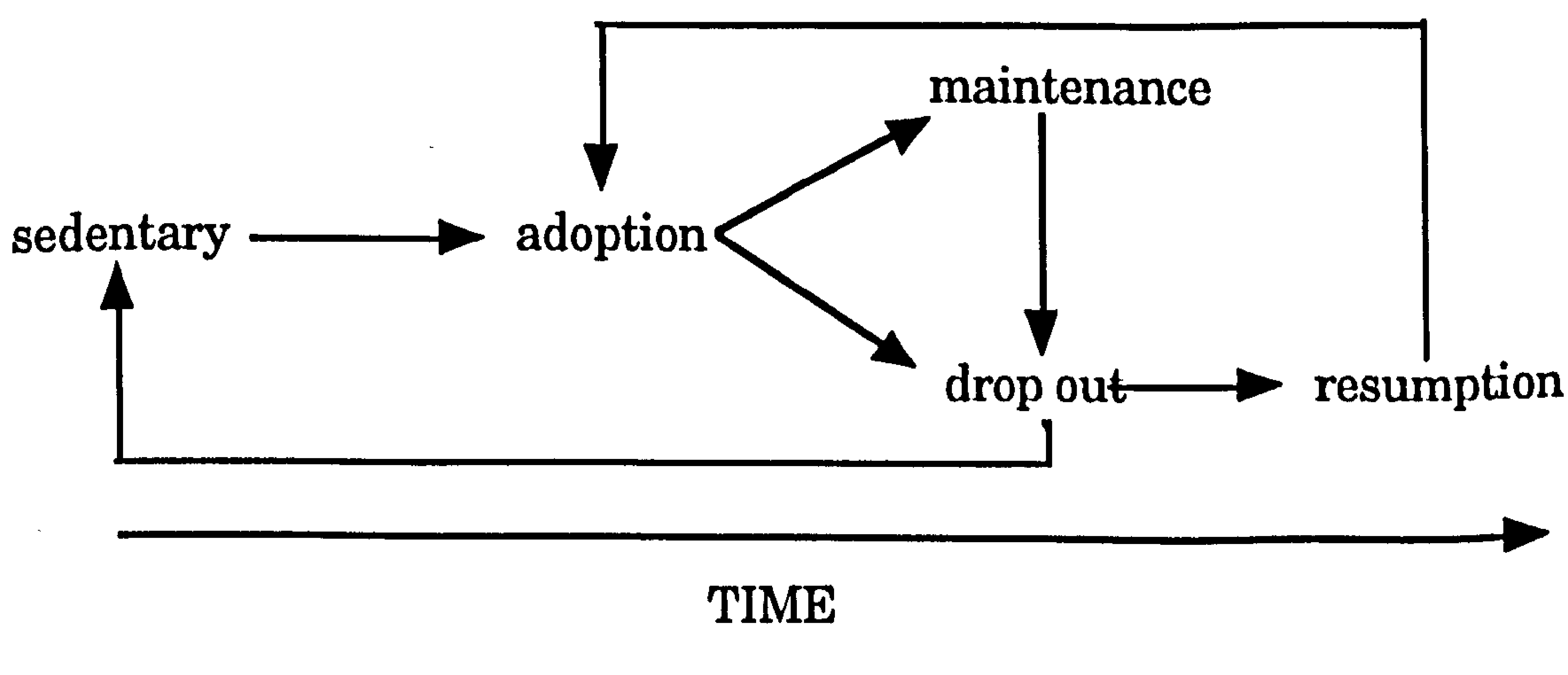


fig. 4.0. Four major phases of the natural history of exercise
(Sallis and Hovell, 1990. p.309)

This model shows the dynamic nature of exercise adoption. Wankel and Hills (1994) underlined this dynamism, stating that exercise behaviour is more than either being active or not being active. Twelve years earlier, Prochaska (1982) proposed a transtheoretical model of behaviour change believing that behaviour, at any one time, can be identified on a spectrum with clearly defined stages. The transtheoretical model has included self-efficacy theory (Bandura,1977); decision balance theory (Janis and Mann,1977) and process of change theory (DiClemente and Prochaska,1982)

Stage theory lies between that of traits and states. Traits are considered to be stable and unchanging whereas states are unstable and changeable. Stages may be stable for long periods of time but are always open to change (Prochaska and Marcus, 1995). These stages are considered in six monthly time periods as researchers have found that this is the optimum period into the past or future that most subjects are prepared to look. The stages of change have been termed precontemplation (I do not intend to change within the next 6 months); contemplation (I am thinking of changing within the next 6 months); preparation (I have started within the last 6 months though I am not doing it regularly); action (I have started within the last 6 months and am doing it regularly); maintenance (I have changed and have remained changed for longer than 6 months).

Behaviours studied by Prochaska were those of smoking cessation (1983), weight control and psychotherapy (1979). Researchers have studied ten processes used in changing behaviour. Experiential processes are noted as consciousness raising, dramatic relief, self-reevaluation, social-reevaluation and social liberation. Behavioural processes used are listed as environmental re-evaluation, relationship fostering, counterconditioning, contingency management and stimulus control. In smoking cessation, Prochaska noticed that experiential processes were more important in the early stages of change but that these became less important than behavioural ones in the later stages. However, Marcus and her colleagues (1992) warned that processes involved in smoking cessation (preventing negative behaviour) may not be the same as those involved in progressing positive behaviour such as taking up exercise.

However, they were able to demonstrate the value of the stages of change model for enhancing exercise adoption as they were able to tailor both the motivational tactics used and the design of the intervention depending whereabouts the individual lay on the stages of change spectrum. When Biddle (1994) reviewed the model in depth, he became concerned about several assumptions that were made which he felt, weakened the validity of the model. He did, however, concede that the model has found support in several other countries and that it will allow opportunities for a practical approach when counselling people about exercise e.g. GP referrals schemes.

The transtheoretical model hypothesises that peoples' behaviour, such as taking up exercise, is not "all-or-nothing" and the model's adoption within this research was deemed as useful for obtaining more information about both the attitudes and behaviours of insulin dependent diabetics towards exercise.

4.2.3. Diabetes and exercise knowledge

The knowledge questions contained within the Exercise and Diabetes Questionnaire were based on the literature review of chapter 2 and the Special Considerations for Safe Exercising section of chapter 3. Berg (1986) underlined the importance for insulin dependent diabetics of understanding the very basic elements of insulin action, carbohydrate intake and energy expenditure in order to keep blood glucose controlled.

4.2.4. Role of the Diabetes Clinic

Schneider and his colleagues (1992) in North America stated confidently that exercise is recommended by physicians as part of the therapy of patients with diabetes mellitus. Salen and his fellow diabetologists (1992) in France also mentioned that it was standard procedure to include exercise promotion in diabetic educational programmes. In the United Kingdom the picture is less clear. The literature suggests, however, that wherever exercise is considered to be part of diabetes management advice, it is in the context of metabolic control. Psychological benefits of exercise for the diabetic patient are almost never mentioned (Berger,1979; Sherwin and Kovisto,1981; Selan et al, 1992). The most recent large-scale study of diabetes management, the Diabetes Control and Complications Trial

(DCCT) gave little attention to the effects of regular exercise on the health of people with diabetes. Metabolic control is the ultimate aim of physicians for their patients as the DCCT showed that persons with good control suffer less diabetic complications over a 10 year period. Research (Campaign, Mellies and Glueck, 1985; Stratton et al., 1987) has shown ambivalent results in metabolic control after periods of exercise adoption and so it is not surprising that many diabetes clinics are reactive rather than proactive with their exercise counselling.

4.2.5. Diabetes and exercise motivation

The World Health Organisation (1985), in its statement on "health for all" for the year 2000, has promoted physical activity as being an important part of everyone's health behaviour. For many years, however, exercise promoters have struggled with poor motivation rates towards adopting, and then maintaining, participation in exercise programmes. Shepherd (1985) stated that no more than 50% of eligible subjects enrol in an exercise programme and Andrew (1981) showed a 50% drop out rate over 18 months. Health promoters have found similar trends when promoting the taking up of other positive health behaviours. The American Diabetes Association (ADA), in its position statement of 1990, urged insulin dependent diabetic patients to take exercise on board because of:-

> "the potential to improve cardiovascular fitness and
> psychological well-being and for social interaction
> and recreation". (p.36)

But this Position Statement does not give any advice on how to get started or what strategies would be useful to employ for maintenance of this new behaviour.

Literature has revealed many reasons given by participants for both beginning and continuing to perform regular exercise. Not only may there be different reasons for beginning a programme or continuing one but Biddle and Mutrie (1991) have suggested that motivations may change over a person's lifespan and that evidence suggests different motivating factors between sexes. Young men have been recorded (Markland and Hardy, 1993) as being more highly motivated to exercise if they gain social recognition, challenge and competition by doing so. Young women, on the other hand, were seeking weight control, enjoyment and physical fitness. Ashford and Biddle (1990) surveyed community sports centres participants' reasons for participating in physical activity and found that the older participants were looking for relaxation, social benefits and health benefits. The younger subjects were motivated by challenge and skill learning. Other researchers have found important motivating factors to be :- to improve health (Paffenbarger et al, 1986); good class leadership (Shephard,1985); weight control (Rhodes and Dunwoody,1980) and because of medical advice (Iverson et al,1985). The latter point has been disputed by other researchers such as Shephard (1985) who found it surprising that the patients in his research analysis rarely mentioned "because the doctor told me to..." as a reason for beginning an exercise programme. It could mean, however, that the patients were not being advised by their doctor to exercise as part of a healthy lifestyle anyway! The Allied Dunbar National Fitness Survey (1992) found subjects gave many of the reasons already cited here as well as to get fitter, to socialise and to feel better.

At present there is no research into exercise motivating factors per se for insulin dependent diabetics and most diabetologists have been concerned with motivating factors for compliance towards insulin and diet therapy. It seems obvious to state that the strongest motivating factors for compliance to treatment advice for such a population is the avoidance of future diabetic complications and to feel physically well in the present (Dunn,1993; Armstrong,1991). The medical profession have disagreed about the benefits and risks of exercise for this population over many years.

4.2.6. Diabetes and exercise barriers

Research in both North America (Canadian Fitness Survey,1983) and the United Kingdom (Allied Dunbar National Fitness Survey, 1992) have shown that the majority of these populations are not habitually involved in exercise. The study of barriers to exercise should, therefore, be highlighted. The most frequently cited barrier has been that of a perceived lack of time (Dishman,1982; Oldridge, 1982; Gettman, Pollock and Ward,1983). Andrew and colleagues (1981) also found that unsuitability of facilities and lack of family and spouse support were important reasons why many exercisers dropped out. The Canadian Fitness Survey (1983) recorded laziness, cost and the importance of other interests as further barriers. Lee and Owens (1985) research revealed over 200 reasons given for dropping out; the major ones were lack of time, injury and illness, laziness, expense and general inconvenience such as class time, distance of facility from home and work. Poor weather conditions have also been blamed (Slenker et al,1984).

Compliance to the diabetic regime consists of insulin injections, blood glucose monitoring and modification of diet and exercise - all of which can be very inconvenient for an individual to carry out under normal living conditions (Wing,1986). Exercise changes the metabolic state and for an insulin dependent diabetic to maintain homeostasis, great effort may have to be made before, during and after the exercise session. This, in itself, is likely to be a major barrier against exercising regularly.

4.2.7. Theoretical Models of Motivation/ Barriers

Several theoretical models of behaviour have been proposed and some researchers have been involved in applying such models to exercise behaviour. The Health-Belief Model (Rosenstock,1974; Maiman and Becker, 1974) postulates that a health behaviour is more likely to occur if the subject perceives a health threat and is convinced that by complying with the health behaviour, that threat will be lessened. Shephard (1985) reviewed work carried out on exercise using this model. He reported that participants in an exercise programme did not usually consider their health to be under threat and that, in fact, those who did feel a health threat were motivated **not** to exercise. The Exercise Behaviour Model (Nolan and Feldman, 1984) suggested four predisposing factors in influencing exercise adoption:- perceived control, self concept, attitudes towards and the value of exercise. This model remains theoretical due to lack of psychometric support. The Theory of Reasoned Action (Ajzen and Fishbein,1980) stated that behaviour is directly related to intentions which themselves are formed from attitudes and social norms (fig 4.1). Shephard's review (1985) of this model also showed that it could be applied to exercise. He cited Riddle (1980) who suggested that her subjects' exercise behaviour could be predicted from their intentions and that the attitude section of the model had much stronger influences than the subjective norm. Her joggers had positive attitudes about exercise improving their health status and also that their physicians favoured exercise while her sedentary subjects perceived their physicians as opposed to exercise. Contrary to this model, however, previous experience of physical activity has an important effect on participation

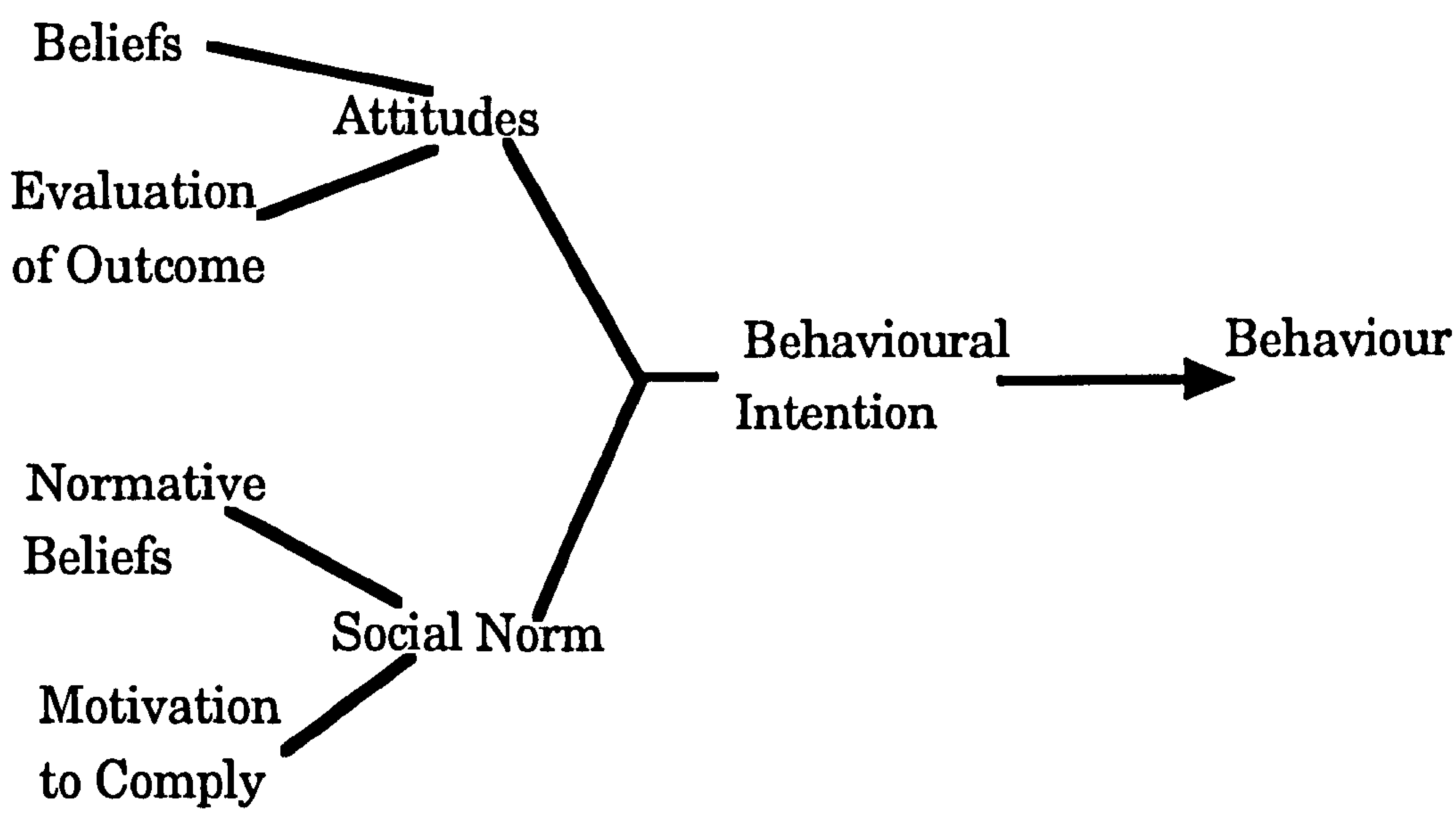


fig. 4.1. Theory of Reasoned Action (Adapted from Ajzen,1988)

regardless of attitude or subjective norms (Godin, 1983) and other work has shown that while there seems to be a causal relationship between attitudes, intentions and exercise behaviour, personal experience of exercise is very important (Baylis et al, 1984). The Theory of Planned Behaviour has accommodated the importance of past behaviour and added the anticipation of obstacles (Ajzen and Maddock, 1986). Biddle and Mutrie (1992) in their review of the model suggested that it may be particularly relevant to exercise studies since exercise behaviour has many participation barriers. Little testing has been carried out on this model to date. The Health Promotion Model is based on social learning theory and was designed to identify factors affecting health behaviours including exercise (Pender, 1982). The model has identified perceived benefits and perceived barriers as important determinants of health promoting behaviour but no instruments were developed to suitably measure these factors. However, in 1987, Sechrist and her colleagues developed an exercise-specific benefits/ barriers scale which showed sufficient reliability and validity to warrant its adoption in new research for testing the effects of perceived benefits and barriers to exercise on actual exercise behaviour.

4.2.8. Aims of Study 2

The aims of this study are to find out by means of a mailed questionnaire:

* The percentage of IDDMs in each of the stages of change for exercise
* Whether IDDMs have adequate exercise and diabetes knowledge to exercise safely.

* To what degree the diabetes clinics educate, encourage and support their patients in regular exercise.

* What barriers against and motivations for exercise have the main influence on IDDMs.

4.3 Method

4.3.1. Subjects

The diabetes consultants of Crosshouse, Paisley, Ayr and Gartnaval Hospitals in the west of Scotland agreed to allow their insulin using diabetic population to become the target population for a mailed questionnaire on exercise. All patients over the age of ten years who used insulin to control diabetes mellitus were targeted as subjects for this research. The number of insulin using diabetics from the four clinics totalled 1,611.

4.3.2. Construction of an Exercise and Diabetes Questionnaire

Initial questions were designed to offer general, unthreatening questions so that the respondent would be sufficiently interested to continue. It was designed to be confidential and no name was requested. Thus, respondents should have felt free to be completely honest in all of their answers without fear of reprimand in any way.

The questionnaire of Marcus, Selby, Niaura and Rossi (1992) and adapted by Mutrie and Caddell (1994) in Stages of Exercise Behaviour Change was used in order to find out how many insulin using diabetics were either exercising regularly and had done so for more than six months or whether they were exercising but not regularly (aim a). A definition of the term "exerciser" was offered and also what criteria were to be used to check whether exercise was regular. This definition was printed in bold before the stages of change questions and read as follows:-

" Regular aerobic exercisers are those people who exercise at least 3 times per week for no less than 20 minutes so that they are slightly out of breath. The exercise is usually either brisk walking, swimming, cycling, jogging, keep-fit, canoeing, football or running games".

The remaining Stages of Exercise Behaviour Change were included by asking the respondent whether s/he had started to exercise regularly within the last six months or whether s/he was considering starting to exercise in the next six months or finally, was not exercising and had no intentions of starting. There was an additional question designed to discover how many respondents had been regular exercisers in the past but had lapsed.

Following on from questions about exercise intentions and behaviour, there were 26 questions requiring "yes" or "no" answers about how to exercise safely as a diabetic (Aim b). These questions were based on basic knowledge and understanding recommended by Berg (1986) and Gordon (1993) in their books for exercising diabetics. The first area covered by the knowledge section of the Questionnaire included preparation required **before** participating in a session of exercise which dealt with carbohydrate intake, insulin intake and blood glucose monitoring. The second area to be considered was involved with strategies which should be employed in the event of a hypoglycaemic episode **during** exercise. Finally, the respondent was asked what safety measures would be important **after** a period of vigorous exercise. Answers to these questions could be deemed to be right or wrong and a total knowledge score obtained by summing the scores.

The third section of the Questionnaire was designed to find out about the patients' perceptions of their clinics' encouragement and support of their taking up and maintaining exercise as part of their diabetes care programme (Aim c). Questions required "yes" and "no" answers once again. Questions in this section of the Questionnaire specifically ask respondents whether they had been given advice to exercise regularly for good health when they were first diagnosed; whether clinic staff have given instructions on how to exercise safely and whether staff ever ask about the patients' exercise habits at the present time. Respondents were also asked to consider whether they would find it helpful to have an exercise adviser on hand to help them with this aspect of their lives.

The next section of the Questionnaire was designed to discover which barriers diabetics felt were the main obstacles for not exercising regularly or for not exercising at all (Aim d). Three questions were set for each of the following six categories:- time, social, physical, psychological, diabetic, social and external /environmental barriers. Respondents were asked to choose one of the following answers:- "never", "hardly at all", "sometimes" and "always".

The final section of the Questionnaire was constructed to determine which motivations would be the most powerful in helping respondents to exercise regularly or to take up exercise. Motivations were categorised into six groups with three items in each category. Four of these categories were based on work by Clough et al (1988) who found that challenge, social, physical and psychological factors were rated as being important in his survey of non diabetic runners. Two other categories were included in this study with diabetics and were specifically related to this population. The first was involved with diabetic control and the second with compliance to treatment recommended by the doctor or the British Diabetic Association.

4.3.3. Piloting the Exercise and Diabetes Questionnaire

The Questionnaire was piloted over a nine month period and evolved through five drafts using 50 insulin using patients and their views as pilot subjects before the final format emerged.

Draft 1 was piloted for four weeks in Ayr and Crosshouse Hospitals with

20 patients and took the form of two separate questionnaires, one for exercisers and one for non exercisers (Appendix 9). Both questionnaires had a knowledge section, a barriers section, a motivations section and a clinic staff advice section. There were several open-ended questions. The Stages of Change in Exercise Behaviour was not included at this time. The questionnaire was printed on A4 white paper and stapled at the top. Each pilot subject was asked to read a definition of regular exercise and then asked to choose whether or not s/he believed him/herself to be a regular exerciser or not. The questionnaire was given to the pilot subject as s/he waited in the clinic to be seen by the doctor. Any questions which the subject did not find easily understandable or clear was noted by the researcher. Discussion took place afterwards with each subject to find out if s/he found the questionnaire too long, too boring, or too difficult. Also, each subject was asked whether s/he felt that areas of concern had been omitted and for any suggestions of how to improve such a questionnaire.

Draft 2 took the form of one questionnaire (Appendix 10) which could be answered by exercisers or non exercisers and was piloted with five patients at the young person's clinic in Ayr. This version had been tidied up a little and sections were more obvious. The barriers and motivations sections were arranged with a 4 point Likert type scale for answering. The open ended style of questions had been removed.

A minor presentation adjustment of Draft 2 , section 2 , resulted in Draft 3 (Appendix 11) which was piloted with five patients at Crosshouse and five at Gartnaval Hospitals. The piloting was still carried out at the clinics while waiting for consultations with the doctors and so it was still easy to obtain subjects' views about the questionnaire after completing it. These ten patients agreed to complete the questionnaire again within two weeks and a reliability coefficient (r) of 0.93 was obtained. Validity was tested by consultation with the appropriate diabetes liason sister who best knew the individual patients. The sister was asked to score, as far as possible, how they believed the patient would score (except for the knowledge section). The questionnaire was still printed on white A4 paper at this time.

Draft 4 (Appendix 12) was constructed by adding the Stages of Change for Exercise Behaviour and a quality of life section by Meadows (1989) and it was piloted with ten patients at Crosshouse Hospital. They unanimously stated that they had enjoyed the questionnaire but that the quality of life section was just too long and they found it difficult to remain focused. The presentation of this draft was in a very different form from all previous drafts as it was printed using an Apple Macintosh computer and had been reduced to an A5 sized booklet.

Draft 5, similar to Draft 4 but minus the quality of life section, was presented to five Crosshouse patients at the clinic who agreed to complete a second questionnaire in two weeks time. The reliability factor on these five returns was r=0.94. Validity was tested by the same method as for Draft 3. Draft 5 (Appendix 13) became the final draft and 1,800 copies were printed. Confirmatory factor analysis with varimax rotation showed that the six motivational sub-scales explained 73.2% of variance and the six barrier sub-scales explained 63.2% of the variance.

4.3.4.Special Considerations for a Mailed Questionnaire

In order to obtain a representitive number of the target population of 1,611 IDDMs, it was imperative to try to attract as many diabetics to read the Questionnaire and to feel motivated to complete and return it. Knowing that mailed questionnaires traditionally have low return rates (Goyder, 1985), the researcher spent several months seeking a good design. The questionnaire was reduced in size to A5 to make handling easier. Cartoon designs were added to the front cover by a graphic artist and the cover paper was lightly coloured (figure 4.2).

A letter from the researcher, explaining what was required from the respondent, how long it would take to complete and why the respondent's participation was important, was included within the Questionnaire itself (page 1). The same design logo was used at the top of each page to give an indication of wholeness and continuity. The respondent was required to use the same form of circling of answers throughout. Attention was given to spacing of text, size of character and type of font used. The rear cover, using the design logo, invited the respondent to seek more information about exercise and the researcher's name and address were offered.Each Questionnaire was mailed with a stamped addressed return envelope and a personal letter to the subject written on the appropriate Diabetes Clinic notepaper and signed by the appropriate Consultant (example in Appendix 13). Each envelope was stamped on the reverse with the researcher's name and address so that the Royal Mail would be able to return any "wrong addresses" or "moved away" subjects

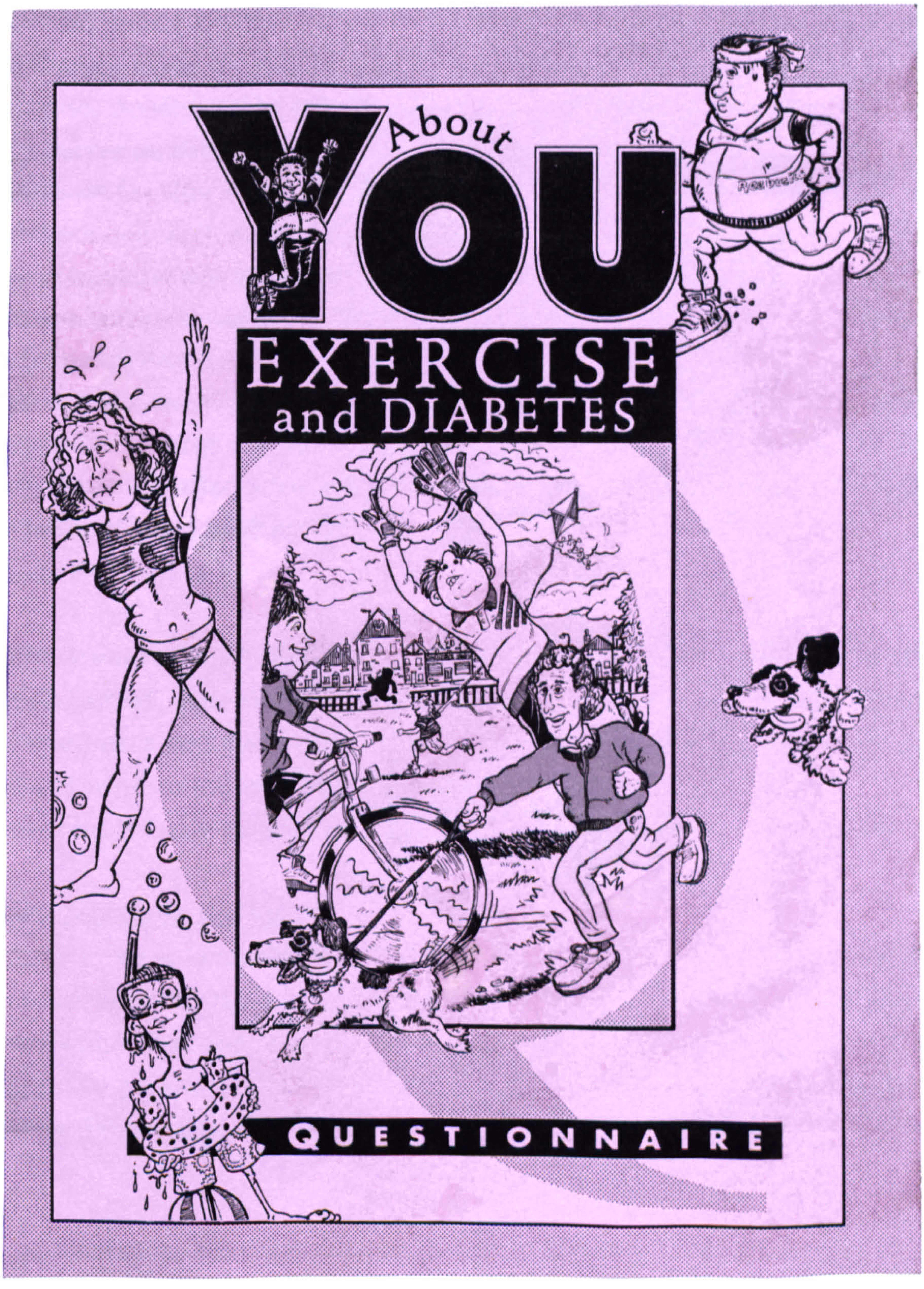


Figure. 4.2. Diabetes and Exercise Questionnaire

4.3.5. Procedure

A data base for the insulin dependent patients of each hospital was constructed using the patient records. Each hospital used a different method of record keeping and names of insulin dependent and non-insulin dependent patients in three of the clinics needed to be separated. This took many months of working with the specialist diabetic sisters and secretaries as each name had to be transcribed by hand, recorded on a card and, finally, entered onto computer. Ayr Hospital chose to do this themselves as they did not wish to release their patient names and addresses for this study. Each subject was given a number which corresponded with a number on the reverse of the Questionnaire. Once a Questionnaire was returned, the number and corresponding name and address were erased from the computer so that information remained confidential and could not be linked to a specific patient in the future. If after 4-6 weeks, a Questionnaire had not been returned, a follow-up letter (Appendix 14) was mailed out to that subject. If a Questionnaire had not been returned after a further two months, that subject was termed "non-respondent" and his/her name and address was removed from the computer.

Questionnaires were mailed on a rolling type mailing system over a six month period. Any relative reporting the death of a subject was written a personal note and the death reported to the clinic. Wrong addresses were also reported to the appropriate clinic. Any letters written to the researcher or any requests for information were replied to personally.

4.3.6. Collecting the Data

Questionnaires were coded on receipt and data entered into the computer for analysis with the statistical package Minitab. A research assistant was employed to code and enter data due to the large response rate. This was made possible by a small grant awarded by the research group of Paisley University.

4.4 Results

There were a total of 1,611 insulin dependent diabetics targeted in this study. This was the total number of names recorded by the four west of Scotland diabetes clinics who had agreed to take part. However, 167 were returned by British Mail as "address unknown" and the hospital clinics were informed of this. 23 Questionnaires were returned with the information that the patient had died. A personal letter of condolence was written to each family. The appropriate hospital clinics were then informed. From a total of 1,421 possible "reachable" diabetics, 1,035 Questionnaires were returned completed thus giving a return rate of 73%.

The results are presented in sections that correspond to the sections of the Diabetes and Exercise Questionnaire i.e. Description of Subjects; Exercise Stages of Change; Knowledge Scores; Hospital Exercise Advice; Barriers to Exercise and Motivations to Exercise. Individual barriers and motivations are grouped into six main groups and each group is examined for differences between exercise stages of change effect and sex and age (<35yrs old/ >35yrs old) effects in accordance with previous surveys. Knowledge scores are compared by Hospital and exercise stages of change.

4.4.1 Description of Subjects

Mean age and standard deviation for this population was 46.2 $\pm$ 18.5 years with 51% of respondents being male. Forty-seven percent of respondents were employed; 21% were retired; 7% were students and 25% were unemployed. Seventy-six percent of this population were non-smokers and 43% felt they were overweight although only 9% believed they were in poor health. Ninteen percent were administering insulin four times daily by pen injector and all the rest were on twice daily injections by the traditional method. Those who had had diabetes for more than 11 years numbered 56% while only 4% had been diagnosed in the previous two years. Senenty-three percent of respondents had either always attended the same hospital diabetic clinic or had attended their present one for more than five years. Twenty-six percent attended hospital a; 26% attended hospital b; 24% attended hospital c and 24% attended hospital d. The complete descriptive results for all subjects is given in Appendix 15.

4.4.2. Stages of Change for Exercise Behaviour

Figure 4.3. graphically illustrates the exercise stages of change responses by the insulin dependent diabetic population towards the given definition of a regular, aerobic exerciser. The respondents labelled "maintainers" are those who regularly exercise and have done so for more than 6 months; "preparers" have done some irregular exercise for more than 6 months; the "action" group exercise regularly but have only just begun in the last 6 months; "contemplators" have not been exercising during the last 6 months but are considering starting; "pre-contemplators" have not been exercising and are not thinking of starting. There were 27% of the population who stated that they were not considering exercising at all and 15% scored themselves as contemplators. Those considering themselves to be regular, aerobic exercisers numbered 28% and a further 30% (4% were in the action group and 26% were preparers) did take some exercise. This information is presented graphically in figure 4.3.

Table 4.0 compares responses from this population with those of two other British surveys carried out using the Stages of Change Questionnaire with non-clinical populations. Surveys 1 and 2 did not receive the high return rate enjoyed by this current study and this will be examined further in the Discussion Section.

Table 4.0. Comparison of Exercise Stages of Change Surveys in Britain

STAGES OF CHANGE	SURVEY 1 (N=424)	SURVEY 2 (N=509)	PRESENT STUDY (N=1030)
MAINTAINERS	43%	44%	28%
PREPARERS	14%	30%	26%
ACTION GROUP	22%	9%	4%
CONTEMPLATORS	17%	8%	15%
PRE-CONTEMPLATORS	*	3%	27%

Survey 1 = Mutrie and Caddell (1994)
Survey 2 = Loughlan (1995)

Table 4.1. displays characteristics of each of the Stages of Change groups. Results are expressed in percentages except for age which is expressed as

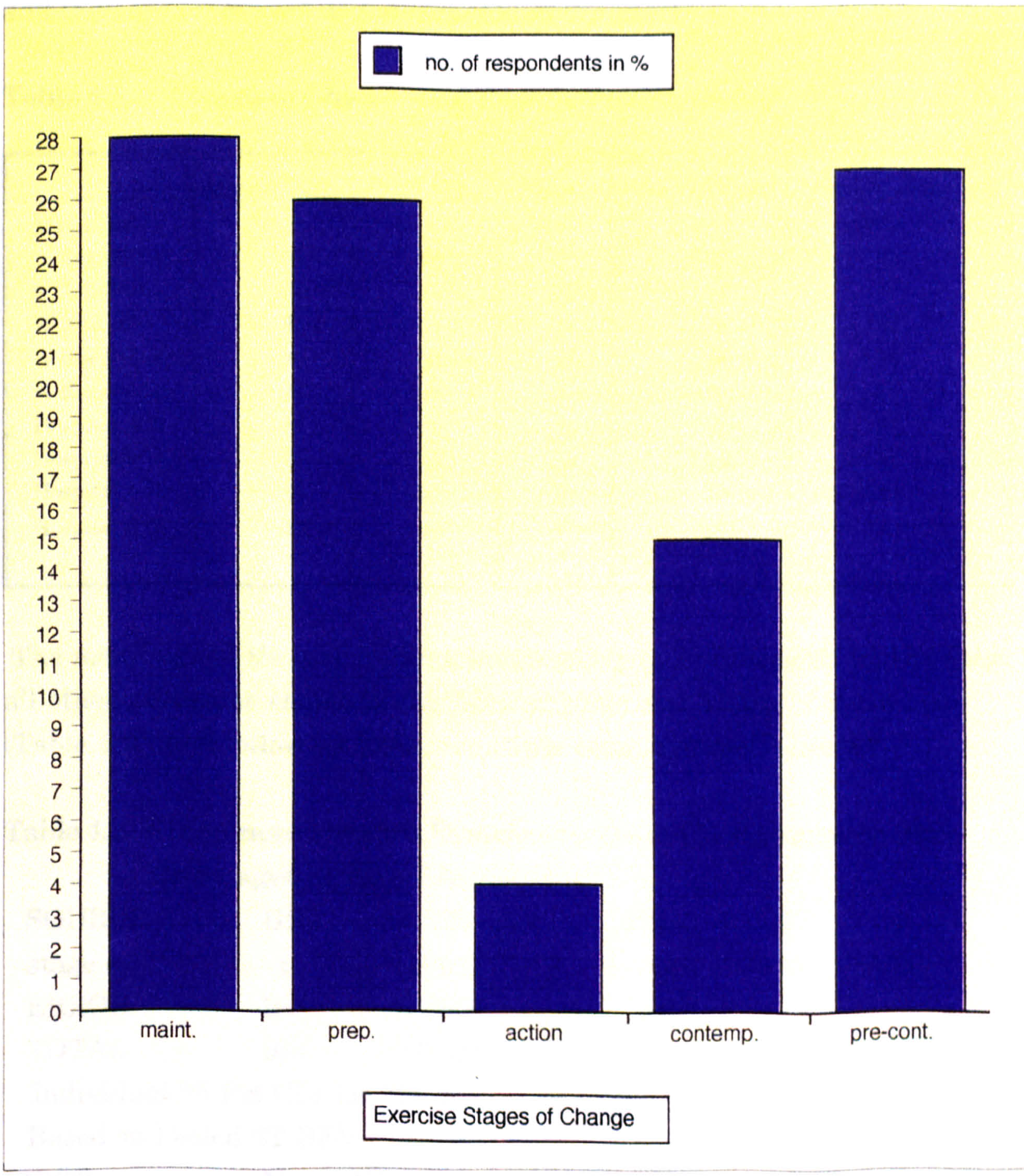


Figure 4.3. Exercise Stages of Change

a mean. Scores on the knowledge questions were out of a total of 26 possible correct answers but their percentage value has been calculated and they are expressed as percentages in the chart.

Table 4.1. Stages of Change and Descriptive Variables

	Maintainers	Preparers	Action	Contemplators	Pre-contemplators
Mean age	41.9	41.6	36.5	42.3	57.1
% Sex (Male)	56	56	36	43	52
% Non-Smk	80	74	87	77	71
% Ave. Wt.	65	54	34	36	55
% Good Health	96	98	95	88	82
% Knowledge	76	74	78.5	75	57
Hospital a %	24	25	24	21	31
Hospital b %	29	32	21	28	21
Hospital c %	25	25	39	25	21
Hospital d %	22	19	16	26	25

The mean age of the pre-contemplators group is significantly higher than all other groups as shown in the following one way analysis of variance (Table 4.2.) and follow-up Tukey multiple comparisons (Table 4.4.).

Table 4.2. Differences between Exercise Stages of Change groups with mean ages by ANOVA

```
SOURCE          DF        SS          MS        F        p
stage ex         4      47015       11754     10.18    0.001
ERROR          959     280509         293
TOTAL          963     327524
 Individual 95 Pct CI's for Mean
 Based on Pooled ST DEV
LEVEL            N    MEAN       STDEV  --+---------+---------+---------+---
Maintainers    266    41.91      18.64           (-*--)
Preparers      256    41.55      16.68          (- -*- -)
Action          38    36.45      13.99  ( - - - * - - - - )
Contemplators  142    42.28      16.82          ( - - -* -)
Pre-Contemps.  262    57.07      16.43                              (-*--)
                                        --+---------+---------+---------+---
POOLED ST DEV =       17.10               32.0      40.0      48.0      56.0
```

The average total knowledge score (more detail in section 4.4.3.) of the pre-contemplators group is significantly lower than the other groups as shown in Table 4.3. Scores were out of a possible 26 points. Tukey multiple comparison follow up tests are presented in Table 4.4.

Table 4.3. Differences between Exercise Stages of Change for average knowledge score by ANOVA

SOURCE	DF	SS	MS	F	p
ex. stage	4	4337.5	1084.4	34.4	0.001
ERROR	978	30827.2	31.5		
TOTAL	982	35164.6			

Individual 95 PCT CI'S for mean
based on pooled ST.DEV.

LEVEL	N	MEAN	ST.DEV	----+---------+---------+---------+
maintainers	273	19.7	3.9	(--*-)
preparers	258	19.3	4.5	(-*--)
action	38	20.4	3.1	(--------*------)
contempl.	146	19.5	4.9	(---*---)
pre-contem.	268	14.9	8.2	(-*---)
				----+---------+---------+---------+-
POOLED ST.DEV. = 5.6				15.0 17.5 20.0 22.5

Table 4.4. Tukey's Multiple Comparisons for Exercise Stages of Change and age and knowledge scores

	Maint.	Prep.	Action	Contem.	Pre-Contem.	p	pooled St.Dev.
*	a	a	a	a	b		
AGE	41.9	41.6	36.5	42.2	57.0	<.001	17.1
KNOW *	a	a	a	a	b		
LEDGE SCORES	19.7	19.3	20.4	19.5	14.8	<.001	5.6

* Values denoted by the same letter are not significantly different from each other but are significantly different from values denoted by a different letter.

4.4.3 Diabetes and Exercise Knowledge

A total of 26 questions were set relating specifically to procedures necessary for safe exercising for insulin dependent diabetics. Correct answers were scored by one point; incorrect answers by no points. The mean score and standard deviations for respondents was 18 ± 6.2. The least understood exercise and diabetes concepts were around the importance of blood glucose testing and blood glucose levels before starting to exercise. After a period of aerobic exercise, only 57% believed it important to test blood glucose levels immediately and then again after two hours. 17% failed to realise the danger of taking exercise when blood glucose levels were dangerously low at 4mmol/l/l. 74% did not know that exercising with glucose levels above 14mmol/l could cause problems of hyperglycaemia especially if ketones were present in urine. 77% answered correctly when asked if it was safe to exercise when blood glucose readings were between 8-14 mmol/l but only 47% would do so if blood glucose was between 4- 7mmol/l, even though many doctors would suggest that this level is quite safe provided that the diabetic is well controlled and adept at monitoring blood glucose levels (Berg, 1986). The full "knowledge" results are set out in Appendix 16. Total mean scores differed between hospital clinics as shown in Table 4.5. below.

Table 4.5. Differences in mean knowledge scores between hospital clinics by ANOVA

SOURCE	DF	SS	MS	F	p
Hospital	3	2280.9	760.3	20.98	0.001
ERROR	1016	36815.5	36.2		
TOTAL	1019	39096.4			

Individual 95 PCT CI'S for mean based on pooled St.Dev.

LEVEL	N	MEAN	ST.DEV.	--------+---------+---------+--------
Hospital a	263	16.3	7.4	(----*----)
Hospital b	270	19.9	4.1	(----*---)
Hospital c	245	18.9	5.5	(-----*----)
Hospital d	242	16.9	6.6	(-----*-----)
				--------+----------+---------+------
Pooled St. Dev. = 6.0				16.5 18.0 19.5

The **Tukey Multiple Comparison** follow-up test revealed hospitals b and c to have significantly higher knowledge scores from hospitals a and d but not from each other (*different numbers at top rt.hand of value denotes significant differences). Hospitals a and d are not significantly different from each other. Results are shown below:-

	Hosp a	Hosp b	Hosp c	Hosp d	
Knowledge	* 1	2	2	1	
scores	16.2	19.9	18.9	16.9	p <.001

4.4.4 Support and exercise advice from the Hospital Diabetes Clinics

Respondents were from one of four west of Scotland Diabetes Clinics attached to large, modern hospitals. Table 4.6. displays subjects' main characteristics in each hospital grouping.

Table 4.6. Differences between hospital groups

	HOSPITAL a (N=258)	HOSPITAL b (N=266)	HOSPITAL c (N=243)	HOSPITAL d (N=241)
Mean Age	55 (±17.5)	36.8 (±15)	42.7 (±18)	50.5 (±17.8)
Males	49%	56%	47%	51%
Maintainers	24%	29%	25%	22%
Not Physically Active	52%	48%	46%	54%
Non-smokers	78%	75%	79%	71%
Overweight	42%	36%	41%	41%
Poor health	10%	6%	6%	12%
% Knowledge	62%	77%	73%	65%

The following tables (Tables 4.7. and 4.8.) show that no significant differences, using chi-square tests, were found between hospital groupings for sex or for the length of time that patients had had diabetes .

Table 4.7. Differences between hospital groupings for males and females.

	Males	Females	Total
Hospital a	126	129	255
Hospital b	148	118	266
Hospital c	115	128	243
Hospital d	122	118	240

Chi-square = 4.823 df = 4 Non-significant (critical value =9.49)

Table 4.8. Differences for hospital groupings and length of diabetes

	<2yrs	2-5yrs	6-10yrs	11-20yrs	>20yrs	Total
Hospital a	7	38	54	81	80	260
Hospital b	17	54	54	82	61	268
Hospital c	9	41	55	78	62	245
Hospital d	12	45	59	69	54	239

Chi-square =15.57 df=14
Non-significant (critical value = 23.68)

However, significant differences were found between all hospital groups for age as shown in Table 4.9. by ANOVA and the Tukey Multiple Comparison follow-up test.

Table 4.9. Differences between hospital groupings for age by ANOVA

SOURCE	DF	SS	MS	F	p
Hospital	3	50174	16905	57.56	0.000
ERROR	995	292214	294		
TOTAL	998	342928			

```
Individual 95 PCT CI'S for mean
based on pooled St.Dev.
LEVEL         N     MEAN    St.Dev-+---------+---------+---------+------
Hospital a   255    56      17.7                               (---*-- )
Hospital b   264    36.8    15.2    ( --*- )
Hospital c   238    42.7    18.0              ( ---*-- )
Hospital d   242    50.5    17.7                          ( --*--)
                                   -+---------+---------+---------+-------
Pooled St. Dev = 17.14            35.0      42.0      49.0      56.0
```

Tukey Multiple Comparison follow-up test:

	1	2	3	4	
Age	54.9	36.8	42.7	50.5	p<.001

Respondents were asked four questions , with "yes" or "no" options, about whether their clinic had given advice on (i) how to exercise safely as a diabetic (ii) exercising for health benefits (iii) their present exercise status. Finally, they were asked if they would find it helpful to have a specialist exercise adviser available at the clinics. The collective responses from patients at each hospital are graphically illustrated in figures 4.4. to 4.7. Chi-square calculations are presented in Table 4.10. to 4.13. below and the Tukey Multiple Comparisons follow-up tests are recorded in Table 4.14. Hospital b was significantly better than the others for advice on how to exercise safely and on encouraging their patients to exercise for good health. But fig 4.5. clearly shows that the majority of patients in all of the clinics said they had not been given any advice on how to exercise safely as a diabetic. The majority of patients from Hospitals a, c and d believed that they had not been encouraged to exercise for good health. Also, the majority of patients in Hospitals a, c and d were not asked at their clinics about whether or not they exercise. Hospital b once again was seen to be significantly better at asking about present exercise status (Table 4.14.) and Hospital c significantly better than Hospital d. Hospital a was not significantly different from either Hospitals c or d. Responses about having an exercise adviser at the clinics showed all Hospitals to be similarly keen with at least 2/3 of the patients answering "yes".

Table 4.10. Differences in Hospital advice on exercising safely

	"YES"	"NO"	ALL
Hospital a	63	187	250
Hospital b	113	147	260
Hospital c	65	176	241
Hospital c	56	175	231
ALL	297	685	982

CHI-SQUARE = 29.7 df = 3 Significant (critical value= 11.3-16.3)

Table 4.11. Differences in Hospitals for health-related exercise advice

	"YES"	"NO"	ALL
Hospital a	113	137	250
Hospital b	151	109	260
Hospital c	103	137	240
Hospital d	106	127	233
ALL	473	510	983

CHI-SQUARE =14.4 df = 3 Significant (critical value= 11.3-16.3)

Table 4.12. Differences in Hospitals for asking about present exercise status

	"YES"	"NO"	ALL
Hospital a	88	158	246
Hospital b	145	116	261
Hospital c	101	143	244
Hospital d	68	163	231
ALL	402	580	982

CHI-SQUARE =38.4 df =3 Significant (critical value =11.3-16.3)

Table 4.13. Comparison of Hospitals for exercise adviser suggestion

	"YES"	"NO"	ALL
Hospital a	154	91	245
Hospital b	178	80	258
Hospital c	167	65	232
Hospital d	160	70	230
ALL	659	306	965

CHI-SQUARE = 5.0 df =3 Significant (critical value =11.3-16.3)

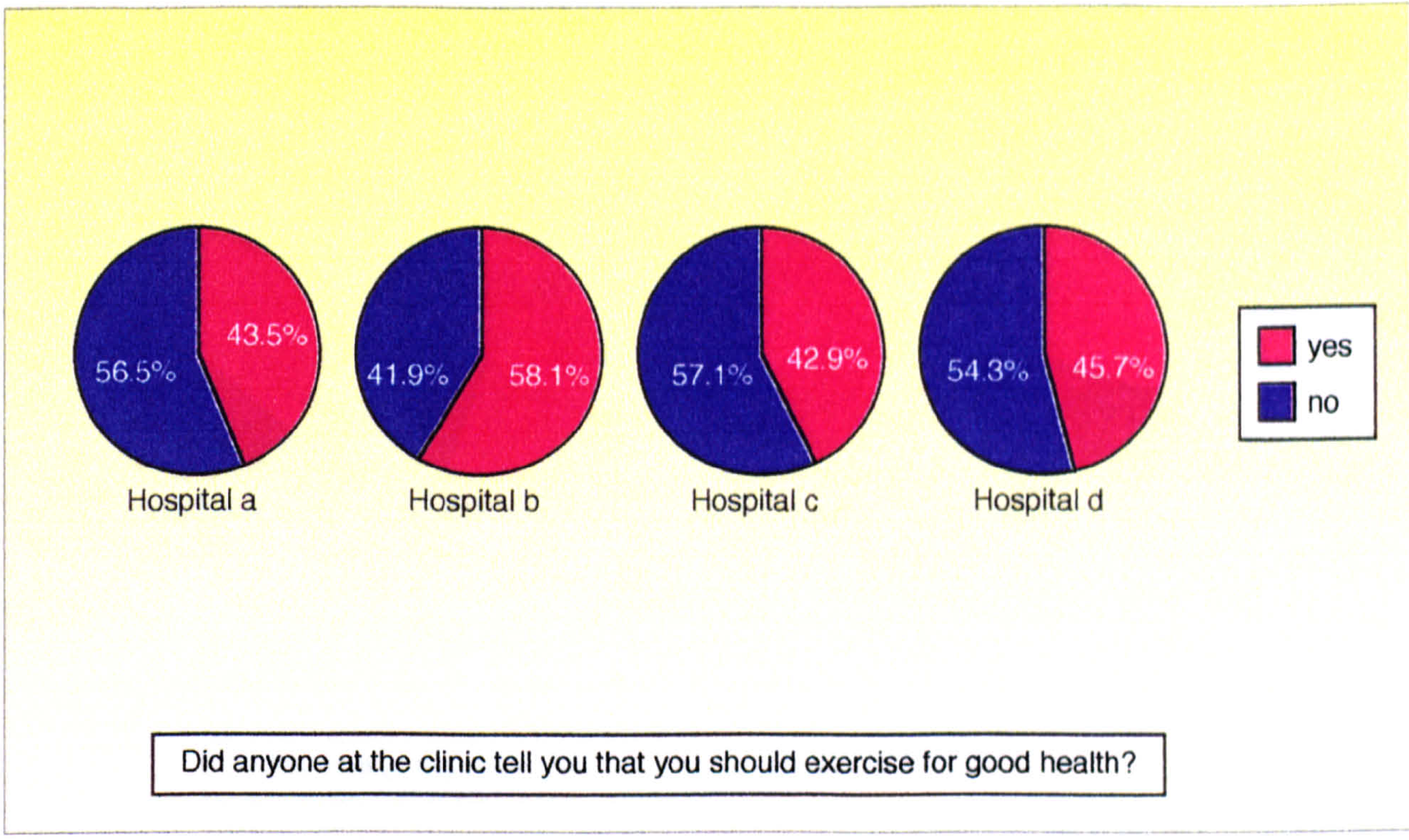


Figure 4.4. Advice from the clinics on exercising for good health

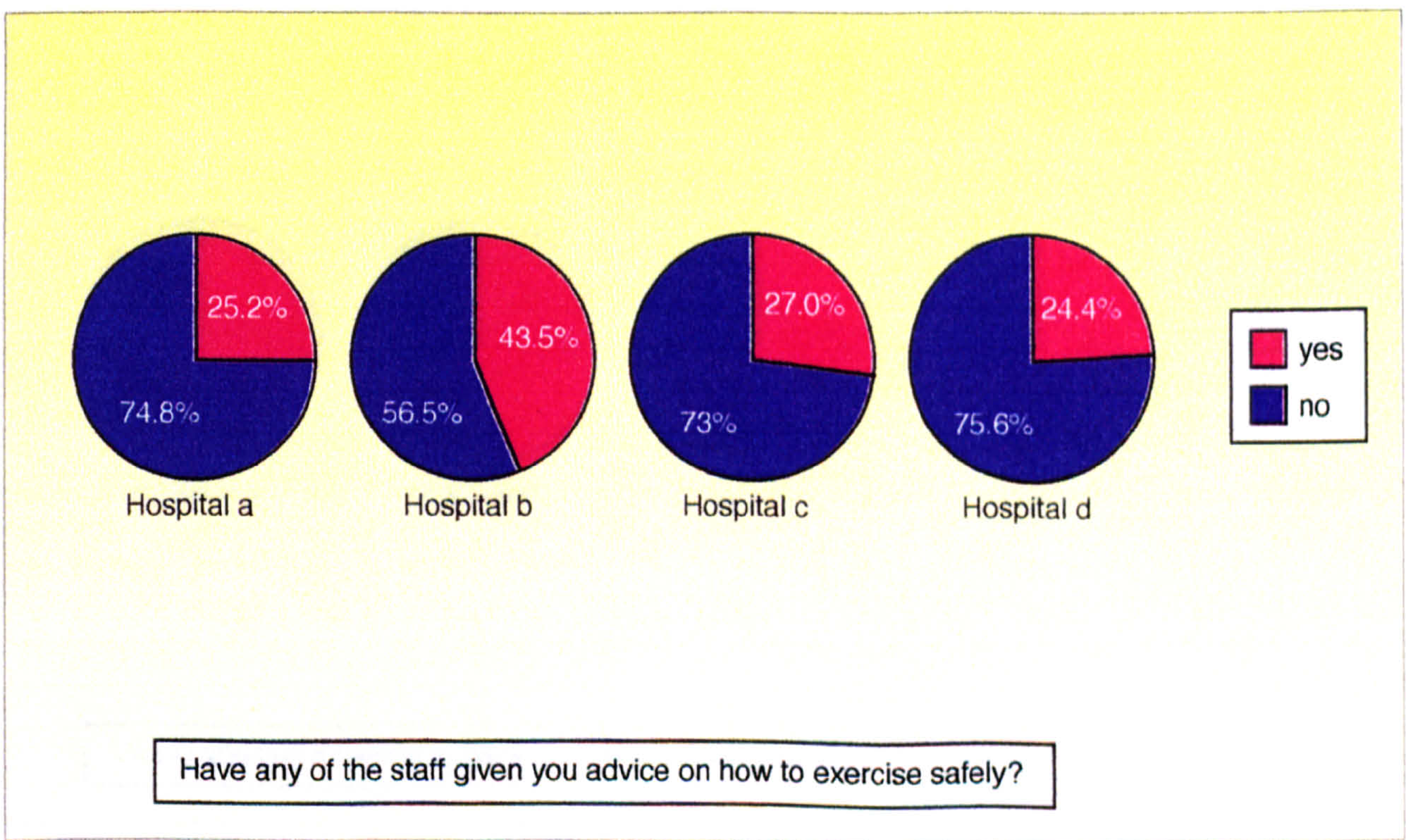


Figure 4.5. Advice from the clinics on safe exercise

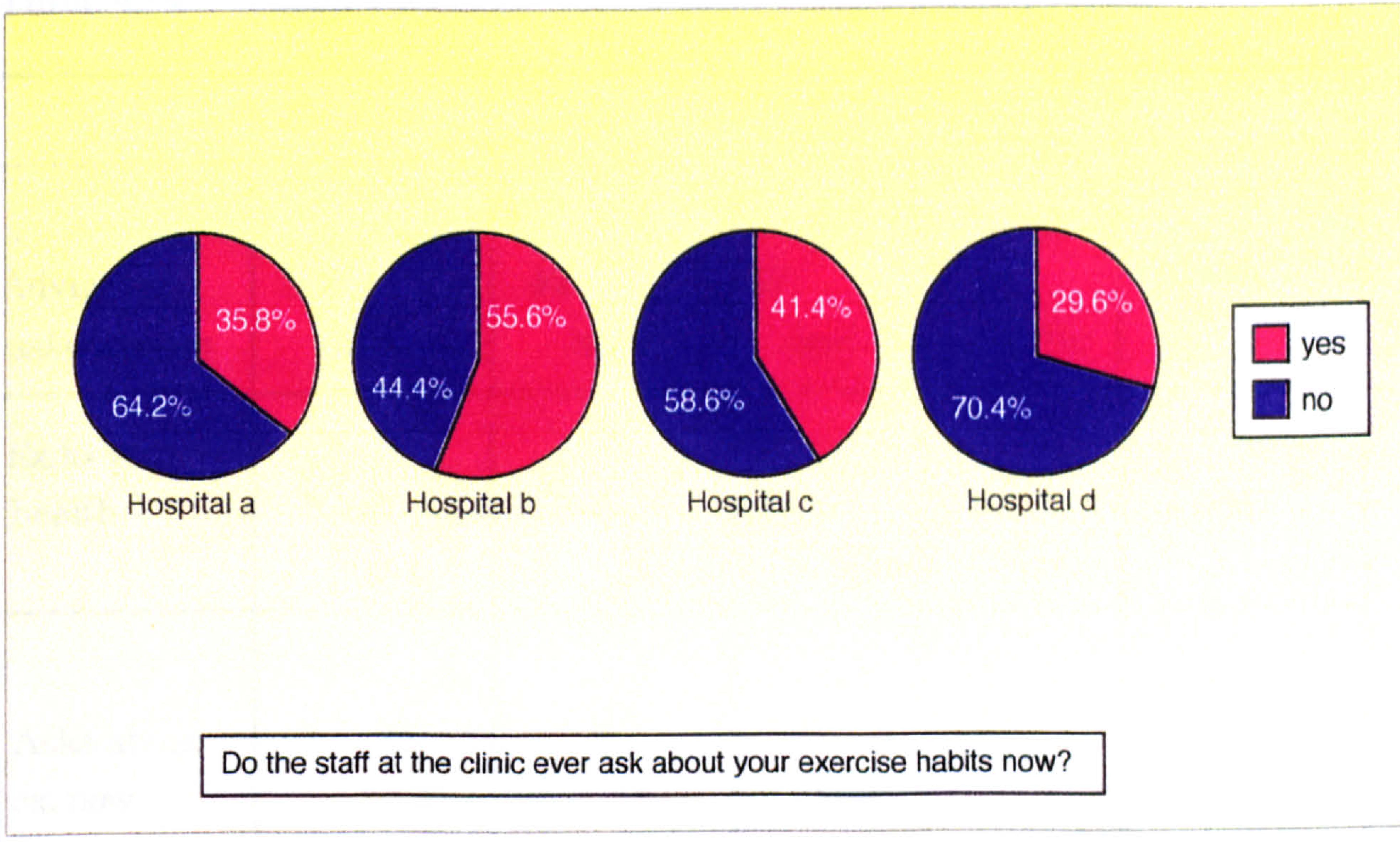


Figure 4.6. Advice from the clinics about present exercise behaviour

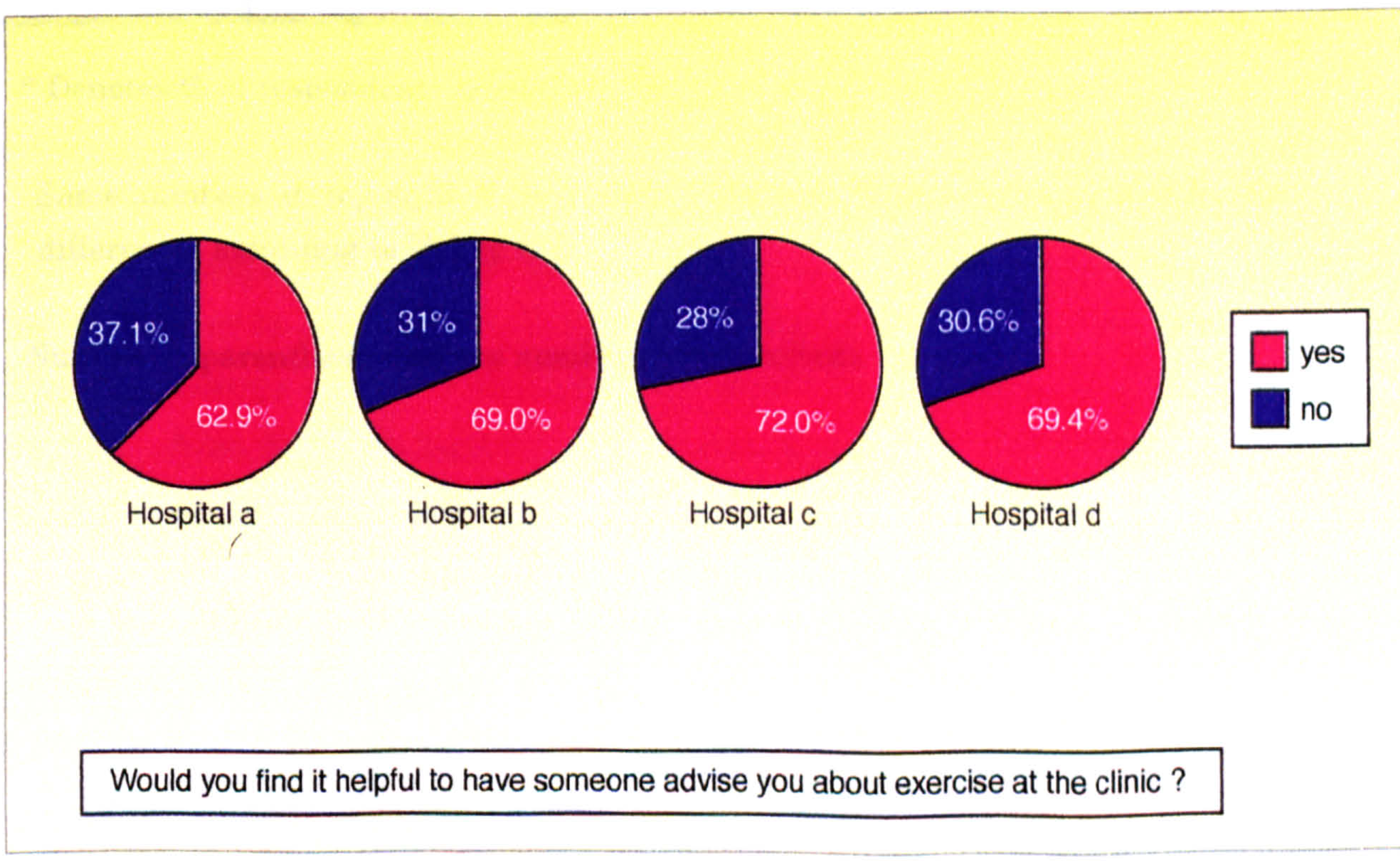


Figure 4.7. The need for an exercise adviser at the clinics

Table 4.14. Tukey's Multiple Comparisons on Hospital Effect

	Hosp. a	Hosp b	Hosp c	Hosp d	p
Advice for safe exercise	* 25[1] (250)	43[2] (260)	26[1] (241)	24[1] (231)	<.001
Ex. for good health	* 45[1] (250)	58[2] (260)	43[1] (240)	45[1] (233)	<.001
Asks about ex. now	* 36[1,2] (246)	56[3] (261)	41[2] (244)	29[1] (231)	<.001
Exercise adviser?	* 63[1] (245)	69[1] (258)	72[1] (232)	70[1] (230)	<.001

* Denotes % of respondents answering "yes".

Same numbers at top right of percentage answering "yes" denotes no significant differences according to Tukey test.

Number in parenthesis denotes number of respondents

4.4.5. Barriers to exercise

Respondents had been asked to study 18 possible barriers to exercise. They were asked to chose one answer from "never"; "hardly at all"; "sometimes" or "always". Fig.4.8. displays the result in a ranked order with the main barrier at the foot of the chart. Barrier scores for "always " and "sometimes" were summed in order to provide this ranking. Individual Barriers of "lack of energy", ""lack of time" and "too much to do" were clearly the most important barriers that "prevent you from exercising at all or as much as you would like". The hassles of having to perform blood glucose testing, changing insulin levels or the fear of having a hypoglycaemic incidence were clearly the least important barriers to exercising.

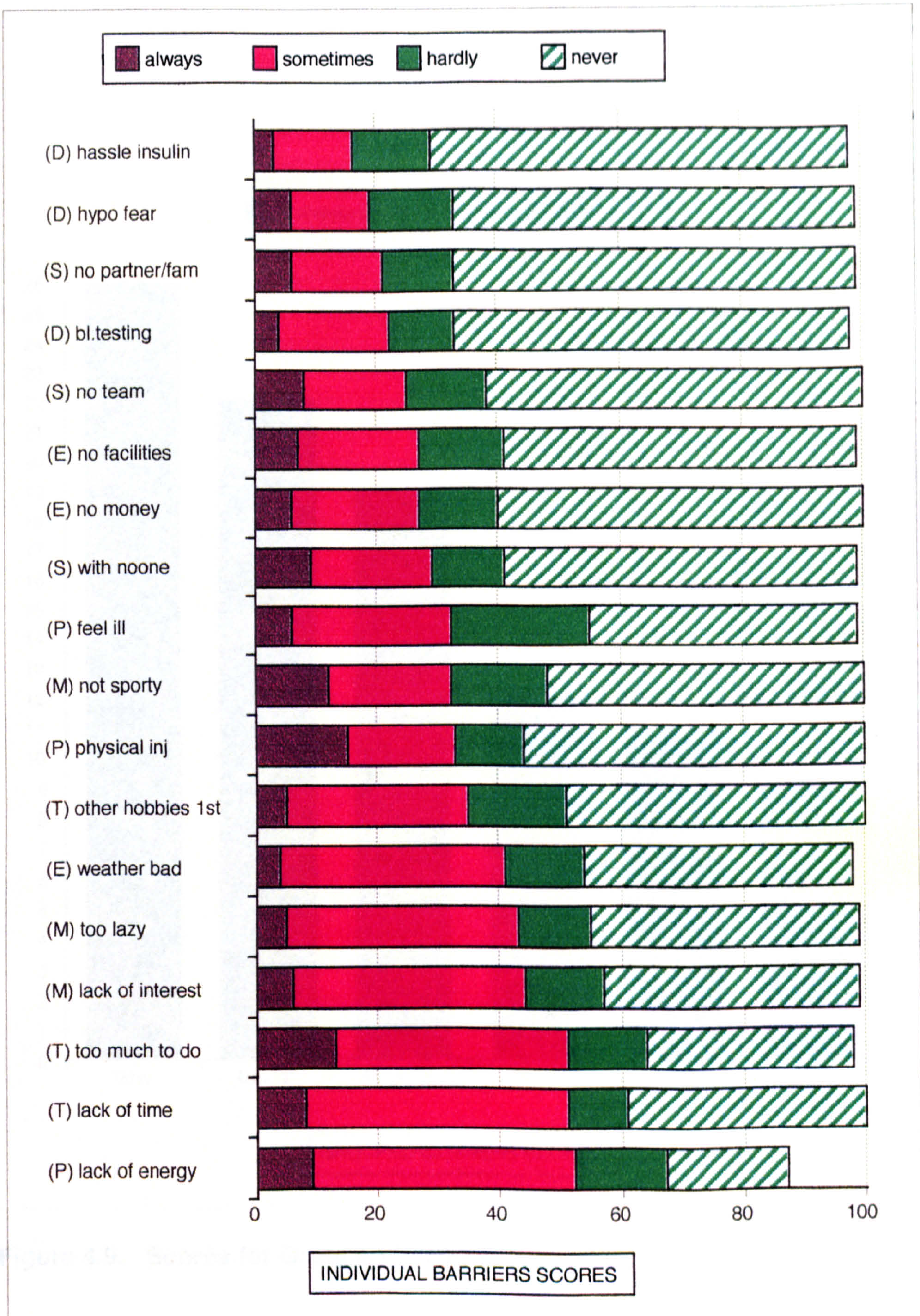
Three individual barriers were classified as belonging to one of six "group" barriers (indicated in brackets on the left-hand side of fig.4.8.). These group Barriers were named "Time Barriers"; "Mental Barriers"; "Physical Barriers"; "Social Barriers" "Environmental Barriers" and "Diabetic Barriers". Scores for responses to "always" and "sometimes" were summed and groups were then ranked as shown in fig.4.9. The Time group barrier was clearly the most important to this population and the Diabetic group barrier was the least important.

Results on pages 113 to 118 are presented in the following manner. Each group Barrier is analysed by one way analysis of variance for exercise stages of change effect. The higher the score on the scale, the bigger the barrier. Also for each barrier, t-tests are applied for differences due to age (younger v. older) and sex.

It can be seen from the Tukey Multiple Comparisons that the maintainers consistently had lower barrier scores for all group Barriers except Environmental Barriers. The contemplators and preparers held significantly higher barrier scores for all groups when compared with the maintainers. The pre-contemplators, however, only showed significant differences from maintainers on three group Barriers:- Physical, Mental and Diabetic. The action group was significantly different in Mental and Time Barriers from the maintainers. (Table 4.33. presents all Tukey Multiple Comparisons for easy reference.)

The t tests showed that the older group (> 35 yrs) of insulin dependent respondents found the Physical group Barrier to be significantly more important than the younger group (<35 yrs) did. The younger group, however, found all of the other group Barriers to be more of a problem than the older group did and Time, Mental and Environmental group Barriers reached significance.

There were no significant differences in group Barriers between males and females except for Mental group Barrier. Females recorded significantly higher scores than males for being too lazy, not being a sporty type and not being interested in exercising either at all or more than they already did.



KEY:- (T)=Time; (P)=Physical; (M)=Mental; (S)=Social; (D)=Diabetic; (E)=Environmental.

Figure 4.8. Individual Barriers

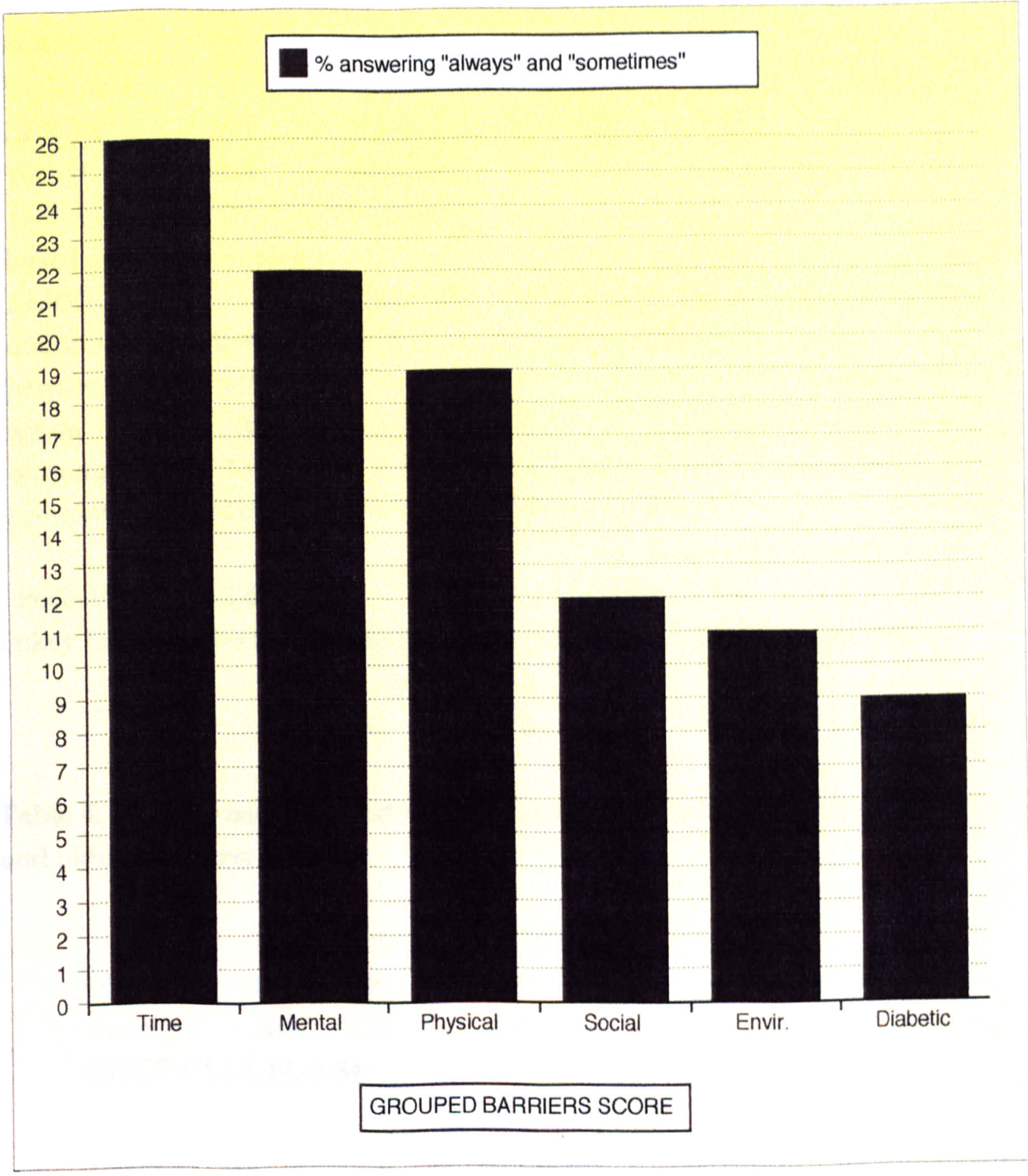


Figure 4.9. Scores for Grouped Barriers

Table 4.15. Differences between exercise stages of change for TIME group Barrier by ANOVA

SOURCE	DF	SS	MS	F	p
Ex. S.of Ch	4	425.99	106.5	18.6	0.001
ERROR	874	4994.88	5.7		
TOTAL	878	5420.87			

Individual 95 PCT CI's for mean
based on pooled St.Dev.

```
LEVEL            N      MEAN   STDEV---+---------+---------+---------+-----
maintainers    249      5.8     2.1     ( ----*--- )
prepares       248      7.1     2.3                       ( ---*---- )
action          36      7.1     1.9                  ( ----------*--------- )
contemp.       131      7.1     2.9                     ( -----*----- )
pre-contemp.   215      5.8     2.9     ( ---*---- )
                                        ----+---------+---------+---------+----
Pooled St.Dev.= 2.4                         5.6       6.3       7.0       7.7
```

Tukey follow-up test:	maint.	prep.	act.	cont.	pre-cont.	
	a	b	b	b	a	
	5.8	7.2	7.1	7.1	5.8	p<.001

Table 4. 16. Two sample t test on TIME group barrier for young (<35 yrs) and older (> 35 yrs) IDDMS

	N	MEAN	STDEV	DF	T	p
Old	548	5.97	2.61	814	-7.19	0.001
Young	336	7.12	2.13			

95PCT CI (-1.47,-0.84)

Table 4.17. Two sample t test on TIME group barrier for male and female.

	N	MEAN	STDEV	DF	T	p
Females	423	6.4	2.55	869	-0.16	0.87
Males	464	6.42	2.45			

95PCT CI (-0.36, 0.30)

Table 4.18. Differences between exercise stages of change for MENTAL group barrier by ANOVA

SOURCE	DF	SS	MS	F	p
Ex. S.of Ch.	4	686.5	171.6	26.3	0.001
ERROR	866	5659.6	6.5		
TOTAL	870	6346.1			

```
Individual 95 PCT CI'S for mean
based pooled St. Dev.
LEVEL          N        MEAN      STDEV-----+---------+---------+---------+
maintainers    249      4.8        1.9   ( ---*-- )
preparers      239      6.5        2.3                 ( --*--- )
action          35      6.8        2.6               ( -------*-------- )
contemp.       132      7.2        2.9                          ( ---*----)
pre-contemp.   216      6.2        3.2              ( --*--- )
                                         -----+---------+---------+---------+
Pooled St.Dev = 2.4                           5.0       6.0       7.0       8.0
```

Tukey follow up test:-	maint.	prep.	act.	cont.	pre-cont.	
	a	bc	bc	c	b	
	4.8	6.5	6.8	7.2	6.2	p<.001

Table 4. 19. Two sample t test for MENTAL group barrier for young (<35yrs) and older (>35yrs) IDDMS

	N	MEAN	STDEV	DF	T	p
Old	546	5.89	2.74	719	-2.1	0.035
Young	332	6.28	2.64			

95PCT CI (-0.76,-0.03)

Table 4.20. Two sample t test for MENTAL group barrier for male and female IDDMS

	N	MEAN	STDEV	DF	T	p
Female	423	6.29	2.84	850	2.48	0.013
Male	458	5.83	2.56			

95PCT CI (0.09, 0.81)

Table 4.21. Differences between exercise stages of change for PHYSICAL group barrier by ANOVA

SOURCE	DF	SS	MS	F	p
Ex. S. of Ch.	4	372.92	93.23	19.11	0.001
ERROR	879	4288.29	4.88		
TOTAL	883	4661.22			

```
                                        Individual 95 PCT CI'S for mean
                                        based pooled St. Dev.
LEVEL          N     MEAN    STDEV  ---------+---------+---------+---------+
maintainers    251   5.183   1.961  (---*---)
preparers      244   6.107   2.167                 (----*---)
action          34   5.941   1.536       (-------------*------------)
contemp.       137   6.708   2.180                              (-------*-----)
pre-contemp.   218   6.812   2.595                                 (------*---)
                                    ---------+---------+---------+---------+
Pooled St. Dev = 2.209                       5.4      6.00      6.60
```

Tukey follow-up test:	Maint.	Prep.	Act.	Cont.	Pre-cont.	
	a	b	a	c	c	
	5.2	6.1	5.9	6.7	6.8	p<.001

Table 4.22. Two sample t test for PHYSICAL group barrier for young (<35yrs) and older (>35yrs) IDDMS

	N	MEAN	STDEV	DF	T	p
Old	552	6.39	2.42	806	5.14	0.001
Young	340	5.62	2.05			

95 PCT CI (0.48, 1.07)

Table 4.23. Two sample test for PHYSICAL group barrier for male and female IDDMS

	N	MEAN	STDEV	DF	T	p
Female	427	6.12	2.23	893	0.28	0.78
Male	469	6.07	2.39			

95 PCT CI (-0.26, 0.34)

Table 4.24. Differences between exercise stages of change for SOCIAL group barrier by ANOVA

SOURCE	DF	SS	MS	F	p
Ex. S. of Ch.	4	204.30	51.08	9.14	0.001
ERROR	814	4547.71	5.59		
TOTAL	818	4752.02			

Individual 95 PCT CI'S for mean
based on pooled St. Dev.

```
LEVEL          N    MEAN    STDEV  ---------+---------+---------+---------+
maintainers   233   4.601   2.076    (---*----)
preparers     244   5.478   2.390                  (-----*----)
action         37   5.351   2.312          (------------*--------------)
contemp.      124   5.879   2.501                          (------*---------)
pre-contemp.  201   4.672   2.562     (-------*----)
                                   ---------+---------+---------+---------+
Pooled St.Dev. =2.364                      4.80      5.40      6.00
```

Tukey follow-up test:	Maint.	Prep.	Act.	Cont.	Pre-cont.	
	a	b	ab	b	a	
	4.6	5.5	5.4	5.9	4.7	p<.001

Table 4.25. Two sample t test for SOCIAL group barrier for young (<35yrs) and older (>35yrs) IDDMS

	N	MEAN	STDEV	DF	T	p
Old	507	4.97	2.47	707	-1.81	0.07
Young	320	5.28	2.33			

95 PCT CI (-0.64, 0.03)

Table 4.26. Two sample t test on SOCIAL group barrier for male and female

	N	MEAN	STDEV	DF	T	p
Female	395	5.11	2.48	810	.26	.79
Male	433	5.07	2.36			

95 PCT CI (-0.29, 0.38)

Table 4.27. Differences between exercise stages of change for ENVIRONMENT group barrier by ANOVA

SOURCE	DF	SS	MS	F	p
Ex. S. of Ch.	4	238.87	59.72	10.40	0.001
ERROR	874	5018.78	5.74		
TOTAL	878	5257.65			

```
Individual 95 PCT CI'S for mean
based pooled St. Dev.
LEVEL          N    MEAN    STDEV---------+---------+---------+---------+
maintainers  249   5.193    1.954          (-----*----)
preparers    244   5.877    2.091                         (----*----)
action        36   5.444    2.104        (-------------*---------------)
contemp.     136   6.390    3.467                                (------*------)
pre-contemp. 214   4.916    2.405      (-------*-----)
                                    ---------+---------+---------+---------+
Pooled St. Dev = 2.396                      4.80      5.40      6.00      6.60
```

Tukey follow-up test:	Maint.	Prep.	Act.	Cont.	Pre-cont.	
	a	b	ab	b	a	
	5.2	5.9	5.4	6.4	4.9	p<.001

Table 4.28. Two sample t test for ENVIRONMENT group barrier for young (<35yrs) and older (>35yrs) IDDMS

	N	MEAN	STDEV	DF	T	p
Old	547	5.26	2.67	849	-4.08	0.000
Young	339	5.91	2.02			

95 PCT CI (-.096, -0.34)

Table 4.29. Two sample t test for ENVIRONMENT group barrier for male and female IDDMS

	N	MEAN	STDEV	DF	T	p
Female	425	5.48	2.73	811	-.22	.83
Male	464	5.52	2.18			

95 PCT CI (-0.36, 0.29)

Table 4.30. Differences between exercise stages of change for DIABETIC group barrier by ANOVA

SOURCE	DF	SS	MS	F	p
Ex. S. of Ch.	4	148.19	37.05	7.94	0.001
ERROR	880	4105.05	4.66		
TOTAL	884	4253.24			

Individual 95 PCT CI'S for mean
based pooled St. Dev.

LEVEL	N	MEAN	STDEV	---------+---------+---------+---------+
maintainers	254	4.083	1.660	(---*---)
preparers	247	4.761	2.033	(----*----)
action	37	5.054	2.054	(-----------*-----------)
contemp.	135	5.119	2.744	(-------*-------)
pre-contemp.	212	5.024	2.744	(-----*-----)

Pooled St. Dev. = 2.160 ---------+---------+---------+---------+

4.20 4.80 5.40

Tukey follow-up test:	Maint.	Prep.	Act.	Cont.	Pre-cont.	
	a	b	b	b	b	
	4.1	4.7	5.1	5.1	5.0	p<.001

Table 4.31. Two sample t test for DIABETIC group barrier for young (<35yrs) and older (>35yrs) IDDMS

	N	MEAN	STDEV	DF	T	p
Old	553	4.62	2.25	761	-1.29	.20
Young	340	4.81	2.08			

95 PCT CI (-0.48, 0.10)

Table 4.32. Two sample t test for DIABETIC group barrier for male and female IDDMS

	N	MEAN	STDEV	DF	T	p
Female	426	4.77	2.22	881	.86	.39
Male	470	4.64	2.18			

95PCT CI (-0.16, 0.42)

Table 4.33. Tukey's Multiple Comparisons on Group Barriers and Exercise Stages of Change effect

	Maint.	Prep.	Action	Cont.	Pre-c	p	p.s.d.
TIME	a * 5.8 249	b 7.2 248	b 7.1 36	b 7.1 131	a 5.8 215	<.001	2.4
MENTAL	a * 4.8 249	bc 6.5 239	bc 6.8 35	c 7.2 132	b 6.2	<.001	2.6
PHYSICAL	a * 5.2 251	b 6.1 244	a 5.9 34	c 6.7 137	c 6.8 218	<.001	2.2
SOCIAL	a * 4.6 233	b 5.5 224	ab 5.4 36	b 5.9 124	a 4.7 201	<.001	2.4
ENVIRON.	a * 5.2 249	b 5.9 244	ab 5.4 36	b 6.4 136	a 4.9 214	<.001	2.4
DIABETIC	a * 4.1 254	b 4.7 247	b 5.1 36	b 5.1 135	b 5.0 212	<.001	2.2

Key:- Maint=Maintainers; Prep=Preparers; Cont.=Contemplators; Pre-c.=Pre-Contemplators; p.s.d.=Pooled Standard Deviation.

3 6 9 12

* Denotes values of barrier importance on the scale----+---------+---------+---------+--------

never hardly s'times always

Different letters at top right of barrier value indicates significant differences.

Numbers at bottom right of values indicates the number of respondents.

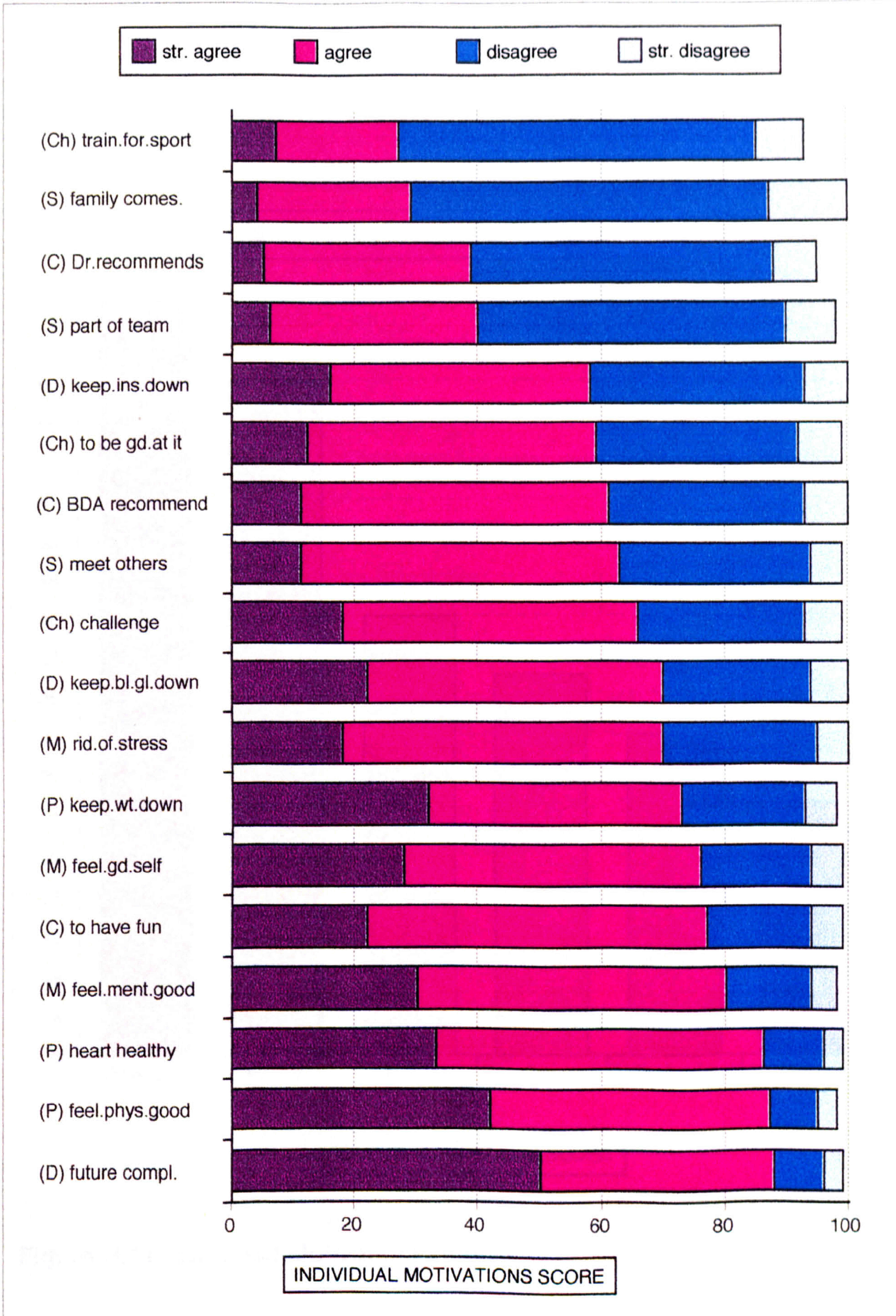
4.4.6. Motivations to exercise

Respondents were asked to study a possible 18 motivations to begin or increase their exercise levels. They were asked to circle one response from either "strongly agree"; "agree"; "disagree" or "strongly disagree". All scores from "strongly agree" and "agree" were summed in order to produce a ranking for individual motivations (fig. 4.10). The strongest motivators are found at the foot of the chart and the least important at the top of the chart. Respondents scored " to prevent future diabetic complications"; "to feel physically better" and "to keep my heart healthy" as the most important factors for motivating them to begin or increase their exercise level. The least important factors were "to train for a sport"; "because my friends/family do" and "the doctor told me to".

Each individual motivation belonged to one of six group Motivations:- "Physical"; "Mental"; "Diabetic"; "Cues"; "Challenge" and "Social". A letter indicating to which group each individual motivation belongs can be seen in brackets at the left-hand side of fig. 4.10. Scores for "strongly agree" and "agree" were summed and groups were then ranked in importance as shown in fig.4.11. The Social group Motivation was of least importance to this population while the Physical and Mental group motivations were clearly the strongest.

Results on pages 123 to 128 are presented in a similar manner to those in the Barriers section i.e. differences between each group Motivation and exercise stages of change are calculated by ANOVA. Tukey Multiple Comparison follow up tests follow each ANOVA and are also displayed in Table 4.52. T tests are calculated for each group Motivation and sex and age (older v. younger) effects. The younger group are shown to be significantly more motivated by every group Motivation compared with the older group. Males are significantly more motivated by Challenge and Diabetic group Motivations than females.

It can clearly be seen from the Tukey Multiple Comparisons that the pre-contemplators consistently have significantly lower scores on **all** group Motivations compared with all of the others. The contemplators show higher motivation values than the maintainers for all group Motivations except Challenge. Maintainers had the highest Challenge value.



KEY:(P)= physical; (M)=mental; (S)=social; (C)=cues; (Ch)=challenge; (D)=diabetic

Figure 4.10. Individual Motivations

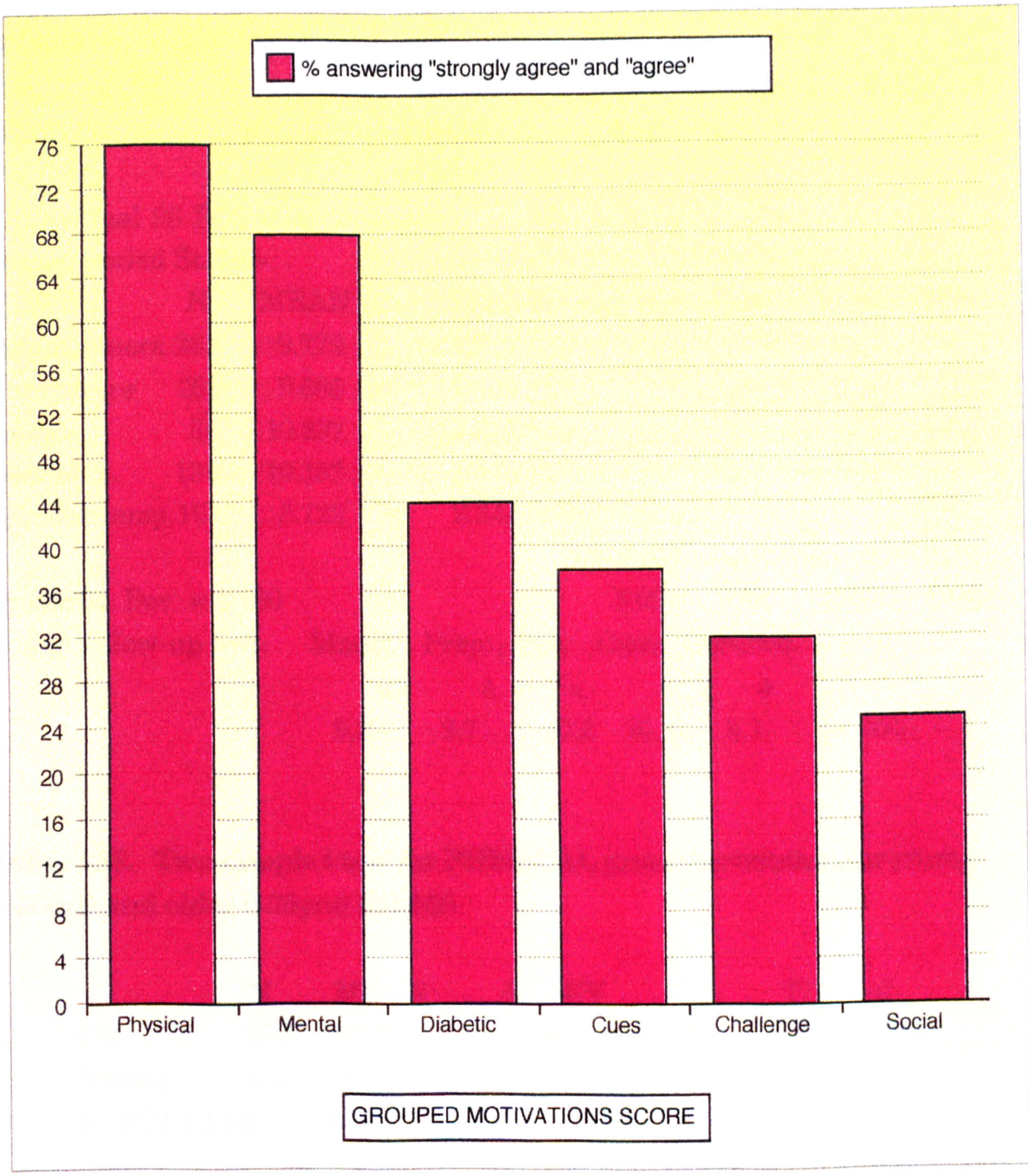


Figure 4.11. Grouped Motivations Scores

Table 4.34. Differences between exercise stages of change for PHYSICAL motivation by ANOVA

SOURCE	DF	SS	MS	F	p
Ex. S. of Ch.	4	478.69	119.67	38.64	0.001
ERROR	882	2731.64	3.10		
TOTAL	886	3210.33			

Individual 95 PCT CI'S for mean
based pooled St. Dev.

LEVEL	N	MEAN	STDEV	---------+---------+---------+---------+
maintainers	262	9.779	1.575	(-*--)
preparers	251	9.685	1.608	(----*---)
action	38	10.237	1.515	(------*---------)
contemp.	139	10.137	1.415	(---*---)
pre-contemp.	197	8.122	2.344	(---*---)
				----------+---------+---------+---------+
				8.00 8.80 9.60 10.40

Pooled St. Dev. = 1.760

Tukey follow-up test:	Maint.	Prep.	Act.	Cont.	Pre-cont.	
	a	a	a	a	a	
	9.8	9.7	10.2	10.1	8.1	p<.001

Table 4.35. Two sample t test for PHYSICAL group motivation for young (<35yrs) and older (>35yrs) IDDMS

	N	MEAN	STDEV	DF	T	p
Old	552	9.13	2.08	874	-6.81	0.001
Young	342	9.94	1.49			

95 PCT CI (-1.05, -0.58)

Table 4.36. Two sample t test for PHYSICAL group motivation for male and female IDDMS

	N	MEAN	STDEV	DF	T	p
Female	433	9.42	2.05	853	-.46	.64
Male	463	9.48	1.76			

95 PCT CI (-0.31, 0.19)

Table 4. 37. Differences between exercise stages of change for MENTAL group motivation by ANOVA

SOURCE	DF	SS	MS	F	p
Ex. S. of Ch.	4	506.45	126.61	29.76	0.001
ERROR	871	3706.22	4.26		
TOTAL	875	4212.67			

Individual 95 PCT CI"S for mean
based pooled St. Dev.

LEVEL	N	MEAN	STDEV	---------+----------+----------+-----
maintainers	260	9.219	1.848	(-*--)
preparers	247	9.283	2.398	(--*--)
action	38	9.737	1.796	(------*-----)
contemp.	137	9.547	1.424	(--*---)
pre-contemp.	194	7.536	2.290	(--*--)
				---------+---------+---------+-------
Pooled St. Dev. =2.1				8.0 9.0 10.0

Tukey follow-up test:	Maint.	Prep.	Act.	Cont.	Pre-cont.	
	a	a	a	a	b	
	9.2	9.2	9.7	9.5	7.5	p<.001

Table 4.38. Two sample t test for MENTAL group motivation for young (<35yrs) and older (>35yrs) IDDMS

	N	MEAN	STDEV	DF	T	p
Old	343	8.52	2.2	732	-6.89	0.001
Young	337	9.55	2.12			

95 PCT CI (-1.32, -0.74)

Table 4.39. Two sample t test for MENTAL group motivation for male and female IDDMS

	N	MEAN	STDEV	DF	T	p
Female	422	8.86	2.54	772	-.85	.40
Male	461	8.89	1.89			

95 PCT CI (-0.43, 0.17)

Table 4.40. Differences between exercise stages of change for DIABETICS group motivation by ANOVA

SOURCE	DF	SS	MS	F	p
Ex. S. of Ch.	4	221.82	55.45	14.63	0.001
ERROR	859	3256.95	3.79		
TOTAL	863	3478.77			

Individual 95 PCT CI'S for mean
based pooled St. Dev.

LEVEL	N	MEAN	STDEV	+---------+---------+---------+---------
maintainers	261	8.897	1.823	(---*--)
preparers	242	9.178	1.780	(---*--)
action	38	9.421	1.968	(---------*-----------)
contemp.	134	9.328	1.839	(---*-----)
pre-contemp.	189	7.952	2.348	(---*----)
Pooled St. Dev. =1.947				+---------+---------+---------+---------

Tukey follow-up test:	Maint.	Prep.	Act.	Cont.	Pre-cont.	
	a	a	a	a	b	
	8.9	9.2	9.4	9.3	7.9	p<.001

Table 4.41. Two sample t test for DIABETIC group motivation for young (<35yrs) and older (>35yrs) IDDMS

	N	MEAN	STDEV	DF	T	p
Old	532	8.7	2.21	827	-2.63	.009
Young	334	9.05	1.71			

95 PCT CI (-0.61, -0.09)

Table 4.42. Two sample t test for DIABETIC group motivation for male and female IDDMS

	N	MEAN	STDEV	DF	T	p
Female	415	8.67	2.16	825	-2.43	.015
Male	454	9.01	1.89			

95 PCT CI (-0.61, -0.07)

Table 4. 43. Differences between exercise stages of change for CUES motivation by ANOVA

SOURCE	DF	SS	MS	F	p
Ex. S.of Ch.	4	206.09	51.52	17.52	0.001
ERROR	852	2504.88	2.94		
TOTAL	856	2710.96			

Individual 95 PCT CI's for mean
based on pooled St.Dev.

LEVEL	N	MEAN	STDEV	-------+---------+---------+---------+
maintainers	259	8.1	1.6	(--*---)
preparers	239	8.1	1.6	(--*---)
action	38	8.2	1.7	(--------*-------)
contemp.	136	8.5	1.7	(----*----)
pre-cont.	191	7.0	2.0	(---*---)
				--------+--------+---------+----------+
POOLED STDEV = 1.72				7.2 7.8 8.4

Tukey follow-up test:	Maint.	Prep.	Act.	Cont.	Pre-cont.	
	a	a	a	a	b	
	8.1	8.1	8.2	8.5	7.0	p<.001

Table 4.44. Two sample t test for CUES group motivation for young (<35 yrs) and older (>35 yrs.) IDDMS

	N	MEAN	STDEV	DF	T	p
Older	526	7.7	1.97	834	- 4.25	0.001
Younger	333	8.2	1.47			

95 PCT CI (-0.73, -0.27)

Table 4. 45. Two sample t test for CUES group motivation for males and females

	N	MEAN	STDEV	DF	T	p
Female	410	7.82	1.89	829	-1.43	0.15
Males	453	8.0	1.72			

95 PCT CI (-0.42, 0.07)

Table 4. 46. Differences between exercise stages of change for CHALLENGE group motivations by ANOVA

SOURCE	DF	SS	MS	F	p
Ex.S.of Ch.	4	435.29	108.82	28.15	0.001
ERROR	861	3327.93	3.87		
TOTAL	865	3762.22			

Individual 95 PCT CI'S for mean based on St.Dev.

```
LEVEL          N      MEAN   STDEV---+---------+---------+---------+-----
maintainers  254       8.2    2.1                             (--*---)
preparers    245       7.8    2.2                        (---*--)
action        37       7.9    1.6                    (-------*-------)
contemp.     137       8.0    1.5                          (----*----)
pre-cont.    193       6.4    1.9  (---*---)
                                   ---+---------+---------+---------+-----
Pooled St.Dev = 1.97                 6.3       7.0       7.7       8.4
```

Tukey follow-up test:	Maint.	Prep.	Act.	Cont.	Pre-cont.	
	a	a	a	a	b	
	8.3	7.8	7.9	7.9	6.4	p<.001

Table 4. 47. Two sample t test for CHALLENGE group motivation for younger (<35yrs) and older (>35yrs)

	N	MEAN	STDEV	DF	T	p
Older	529	7.2	1.97	688	-8.8	0.001
Younger	338	8.4	2.08			

95 PCT CI (-1.5, -0.97)

Table 4. 48. Two sample t test for CHALLENGE group motivation and males and females

	N	MEAN	STDEV	DF	T	p
Females	414	7.4	1.9	868	-3.34	0.001
Males	457	7.9	2.2			

95 PCT CI (-0.75, -0.19)

Table 4. 49. Differences between exercise stages of change for SOCIAL group motivation by ANOVA

SOURCE	DF	SS	MS	F	p
EX.S.of Ch.	4	248.7	62.2	12.9	0.001
ERROR	854	4110.9	4.8		
TOTAL	858	4359.6			

```
Individual 95 PCT CI'S for mean
based on pooled St.Dev.
LEVEL          N        MEAN    STDEV-----+---------+---------+---------+
maintainers  256        7.7      1.8                          ( --*--- )
preparers    238        7.5      3.0                       ( ---*--- )
action        35        7.5      1.4                 ( ---------*--------- )
contemp.     137        7.6      1.6                       ( ----*---- )
pre-cont.    193        6.3      1.9    (----*--- )
                                       -----+---------+---------+---------+
Pooled St.Dev. = 2.2                        6.3       7.0       7.7       8.4
```

Tukey follow-up test:	Maint.	Prep.	Act.	Cont.	Pre-cont.	
	a	a	a	a	b	
	7.6	7.5	7.5	7.6	6.3	p<.001

Table 4.50. Two sample t test for SOCIAL group motivation for younger (<35yrs) and older (>35 yrs) IDDMS

	N	MEAN	STDEV	DF	T	p
Older	525	7.0	2.6	855	-4.33	0.001
Younger	336	7.6	1.6			

95 PCT CI (-0.89, -0.34)

Table 4.51. Two sample t test for SOCIAL group motivation for males and females

	N	MEAN	STDEV	DF	T	p
Females	412	7.2	1.8	806	-0.7	0.47
Males	455	7.3	2.6			

95 PCT CI (-0.41, 0.19)

Table 4.52. Tukey's Multiple Comparisons on Group Motivation and Exercise Stages of Change effect

	Maint.	Prep.	Action.	Cont.	Pre-c	p	p.s.d
PHYSICAL	9.8^{a}_{262}	9.7^{a}_{251}	10.2^{a}_{38}	10.1^{a}_{139}	8.1^{b}_{197}	<.001	1.8
MENTAL	* 9.2^{a}_{260}	9.2^{a}_{247}	9.7^{a}_{38}	9.5^{a}_{137}	7.5^{b}_{194}	<.001	2.1
DIABETIC	* 8.9^{a}_{261}	9.2^{a}_{242}	9.4^{a}_{38}	9.3^{a}_{134}	7.9^{b}_{189}	<.001	1.9
CUES	* 8.1^{a}_{254}	8.1^{a}_{239}	8.2^{a}_{37}	8.5^{a}_{136}	7.0^{b}_{191}	<.001	1.7
CHALLENGE	* 8.3^{a}_{254}	7.8^{a}_{245}	7.9^{a}_{37}	7.9^{a}_{137}	6.4^{b}_{193}	<.001	1.9
SOCIAL	* 7.6^{a}_{256}	7.5^{a}_{238}	7.5^{a}_{35}	7.6^{a}_{137}	6.3^{b}_{193}	<.001	2.2

Key:- Maint.=Maintainers ; Pre=Prepares; Cont=Contemplators;
Pre-c=Pre-Contemplators; p.s.d=Pooled Standard Devaition.

strongly disagree   disagree   agree   strongly agree

* Denotes values of motivation importance on the scale----+---------+---------+---------+---

3   6   9   12

Different letter at top right of motivation value indicates significant differences.

Numbers at bottom right of values indicates the numbers of respondents.

4.5. Discussion

1,030 Diabetes and Exercise Questionnaires were returned, giving a 73 % return rate which is at the high end of the spectrum for mailed Questionnaires (Goyder,1985) and higher than other stages of change studies. This may be the result of the strenuous efforts in piloting and design and including a personal letter from the appropriate diabetes consultant with each mailing. It may also be due to the fact that insulin dependent diabetic people are a population committed to staying well in the face of their chronic disease. Many letters received from respondents during this study indicated a desire to help in research for future diabetic people and in a desire to learn more about the benefits of exercise in their own situation. Twenty-seven percent of the Questionnaires were not returned and any conclusions from this study should be interpreted with some caution with this in mind. However, since almost three quarters of the population responded, there is reasonable confidence that the views expressed are representative of the population.

The age range of responders was wide (10- 83 years) and there were almost equal numbers of males and females. However, there was a much higher proportion of unemployed subjects (25%) than would be expected in the general population of the west of Scotland at that time (10.5%, reported in the "Leader" 19.2.93). Respondents were fairly evenly distributed between the four hospitals with each providing about 250 patients. A very clear definition of "regular, aerobic exercise" was given on page 2 of the Questionnaire and examples, including walking, were given. The fact that walking was mentioned as exercise may be the reason that 28% listed themselves as regular exercisers. A total of 73% of the respondents classed themselves as being **interested** in either beginning to exercise or already being active to some degree. Even the 27% who were in the pre-contemplator category were motivated sufficiently to complete and return the Questionnaire, usually with an accompanying letter explaining why they felt they could no longer be active but wishing the study well:

> "This work on exercise comes too late for me. I have been diabetic for 35 years and my legs are no good now. But I

hope the youngsters will get help to stay active so this won't happen to them". (55 year old man)

" If I didn't have all this trouble with my eyes I'd still be dancing. I hope your work will keep them all dancing for a long time". (67 year old female)

" I used to play football and was in the army but diabetes got the better of me and now I can only walk a little."
(37year old male who has had diabetes for 32 years)

Since the total respondent mean age was 46.2 (±18.5) and that 56% had had diabetes for more than 11 years, it is clear that it is not only the young and newly diagnosed IDDM who is interested in exercise. Questionnaires were anonymous so there should have been no reason for respondents to provide false answers. Patient confidentiality has been of prime importance in this study.

This positive attitude from the majority of respondents towards exercise was not matched by positive views of exercise education given by the four Hospital clinics. Patients' perceptions of information, support, advice or encouragement from their health professionals towards exercise was that little had been provided either on first diagnosis or during more recent clinic appointments. Results of exercise knowledge scores reflect these perceptions. Respondents scored an average of 69% on the most basic of questions about exercise and diabetes. 74% did not realise that exercising with a high blood glucose level could cause worsening hyperglycaemia (Berg, 1986). This information seems rarely to be given to IDDMs who, anecdotally in exercise counselling in Study 1, reported that they recalled clinic staff emphasising the need to take extra carbohydrate to avoid hypoglycaemia but that no guidance on an upper limit for blood glucose levels was ever given. It is almost impossible, therefore, to believe that 16% did not realise that exercising with a blood glucose reading of less than 4 mmol/l could be dangerous. Yet, no more than 26% of patients from Hospitals a, c and d can remember ever being told how to exercise safely. Even at Hospital b, which shows significantly higher numbers of patients agreeing that they were told how to exercise safely, the percentage only reaches 43%. If patients' perceptions are indeed true, these results are extremely worrying for the health and safety of the majority of insulin dependent diabetics who may decide to embark on an exercise programme.

Around half of the respondents remember being told, when first diagnosed, that they should exercise for good health but fewer were ever asked about their present exercise participation by their health professionals. Hospital b consistently and significantly did better than the others in advising and encouraging patients to exercise but even here the numbers of patients reporting positively is only around 50%. Patients in Hospital b are significantly younger (mean age =36.8,SD±15) which may be the reason that exercise is mentioned by the health professionals more frequently. From these results, it is not surprising that 69% of respondents would welcome the opportunity to consult a specialist exercise advisor at the normal clinic appointments. It is apparent from these results that exercise education, both the imparting of knowledge and the giving of encouragement, is seriously lacking in the diabetes clinics of four west of Scotland hospitals.

Twenty-eight percent of respondents considered themselves to be regular exercisers or "maintainers" which corresponds closely to the Allied Dunbar National Fitness Survey (1992) where 20-30% of the English population were identified as regular aerobic exercisers. In this National Fitness Survey, 17% were listed as sedentary, whereas a total of 42% insulin dependent diabetics were inactive (contemplators and pre-contemplators). It is likely that a small percentage of people with insulin dependent diabetes will find physical activity either difficult or dangerous due to severe disability from diabetic complications but with recent research showing clearly the connection between cardiovascular disease and physical inactivity, this large sedentary population of IDDMs poses a challenge to those involved in the care and education of diabetics. Yet, 15% of this sedentary group classified themselves as "contemplators" and therefore open to the possibility of becoming active.

All scores on the group motivations scale for contemplators are positive (higher than 7.5) and, along with maintainers, preparers and action categories, are significantly higher ($p<.0001$) than scores recorded by pre-contemplators. Contemplators have the highest score in group Cues and equal highest in group Social motivations. It would seem from these results that this category have a wide base of possible motivations. Since they have the highest Cues motivations, they are more likely than any other category to listen to their doctor and with the correct exercise counselling from their health professionals plus some motivational tactics, there is a good chance that they would start to be physically active.

However, contemplators had significantly higher barriers scores in all group barrier when compared with maintainers and held the highest Mental, Social and Environmental group barrier score of all exercise stages of change categories. The Mental group barrier score reached significance ($p<.0001$) and this would indicate that they are not naturally drawn to physical activity. Although they have stated that they could be motivated to begin exercise in order to gain mental, physical and diabetic benefits, they would need to be guided into a particularly stimulating and interesting programme since they do not see themselves as "sporty types" and lack interest in physical activity. Contemplators and pre-contemplators had significantly higher physical group barriers than the other categories. Contemplators, actors and preparers all had significantly higher Time barriers than the other two categories. Although contemplators are indicating higher group barrier scores than maintainers, the scores are still moderately low on the scale (<7.5) and, therefore, should not prove to be too difficult to overcome.

Pre-contemplators, however, have shown a significantly lower motivational score on all group barriers when compared to all exercise stages of change categories. They show negative scores (<7.5) on group motivations for Mental, Cues, Challenge and Social motivations. Their only positive reasons for exercising would be to gain the group Physical and group Diabetic benefits. Pre-contemplators are the oldest, highest percentage of smokers and have the lowest correct scores for exercise knowledge. Their highest group barrier was the Physical group where they and the contemplators have significantly higher scores than the other categories. They also score themselves as lowest on the good health score. This category probably contains people with the highest incidence of diabetic complications and physical ill health who would find it only possible to exercise at the lowest of intensities. However, the new health promotion message echoes the work of Pate and colleagues (1995) who have shown that small amounts of exercise even at low intensity can provide health benefits.

Ninety-eight percent of the preparers believe that they are in good health though 26% are smokers. They are a category of insulin dependent diabetics who exercise but not on a regular basis and their biggest problem would seem to be the group Time barrier where they recorded the highest score compared to all other categories. Their group motivation scores are similar to maintainers except for group Challenge where their score was lower and similar to action and contemplators. It is likely that with assistance with time management and encouragement for smoking cessation, this category of responders may become maintainers also.

The action category was by far the smallest with only 38 respondents. They were the youngest, most knowledgeable and with the least percentage of smokers. They were more highly motivated than any other category by group Physical, Mental and Diabetic motivations. They shared a significantly low group Physical barrier score with maintainers but had recorded a high score on the group Diabetic and Time barriers along with the contemplator category. Respondents in this category had started regular exercise only within the previous 6 months and these results suggest that in order to maintain these new exercise levels, they would require assistance with time management and coping with the adjustments of insulin, blood glucose testing and carbohydrate intake necessary for safe exercising. Where are they likely to get such assistance? Can they realistically expect that the diabetes education programme within their hospital clinic will provide it? Evidence from this study suggests that this is extremely unlikely. Without such help, this category are likely to find it increasingly difficult to maintain their exercise levels and "drop out" thereby losing both psychological and physical benefits of exercise.

Maintainers had the highest score for the Challenge group motivation. However, the most noticeable fact about this category is that all group barrier scores of maintainers are the lowest or shared lowest when compared with all other categories, except for Environmental. Group Mental barrier score is significantly lower (<.0001) than any other category. The highest group barrier score for maintainers was that of Time but even then the level was only 5.8 which shows that it is not really a problem to this category. Their lowest group barrier was that of the group Diabetic barrier and this was the case for the other physically active categories also (action and preparers). This is one of the most surprising results of this study. The majority of articles written for insulin dependent diabetics contain advice on how to avoid hypoglycaemia and, anecdotally, health professionals are more concerned with this area when considering exercise advice than any other. It would seem from these results that diabetics do not place diabetic barriers first and , like other populations, have more Time and Mental barriers. They are, however, motivated to exercise in order to feel physically and mentally well and to delay or prevent the onset of diabetic complications.

Examining the individual motivations score (fig.4.10.), it is clear that insulin dependent diabetics would be **most** motivated to become regular exercisers if it would prevent them from getting any or as many diabetic complications in the future. They also responded highly to "feel better physically" and to "keep my heart healthy". From the day they are diagnosed as insulin dependent, people with diabetes are made aware that they are under threat of diabetic complications, including cardiovascular disease, unless they keep tight metabolic control. It seems very natural that they would be highly motivated to exercise if, by becoming physically active, their struggle for keeping good health is boosted. However, it is also interesting to note that they also rate "To have fun"; "to feel better mentally" and "to feel good about myself" as being of great importance in their lives also. This latter point serves as a reminder that diabetic patients are still **people**, with similar needs, ambitions and problems as non diabetic people.

Considering individual motivations again, it is interesting to note that few respondents would be motivated to exercise because "the doctor told me to". This poses an important question about diabetes education and the doctor/patient relationship. More IDDMs would be motivated to exercise if the British Diabetic Association recommended it than if their own doctor did! Do doctors, in fact, realise this fact and could that be the reason that less than 50% of respondents reported that exercise advice had been given by their health professionals? Or do patients have a particularly rebellious streak towards advice from their doctors because they do not impart advice that is perceived as helpful to them, including exercise advice? Literature reviewed earlier in chapter 2 revealed a study where in 70% of consultations under examination, doctors interrupted patients within 18 seconds of their beginning to speak (Beckman and Frankel, 1984). Coles (1990) noted that doctors tend to tell patients what they assume the patient needs to know in order to become a well controlled diabetic and Gamasu and Bradley (1987) showed that attributions of patients and doctors about good control are frequently very different. Gamasu and Bradley (1987) stated that if doctors and patients hold inappropriate causal attributions about diabetes managemnet, patients are likely to ignore what the doctors say. Whatever the answer, the problem remains that insulin dependent diabetic people do need advice, knowledge and encouragement if they are to become regular exercisers and, at present, very few are receiving such support from their clinics.

Recent literature has suggested that both barriers and motivations may be different for males and females and may change as a person ages (Biddle and Mutrie,1991). Results of this study show that there were no significant differences in barriers for males and females except for the group barrier of Mental where the males scored significantly lower. In this population, the males were more interested in exercise and considered themselves to be less lazy and more of a sporty type than did the females. Males also scored significantly higher than females on the group motivation of Challenge. This corresponds to male motivation in other populations (Ashford and Biddle, 1990).

The older (>35 years old) IDDMs found the group Physical barrier to be significantly more of a problem than the younger IDDMs. The younger ones had significantly higher group Time, Mental and Environmental barriers. As mentioned earlier, it is probable that the older IDDMs have some diabetic complications which would present physical difficulties for exercise. The younger diabetics may have problems with time due to beginning a career or course of study and /or raising a young family. However, linking in all three group barriers, it could be that the younger population prefer to put other hobbies first and have too much to do (Time group barriers); do not have any interest in exercise or do not see themselves as sporty types (Mental group barriers); do not wish to spend any money on exercising and do not make the effort to travel to facilities if they are not nearby (Environmental group barriers). This seems unlikely when motivations are considered. The younger diabetics show significantly higher motivation scores for every group motivation and their motivation scores are all positive (>7.5) on the group motivation scale. So it would seem that this younger population's barriers are not due to lack of interest in exercise.

4.6. Conclusions

This study was devised as a follow up of Study 1 where several questions had been left unanswered. These questions were listed in the Introduction and due to the high return rate of the Exercise and Diabetes Questionnaire and many personal letters received, they can be answered with some confidence that they are the views of the majority of the insulin dependent population. 27% of registered insulin dependent diabetics failed to respond, however, so there still remains a degree of caution in generalising these results.

The quest to discover how many IDDMs are in each stages of change for exercise (Question a) was raised due to a lack of any data on exercising or sedentary IDDMs. The British Diabetic Association often includes article about exercise in their literature but was unable to provide any data on how many insulin dependent diabetics actually take their advice. This study shows that 28% of respondents exercise regularly with a further 4% who had just become regular exercisers within the last 6 months; 26% exercise but not regularly; 15% are thinking about starting and 27% have no intentions of starting.

Whether IDDMs have adequate knowledge to exercise safely (Question b) is not a simple question to answer and the results of this study have revealed some worrying areas of lack of knowledge. Most respondents knew how to avoid hypoglycaemia in exercise but few understood the hyperglycaemic possibilities and only half of the respondents understood the importance in blood glucose testing for several hours post exercise. Only 30% of respondents could remember their hospital clinics giving advice on how to exercise safely. It would seem fair to conclude that the majority of insulin dependent diabetics do not have adequate knowledge to exercise safely.

The third research question set at the beginning of this study was directly linked to the specific exercise education given by the four participant hospital diabetes clinics. Patients' characteristics across the four hospital clinics were very similar except for age. Hospital b patients had a significantly younger mean age than the others. The youngest clinic population consistently recorded significantly higher scores for advice, encouragement and information on safe exercise when compared with the other three clinics. However, only half of the respondents in the best clinic remember receiving adequate exercise education. Patients' perceptions of their hospital diabetes clinics' exercise education is very poor. It is now necessary to find out the perceptions of the health professionals in the area of exercise education in order to obtain a balanced picture.

Question (d) can be answered simply by studying figure 4.8. and concluding that lack of energy, lack of time and having too much to do are the main barriers for preventing insulin dependent diabetics in this sample from exercising as much as they would like. However, by grouping individual barriers into six groups and examining each group for effects of exercise stages of change category, sex and age, it can be seen that barriers change in importance for different sets of people. Males and females show few differences in barriers whereas respondents over 35 years of age hold very different barriers from younger people. This study also has shown that those respondents who are maintainers have much lower scores on all barriers which is probably the most powerful reason that they have maintained their exercise levels for so long. A future research question should be that of finding out how these maintainers succeeded in overcoming their barriers. By using one way analysis of variance for exercise stages of change on group barriers, it is easy to identify the most problematic areas encountered by those who have not yet attained regular exercise levels. Theoretically, if the appropriate assistance could be given to overcome stated areas of difficulty, exercise levels could be increased and maintained. Results suggest that this assistance is unlikely to be given at the diabetes clinic unless a major change occurs in the accepted Scottish diabetes education programme. Anecdotally, health professionals and journals written for diabetic patients, emphasise ways of preventing hypoglycaemia as they believe this to be the biggest barrier held by IDDMS. But fear of a hypoglycaemic event was, in fact, listed as being one of the least important barriers. But hospital clinics must move on from believing that advice on avoiding hypoglycaemia is the only routine piece of information necessary to give because 42% of IDDMs remain physically inactive.

The final research problem, Question (e), was tackled in a similar manner as Question (d). The main individual motivations for exercising regularly was clearly to maintain physical good health and eliminating the possibility of developing diabetic complications. Secondly, this population showed a desire to have a good quality of life i.e. to have fun and to feel mentally well. As with the barriers analysis, the younger v. older age grouping had a much bigger effect on group motivations (younger age motivations significantly higher for all group motivations) than did sex differences. The pre-contemplators showed a consistently significant lower motivation score for all group motivations when compared with all other categories which would largely explain their inactivity. Compared with the preventing future complications, the other "diabetic" motivations ranked only as moderately important.

4.7. Future directions

Forty-two percent of people with insulin dependent diabetes in this study are inactive. Strenuous effort must be applied to finding ways of helping those who are physically able to begin to be physically active in order to protect their already compromised health status.

This study has also shown that the majority of insulin dependent diabetics do not perceive that they are receiving adequate information, advice or encouragement in their diabetes education programmes to either begin or maintain exercise levels. It is important to test the respondents' perceptions by questioning the health professionals. Only when this has been completed, can problem solving be attempted.

CHAPTER 5

Health Professionals Speak Out

5.1 Introduction and Background

Study 1 and Study 2 had resulted in a great deal of communication with patients who had insulin dependent diabetes. The Exercise and Diabetes Questionnaire used in Study 2 revealed the perceptions of 1,035 of such patients towards their diabetes clinics and the knowledge, support or encouragement given by these clinics with reference to exercise. The health professionals staffing these clinics had not yet been consulted about **their** perceptions and views. It was now necessary to present an opportunity for the diabetes health professionals to speak out.

(The diabetic "team" in west of Scotland Hospitals usually consist of a Consultant diabetologist, usually at least one other doctor, at least one specialist diabetes liaison sister, a dietitian and a chiropodist. A patient attending a hospital clinic will see a doctor, chiropodist, specialist nurse and a dietitian, when required, once a year for an annual check up. At other visits, the patient will see some, but not all, of the team unless the consultant states otherwise).

The information required from the Health Professionals centred around the following: Does each member of the diabetes care team:-

a) believe exercise is important for IDDMs?

b) know why exercise may be important for IDDMs?

c) encourage the patients to exercise?

d) educate the patients to exercise safely?

e) understand the physical and psychological benefits of exercise?

f) actively exercise him/herself?

g) consider her/himself to be well resourced with educational packs, posters or an exercise adviser.

In order to find the most suitable method of obtaining the facts, views, perceptions and feelings from the diabetes care team, a literature review of research methodology was undertaken. The following issues were identified as being pertinent to this study:-

*The health professionals were all under tremendous time constraints due to their heavy caseloads.

*Their professional status should be safeguarded so that they would not feel compromised or threatened by any answers they may give.

*The total number of Health Professionals involved with these four Diabetes Clinics was relatively small (around 26).

*They work as a team and have regular team meetings once per week.

5.2. Review of Literature

5.2.1. Qualitative and Quantitative Research Methods.

Quantitative methods have been used for many years in medicine, social science and physical education research to give a numerical indication of a sample response or to measure specific reactions in an experimental study. Qualitative methods have been used traditionally to discover in-depth opinions, views and perceptions and to study situations as a whole, seeking to examine how components affect each other in order to produce this whole. The tendency in quantitative research is to take things apart and examine each part separately whilst trying to control the other parts or variables. Thomas and Nelson (1990) have summarised the main differences between the two methodologies in the following table 5.0.

Table 5.0. Characteristics of Qualitative and Quantitative Research

Point of comparison	Qualitative research	Quantitative research
Focus of research	Quality (nature, essence)	Quantity (how much, how many)
Philosophical roots	Phenomenology, symbolic interaction	Positivism, logical empiricism
Associated phrases	Fieldwork, ethnographic, naturalistic, grounded, subjective	Experimental, empirical, statistical
Goals of investigation	Understanding, description discovery, hypothesis generating	prediction, control, description, confirmation, hypothesis testing
Design characteristics	Flexible, evolving, emergent	Predetermined, structured
Setting	Natural, Familiar	Unfamiliar, artificial
Sample	Small, non random, theoretical	Large, random, representative
Data collection instruments	Researcher as primary instrument, interviews, observations	Inanimate (scales, tests, surveys, questionnaires, computer
Mode of analysis	Inductive (by researcher)	Deductive (by statistical methods)
Findings	Comprehensive, holistic expansive	Precise, narrow reductionist

From Thomas, J. R. , Nelson, J. K. (1990). Research Methods in Physical Activity, p.323.

It is clear from this table that each method has strengths and weaknesses depending on the type of study that is being undertaken. Basically, it is important to identify exactly what information the researcher wishes to know about the problem under examination. In this study, the information required is that relating to points (a) to (g) identified in 5.1. If the study involved the concepts of qualitative and descriptive opinions and the numbers involved were very small, it would appear that qualitative methods would best provide the information needed. However, there are several contentious issues to consider before proceeding with qualitative methodology. Merriam (1988) highlighted the differences of opinion about reliability and validity that quantitative and qualitative research expounds. In quantitative or experimental research, reliability and validity are accounted for **before** the study begins. In a qualitative study, however, reality is:-

> "...assumed to be holistic, multidimensional and ever changing rather than a fixed objective phenomenon waiting to be discovered". Thomas and Nelson (1990) page 338

As the concept of reality in qualitative and quantitative research is different, so there needs to be an acceptance that validity and reliability in qualitative research are based on different assumptions (Kirk and Miller, 1986). Krueger (1988) admitted that a cynic may believe that nothing is valid. Any measure of human beings can be distorted intentionally or unintentionally as people are not always honest or willing to give all the information required. LaPiere as long ago as 1934 recognised the quandary about validity and reliability and Krueger (1988) quotes from his writings:-

> "Quantitative measures are quantitatively accurate qualitative evaluations are always subject to the errors of human judgment. Yet it would seem far more worthwhile to make a shrewd guess regarding that which is essential than to accurately measure that which is likely to be irrelevant" (p. 237)

Thomas and Nelson (1990) refer to these problems as Type 3 error (solving the wrong problem) and Type 4 error (solving a problem not worth solving). Merriam (1988) has suggested several strategies which may be employed to aid internal validity. He believes that triangulation or using more than one source of data collection, should be tried. This is not necessarily a simple process as it is important to check on the relationships of the different kinds of data so that errors are not magnified. Krueger (1988) similarly suggested that there are benefits of combining even quantitative and qualitative procedures for strengthening the research design. Merriam's (1988) subsequent strategies involved the researcher's checking with the subjects that his/her interpretations were correct and also that the researcher's peers should be enlisted to examine subjective evaluations. Finally, he felt that it would add to the validity of a study if data could be collected over a long term with repeated observations and that participants be involved in all phases of the study. With regard to external validity, Locke (1989) emphasised that most readers of research can recognise which situations or findings are applicable to their own situations and that this is not an inferior measure of external validity.

Differences in analysis of qualitative and quantitative data are often quite marked. Table 5.0. succinctly states that qualitative analysis is inductive while quantitative data analysis is deductive. Quantitative research protocol demands that an hypothesis is stated **before** the experiment or study begins. Results will hopefully prove or disprove the hypothesis which will either be rejected or accepted. Qualitative research normally develops an hypothesis **as a result of** data collected in the study. Analysis in qualitative studies is dependent on the nature and purpose of the investigation but generally involves sorting and analysing data **during** collection, analysis and categorisation, interpretation and theory construction (Thomas and Nelson, 1990). However, qualitative data may also lend itself to analysis by quantitative means from time to time (eg. frequency counts of certain ideas, words etc.)

The most commonly used qualitative research methods used in social science and physical education settings are participant observation, case studies, individual interviews or group interviews. In this particular study, the researcher sought to obtain an understanding of what the Health Professionals felt about regular exercise both for their patients and themselves; whether they believed it to be an important part of diabetes care; how much priority it was given in diabetes education; whether the professionals actually had the knowledge and resources to promote exercise with their patients. Given that lack of time was a premium with all members of the team, it was logical to consider some type of group interview which would focus precisely on their beliefs about exercise.

5.2.2. Group interviews

Watts and Ebbutt (1987) accepted the definition of an interview as :-

> "...a conversation initiated by an interviewer for the specific purpose of obtaining research relevant information and focused by him/her on content specified by research objectives" (p.25)

They had discovered that group interviews could be condensed into two types:- those in which the interviewer kept tight control of the discussion and that each participant answered directly to the interviewer in turn; those in which the interviewer acted only as a facilitator to guide the discussion whenever it went off track. In the former, the interview represented a series of individual interviews, albeit all participants were in the room at the same time. In the latter, the participants spoke to **each other** most of the time and to the interviewer occasionally. Krueger (1988) and Morgan (1988) refer to these types of group interview as "focus groups".

5.2.3. Focus Groups

Kitzinger (1994) elaborates on the methodology of focus groups and underlines the fact that they are distinguished from the broader category of group interviews by their explicit use of group interaction. Whilst accepting that group discussions have been widely used for the past 20 years to collect data, she strongly asserts that they have not been systematically developed as a research technique and are rarely acknowledged as part of a process.

As in any other research tool, there are strengths and weakness. Morgan (1988) views focus groups as somewhere in between participant observation and individual interviewing. He believes that they have neither the strengths nor the weaknesses of these two methods and that they are more flexible than either. They are flexible in that they can stand alone or be used as follow-up research to clarify findings from other data. They are:-

> " useful when it comes to investigating what participants think but they excel at uncovering why participants think as they do" (p28)

Table 5.1. summarises advantages and limitations of focus groups as perceived by Krueger (1988). His opinion of the usefulness of this method coincides closely with that of Stewart and Shamdasani (1990) in that the validity of data gathered by this method depends on whether participants feel comfortable about openly communicating their ideas, views and beliefs.

Table 5.1. Advantages and limitations of focus group interviews

Advantages	Limitations
They are socially-oriented	Data are difficult to analyse
Capture real life data	Interviewer/moderator requires specialist skills
They have flexibility	Discussion must be conducted in a conductive/natural comfortable environment
They have high face-validity	Groups may be difficult to assemble
They present speedy results	Interviewer/moderator has little control over discussion
They are both cost and time effective	

Kitzinger (1994), maintaining her stance that interaction between participants must be maximised, has written some guidelines for running a focus group session. Preparation should include arranging the physical environment, considering the homogeneity, or otherwise, of the participants, whether the group know each other and whether to include 'ice-breaker' exercises at the beginning of the meeting to help the participants relax. However, she stresses that the most important factors lie in the facilitator's ability and willingness to **listen** to the participants, to allow them to speak in their own style of language (be it loose words, jokes, anecdotes or even swearing). As well as tapping into a depth of understanding not normally reached by one-to-one interview situations, focus groups bring out what are held by a particular group as norms. Participants' assumptions are often challenged by each other and observations may be made on the factors which are successful in changing minds in a particular group. The other side of focus group interaction is sometimes seen when the group taps into certain criticisms and the session may deteriorate into a communal moan.

Krueger (1988) has suggested that a focus group should consist of between four and twelve participants. The notion of whether participants know each other or whether they are strangers should be dependent on the aim of the study. The disadvantages of participants knowing each other could be an unwillingness to disclose personal information and that there may be some "historical" issue which affects the relationships within a particular group. He also reminded researchers that focus groups do not try to reach a consensus, provide recommendations or solve problems although understandings gleaned from an analysis of a focus group interview may indeed help to begin the process of any of these issues.

Analysis and interpretation of focus group data must be as rigorous as data generated by any other method. Krueger (1988) pointed out that qualitative analysis is often accused of being what the researcher wants it to be and may be twisted to support the researcher's pet hypothesis. Analysis of numbers seems much more "scientific". But he showed that the reduction of an opinion in a survey to a number which then becomes a symbol of reality will also have inherent flaws in communication.

> "This does not mean that we should abandon statistical analysis, but rather we should recognise inherent assumptions and treat all data that measure human experience with adequate humility"
>
> Krueger (1988) page 108

Focus group analysis is essentially determined by the purpose for which the data was collected and each of the referenced writers frequently remind researchers to return to the aim of their interview during analysis to avoid getting swamped with an overwhelming amount of information. Morgan (1988) has set out clear strategies for analysis. He states that there are two ways to analyse focus group material. The first is qualitative or ethnographic and the second is via systematic coding using content analysis. It is possible to analyse using a combination of both methods and thereby gaining a special strength or balance. He suggested using one or two groups' analyses as pilot analysis to generate an hypothesis and coding scheme so that further groups are analysed against these standards. A further strategy may be that of using a second analyst and a comparison made of both analyses.

The use of a questioning guide will help the analyst to see topic areas but if the focus group was conducted liberally without a guide, then topic areas will have to be determined from the transcripts. Morgan (1988), Krueger (1988) and Stewart and Shamdasani (1990) have all suggested the use of colour coding topic areas, cutting and pasting or the use of a computer programme to aid in sorting and organising areas.

Interpretation of organised material in reporting the analysis is very dependent on the skill of the researcher. Krueger (1988) pointed out that interpretation must take into account evidence beyond words on a transcript. It should note participants' intensity of feeling, specific examples they give and how consistent they are in their opinions. Honesty in interpreting and reporting may be achieved by the researcher's analysis being systematic and verifiable. He concluded his advice by warning researcher to stay clear of "hunches" and to report what the respondents are really trying to say.

5.3 Method

The Diabetes Consultants of the Diabetes Clinics of Ayr, Crosshouse, Royal Alexandria Paisley and Gartnaval Glasgow Hospitals were contacted. A request was made by the researcher that she meet with the Diabetes Team together for a focus group interview lasting approximately 60 minutes. The interview would be taped but identities of the team members would remain confidential and no names would be printed in the transcripts. An interview guide would be constructed but would not be given to the participants before the meeting. Interviews would take place in an area suitable and convenient for the Health Professionals.

5.3.1. Construction of an interview schedule

Each diabetes team indicated that they would only be free for a 30 minute period for interview. It was necessary, therefore, to present a very focused interview session which would not be threatening to the team. It would be important to get the team relaxed as soon as possible, to ask questions which would be interesting to all team members and to encourage them to discuss freely with one another their opinions. The following schedule of questions was drawn up to be used in a semi structured way:-

"1)This is the definition of exercisers as used in the Exercise and Diabetes Questionnaire

> **"REGULAR AEROBIC EXERCISERS ARE THOSE WHO EXERCISE AT LEAST THREE TIMES A WEEK FOR NO LESS THAN 20 MINUTES SO THAT THEY ARE SLIGHTLY OUT OF BREATH. THE EXERCISE IS USUALLY EITHER BRISK WALKING, SWIMMING, CYCLING, JOGGING, KEEP FIT, CANOEING, FOOTBALL OR OTHER RUNNING GAMES".**

28% of IDDMS exercise regularly according to the results of the Questionnaire. Is this the figure you would have expected or is it a surprise to you

2) What kinds of benefits,if any, do you think IDDMs would reap from exercising regularly? Might there be problems too?

3) Have you any suggestions how to improve the number of IDDMs who exercise?

4) What kinds of resources in the exercise area e.g. posters, packs, classes etc. would you like to see in your diabetes centre?

5) Do you think that the research community should be spending more time and money on finding out if exercise does have important benefits or do you think other things are far more important? (such as?)

6) Would you, with a newly diagnosed diabetic, wait a few months before giving exercise advice or would you wait until s/he asks?

7) What kind of exercise advice do you think it is best to give?

8) Do you use a booklet to illustrate your advice? If so, what is it called?

9) Is exercise an important part of your lifestyle? (if so, why? if not, what are the main barriers for you?"

5.3.2.Procedure

The interview schedule was presented to a group of health professionals not involved in this study and their comments were evaluated. The only change necessary was to omit the introduction section at the beginning as the group felt somewhat exposed by giving their names while the tape recorder was recording. It was clear, however, that a time period of only 30 minutes did not allow for a true focus group interaction but it did allow enough time for the collection of information required for the aims of this the study.

Each interview was carried out in familiar surroundings to participants. Seating was arranged so that each respondent could easily see all other respondents. The tape recorder was set on a table to the side of the group and was not the focus of attention. Immediately following the focus group interview, the researcher made notes on non-verbal signals, emphasis on certain themes, changing minds and any further significant behaviours. These notes have been condensed into a Report. The Report on each interview can be found in the appendices. Several days were allowed to elapse before the next focus group meeting so that clarity in transcription was maximised. Audio-tapes were transcribed immediately following each interview and before the next interview . Data was analysed using a second analyst working with the same analysis criteria as the researcher. This criteria involved frequency counts for main factors and organisation of information around the specific question areas.

5.4 Results

The consultant of Hospital a refused to be tape-recorded and so he was interviewed separately. His responses were recorded by hand after the interview . The transcript and the Report can be found in Appendix 17. The rest of the Health Professionals of Hospital a (two nurses, one chiropodist and one dietitian) agreed to be tape-recorded and their responses were transcribed and can be found in Appendix 18 with the Report of the interview. The total number of health professionals interviewed in this clinic was five and for the purpose of organising information around the specific question areas, the consultant's views were included as being part of this clinic's viewpoint.

Hospital b (Consultant, four doctors, two nurses and one chiropodist) were interviewed on a diabetes clinic day and three members of the group (Consultant, one doctor and one nurse) were called away before the end of the interview. The total number in the group at the beginning of the interview was seven. The transcript and the Report of the session can be found in Appendix 19.

The consultant of Hospital c was on holiday during the appointed focus group interview and the interview was conducted in his absence with seven of the diabetes team (three doctors, two nurses and two dietitians). The transcript and Report can be found in Appendix 20.

Four members (which represented a full complement at this time) of the diabetes team of Hospital d (Consultant, nurse, doctor and chiropodist) were present for the focus group interview. The transcript and Report are in Appendix 21.

Analysis was conducted using the method suggested by Morgan (1988) which combines both the qualitative and content analysis methods. Results are presented under two headings. Firstly, the topics of interest are centred on the question schedule and all responses from the four clinics relating to each question were cut and pasted and merged around each specific question. Secondly, any other points of interest which arose during the sessions have also been presented.

5.4.1. Responses to Question Schedule

a) Question 1

"28% of IDDMS exercise regularly according to the results of the Questionnaire. Is this the figure you would have expected or is it a surprise to you?"

Only three respondents out of 23 taking part in the sessions thought initially that it was possible that 28% of their patients exercised regularly. However, they also changed their minds when they realised that the survey did not involve **just** young people. Everyone else believed this number to be too high and some respondents felt strongly about it.

> "They're fibbing! 28% do not exercise. I think it's less and I think they've answered in the way they think we want them to. I don't believe it's anywhere near as high as that"
>
> " When I ask patients if they exercise, very few say they do. They usually have some excuse like "oh, my leg is sore" (laughter)
>
> "Yes, it's surprising what they can think up"

Several respondents were concerned to know whether the survey respondents were only in the young age group and made it quite clear that, in their mind exercise was something young people only do. I prompted these groups by reminding them that walking was also exercise but this did not seem to change their minds that age was an important factor, as can be seen by the following comments:-

> " That's a much higher figure than I would have expected. I would guess that only 5% exercise regularly. For instance, we took a group of teenagers to Barcaple and they cut their insulin by half but they kept eating non-stop and just had all the signs of non exercisers. So if **they** don't exercise and they're just young, why should we expect the others to?"

> "......it would be different if it were just the young insulin dependents, but...well... a third's quite high.."

> "..we get some, usually the younger ones, who are quite keen"

One respondent compared his patients with a non-diabetic population and his response shows a much lower expectation for diabetics to take on board exercise:-

> "I don't think 28% of the population exercise on a regular basis and I think diabetics would exercise even less".

The respondents were very much of one mind about this subject. They did not believe that the insulin dependent diabetics responding to the Exercise and Diabetes Questionnaire had answered truthfully. No one could accept that 28% were regular exercisers.

b) Question 2

"What kind of benefits, if any, do you think that IDDMS would reap from exercising regularly? Might there be problems too?"

Benefits mentioned by respondents were categorised into five types: improving cardiovascular health ; diabetic control; weight loss; feelings of well-being; feelings of "being normal". Benefits relating to improving cardiovascular health were mentioned a total of eight times as was feelings of improved well-being. Reference to the use of exercise in improving diabetic control was noted seven times, even though research studies to date have been unable to verify the truth of this theory. Weight loss as the result of exercise was mentioned four times and two respondents felt that being able to exercise regularly helped their patients socially in destigmatizing diabetes.

"It's important as a whole package along with diet and insulin regime"

"We generally need to exercise more....I guess diabetics...are a high risk category."

"...so if they modify their lifestyle a little bit, they get significant benefits. And the west of Scotland has such an awful heart problem anyway, if you can stem the tide in a minute number of cases, then it's worth doing."

" It's not just...I think a lot of people exercise and they feel better. It's their endorphins levels. I've no doubt you don't have to be a fully trained athlete but when you exercise regularly, you do feel better and it carries over, not just at the time. I think diabetes is a miserable enough condition to have that if we can do **anything** to make them feel better..."

There was also concern about diabetics exercising, or rather over-exercising. But some of these concerns were clearly linked to the type of exercise, which was **not** that described in the definition given to all respondents at the start of their interview.

" Some do martial arts"
" And the body builders"
"Oh yes, the body builders"(laughter)
"In our clinic there are a large number of young men who are body builders and I don't think that group would have good control and I worry about hypertension"

" But there are one or two I can think of who are completely obsessed

by it (exercise)"
"They're a bit loopy"
"You mean the luney ones?'
"Exercise has gone beyond the bounds of rational behaviour".

Besides the concerns about the "5-10% who over-exercise", every respondent interviewed wished that more of their patients were sensible exercisers as they believed the benefits of regular exercise were important .

c) Question 3
" Have you any suggestions how to improve the number of IDDMS who exercise?"

The answers reflected that this was a question that they really had not seriously addressed in their thinking about diabetes education and care. If a patient was already exercising, information to prevent hypoglycemic episodes was given in the early stages of diabetes education but two nurses indicated that it was rarely an area that was included in update information. If a patient was not already exercising, no encouragement or support was routinely given to encourage exercise as the general belief was that an insulin dependent patient had enough lifestyle changes with which to cope without thinking about exercise. Exercise was "bottom of the pile".

> " I don't think we can expect them to take on board exercise when they have to change so much else.....It's low down on the list if you like"

In fact, it was so low down on the list that one respondent felt that by introducing the concept of regular exercise:-

> " ...then they don't do the important bits"

Exercise was clearly not considered as one of the "important bits" by the majority of respondents. Insulin and diet were always mentioned first.

However, after some time of discussing exercise with others in their own group, they began to identify the problems and to suggest some ways in which these may be overcome. One of the most frequently voiced comments was that diabetics must never be told that they **have** to exercise. The aversion to forcing their patients to exercise was noted eight times. Clinic 2 showed particularly strong feelings about being forced.

> "But people should be doing exercise because they want to do it, not because they're forced"
> "No not if you've got to"
> "There are some places... in the States... where they have to...to go through this exercise programme which must cause more stress.."
> "That lets me out...I just wouldn't be there.."

Positive suggestions were setting up a specialised class, like in cardiac rehabilitation classes (seven references); giving out more leaflets (one reference); using special motivation techniques (four references); employing an exercise specialist advisor (six references); adding exercise counselling into the regular clinic consultation (seven references).

Lack of time was often cited as a reason for not thinking about exercise in regular clinic visits but one dietitian believed that exercise had fallen by the wayside due to lack of ownership:-

> "..there isn't anyone who actually has the responsibility for exercise. We have the nurses, the chiropodist, the dietitians but while we all mention exercise, no one is responsible for it"

> "... if only we could refer them to someone..."
> "Yes, some specific person and then tell them to make an appointment with this person....that might work"

Comments within the focus groups sessions were often tinged with humour as portrayed by one doctor's suggestion for an exercise advisor:-

> "We could have Mr. Motivator in the corner"

Most Health Professionals stated that they did not feel they had enough time to give adequate exercise counselling to their patients, though one consultant came to the conclusion that :-

> "Maybe we should be including it when we talk about things in the clinic. Previously, the Joslin's triad in America included exercise. Maybe we've forgotten about exercise. Everyone's forgotten about exercise, partly because it's harder to do"

The final comment from one consultant showed that ignorance about diabetes and ignorance about exercise is still a concern in the medical world:-

> "...a lot of them get told that they have to give up sports when they are diagnosed. If you look at instructional things they often say "before you take up...........check with your doctor"..well, that puts them off straightaway. We had a young chap who played for the local rugby club who was devastated when he came to see us because his own GP had told him that now he was a diabetic, he'd have to give up the rugby. He said he could still play cricket but not rugby! We told him it just wasn't true. They still get told such stupid things by their GPs. There isn't any education input for the GPs. It used to be as bad in the hospitals but now we have people who are interested in diabetes and receive some training in it".

d) Question 4
"What kind of resources in the exercise area would you like to see in your diabetes centre?"

This would seem to be a very straightforward question with almost everyone agreeing that they did not have up-to-date and interesting resources on exercise. However, one clinic felt they were well resourced:-

> "I think we have enough leaflets..the drug companies usually have some"
> "And we've just put together our own pack with some information on

exercise in it"

However, the consultant of the same clinic, who was being interviewed separately from his staff as he refused to be tape-recorded, believed that they were totally under-resourced as they:-

> "....don't have any"

Every respondent in the other three clinics said that time was the biggest barrier in using the few resources they had and that they saw the answer as having someone whose remit was to educate about exercise:-

> "We don't have the time, of course.....ideas...but we do need more bodies if we are to put ideas into practice. We need more bodies"

> "We don't even have time to give them (information packs) to the diabetics"

After several minutes discussing the problem of not having time themselves and wishing there was an exercise advisor to do the educating, one clinic reflected on their information rack in their clinic and realised that, in fact, it does empty regularly and therefore, the patients must be interested in reading the few leaflets that they do display. One of the doctors in this clinic felt quite strongly about putting across a positive message:-

> "It would be useful to have a poster up as well...of you know, positive things...pushing..you know, pushing exercise. So often when people come to the clinic they see negative posters.... "No Smoking if you're diabetic...." etc."

Two clinics also came up with the idea that it would be helpful for their patients if they were able to be more specific about giving local information on classes, leisure centres, special sporting events etc.

e) Question 5

"Do you think that the research community should be spending more time and money on finding out if exercise does have important benefits or do you think other thing are far more important? (such as?)"

All 23 respondents acknowledged that research in exercise and diabetes was sadly lacking. Six respondents stated that it would be much more powerful in promoting physical activity/exercise if :-

> "...we KNEW that the research did "prove" that exercise helped their cardiovascular system because we could then tell them that it definitely does and that it might improve their chances of staying healthy."

A doctor in another clinic showed the same lack of understanding about present day exercise research among non-diabetic populations and the ability of exercise to decrease cardiovascular incidents:-

> "I think other things are more important. I think it's not the number one priority for diabetic research. The number one priority should be cardiovascular deaths...we are getting better to stop patients from going blind or having renal failure and better at stopping them losing their feet. We're picking up a lot of foot problems here but we're not stopping them from dying from cardiovascular disease. Just now we're looking at intervention in cholesterol and blood pressure. If exercise were to be beneficial there, it would be nice to know."

The fact that taking on exercise does not show immediate results and the difficulty in maintaining regular exercise was also raised. Three respondents felt that research into intervention and motivation techniques would need to go alongside any research into physiological and psychological effects of exercise with diabetics. A further respondent stated the sense in pursuing exercise research as "exercise is cheap".

f) Question 6

" Would you with a newly- diagnosed diabetic, wait a few months before giving exercise advice or would you wait until s/he asks?"

All but two respondents said that they ask a newly- diagnosed diabetic straightaway whether they exercised or not before diagnosis. The other two said that they ask within the first few weeks, once the patient has absorbed information about insulin and diet. All respondents felt it was important to encourage an already exercising patient to continue exercising and to dispel any fears they may have of having to give it up. Most information at this point would be to do with insulin action and how to prevent hypoglycemic episodes. All respondents were very much in agreement about their procedure with already exercising patients. The differences of procedure appeared to be in support or encouragement of non-exercising patients to begin to exercise. This kind of support was haphazard and was only given on a regular basis by three health professionals when they had time. One nurse expressed her concern at trying to point out to her newly-diagnosed patients that walking, gardening and many household and vocational tasks involved exercise and that the individuals must recognise that s/he may need to adjust carbohydrate and insulin levels in these situations. She pointed out that the word "exercise" has very restrictive connotations in peoples' minds.

> "I say 'Do you go out walks with the dog? Do you go round the shopping centre?etc...' That's a form of exercise if you go out a long walk with the dog you might not realise just how long you have been walking and your insulin is acting. They might not think they are exercising but they are to a degree....Some people think when you say 'exercise' you mean jogging, aerobics or whatever..."

g) Question 7

"What kind of exercise advice do you think it is best to give?"

All respondents stated repeatedly that each patient was an individual and should be treated as such when giving exercise advice. Avoiding hypoglycemia was mentioned six times as the health professionals perceived this to be the patient's biggest fear. It was sometimes difficult to glean specific information about the appropriate blood glucose level that a would-be exerciser should strive for before exercise and the general consensus was that any patient starting exercise with blood glucose less than 6 mmol/l would run into hypoglycemia before the end of the exercise period. One consultant believed that a starting level should be between 9 and 10 mmol/l but almost everyone agreed with the sentiments expressed in the following quotation from a nurse:-

> " I would ask them to do a lot of blood testing, like before, during if possible and after. But it's very experimental and everybody is different and that depends on the type of exercise......we emphasise that everyone is different and they are going to have to work quite hard at.....finding out for themselves, yes....but with our support"

Seven respondents mentioned the importance of blood glucose testing several hours after exercising to check that the exercise effect was not causing glucose to plummet towards hypoglycemia. The dietitians all mentioned not increasing carbohydrate before exercise if weight reduction was an issue and a chiropodist mentioned the importance of shoes at the outset of an exercise programme.:-

> " I'm trying to guess at where the person is in their life. I would look at the shoes they've come to the clinic in and talk about other shoes they wear for different activities in their lives. Time, or lack of it, is a problem though in any clinic consultation"

Not one respondent mentioned the spiralling effect on blood glucose of beginning an exercise session with a very high blood glucose level in an attempt to bring it down. Two nurses realised after prompting that this may be an important omission in exercise education:-

> "Hmm, I think that actually it seems that **very** few people know about the fact that it can go up"

Two consultants did not seem to think this hyperglycemic reaction was of great significance and one held up Gary Mabbut as a role model!

> " We don't give them an upper limit or advise them not to exercise if its above a certain limit. Look at Gary Mabbut who says he would never go onto the pitch with one lower than 20mmol/l."

h) Question 8
"Do you use a booklet to illustrate your advice?"

Only one respondent did not think his clinic had any booklets but this was disputed by his staff in a separate interview. All other 22 staff said they had an "Ames" booklet and seven others also use a "Flora" booklet. However, no one felt that these booklets were quite what the patients wanted or needed. One consultant put it clearly:-

> "We're aware of the deficiencies but to find the time to redesign the booklet...it would be nice to do...I know some places do it if there's one thing they feel strongly about. There are deficiencies...the language is too middle class..... Oxford style language; patients don't usually read like that. It needs to be in 'Daily Record' language, something that's easy to read".

One of the chiropodists mentioned that he had tried to find literature on exercise for some of the flexibility work he does with his patients but that the literature search had drawn a blank. The general feeling was that they "get by" on what they have but it is inadequate.

i) Question 9
"Is exercise an important part of your lifestyle? If so, why? If not, what are the main barriers for you?"

Only five respondents out of 23 said they did not exercise because they did not like it and one did not exercise because of lack of time. Seventeen respondents (74%) said that they did exercise regularly and yet earlier in the interviews, they found it very difficult to believe that 28% of their patients did. Every Health Professional expressed an understanding that they should exercise and the specific effects reported were:-

> "It gets rid of stress"
> "I feel less tired afterwards"
> "I don't have the well-being if I don't...I feel irritable and grumpy"
> "Keeps the weight down"
> "Gets rid of hospital things"
> "It's for fitness. A sense of well-being and certainly in terms of an escape. I cycle to and from work.....by the time I get home in an hour a lot of the things in your head at the start, they're gone".

5.4.2. Additional points of interest

a) Understanding of the term "exercise"

16 Health Professionals interviewed consistently spoke about exercise as an activity of high intensity or weight lifting and body building. Only three nurses, one dietitian and one chiropodist mentioned low intensity exercise as being valuable. One young man was laughed at by mentioning golf......."Golf's not exercise!" interjected an older colleague. They also spoke about it being something one did at a specific time for a length of between 20 minutes and one hour. Only one nurse and one dietitian considered the value of everyday activity like running up and down stairs, chasing around after children at home and walking to work. Most spoke about exercise as something that would require quite a bit of time and often, special facilities, in order to do it properly. The word "exercise" continually conjured up a specific picture of leotards, aerobics, swimming, cycling or jogging; walking was hardly ever mentioned, either in relation to their own exercise or that of the patients.

Three doctors in one clinic were very focused for a considerable time of the interview on the dangers of body building even though they had been clearly given the definition of aerobic exercise at the start of the interview. There was considerable laughter in one clinic at the thought of their colleagues exercising and once again it was images of leotards and shiny muscles that were emerging.

There were reoccurring statements about the younger patients exercising and very little mention about any older or middle-aged patients still being active.

b) Current knowledge about exercise

Two doctors stated that it would be useful to actually know if exercise had benefits for diabetics whose primary killer is cardiovascular disease. One of these doctors had previously stated the fact that he knew exercise gave him cardiovascular benefits and that this is why he was active himself.

One doctor believed that psychological benefits could only be gained after doing large amounts of exercise as:-

> "It's endorphins that make you feel better"

Another doctor agreed that a high level of exercise was necessary to improve diabetic control:-

> "I'm not saying you need to be a fully trained athlete or anything....but you need vast amounts of exercise to cause insulin levels to drop"

c) Distinguishing between insulin and non-insulin dependent diabetic patients

It was noticeably difficult for some health professionals to think only of their insulin dependent patients during their interview as they lapsed into talking about type 2 patients for considerable amounts of time. This is understandable since both type 1 and type 2 diabetics are seen in any one clinic session. They are not separated.

5.5. Discussion

The interviewing of the health professionals of these four west of Scotland diabetes clinics was very restricted due to lack of time available by the health professionals themselves. It was impossible, therefore, to attain a true focus group situation which would have required twice as much time from participants. But because the respondents all knew each other well, they settled down very quickly and a degree of interaction took place. There was insufficient time to note a great deal of mind changing occurring by lively debate or persuasion of more knowledgeable colleagues. It was possible, however, to note underlying beliefs and discriminations on the issue of exercise and it was very clear whether a participant valued, or otherwise, exercise in diabetes education and care.

It was evident that no one believed that 28% of people with insulin dependent diabetes would exercise regularly. Comments such as "they're fibbing" and the belief that IDDMs would definitely not exercise as much as the general population showed the strength of feeling about this result. Yet later in the interview, 74% of the health professionals indicated that they themselves exercise regularly! It may have been extremely difficult, however, for the health professionals at this point to be considering only the insulin-dependent patients and not the total diabetic population that they see in their clinics. The insulin dependent diabetics make up only about one fifth of the total diabetic population in any clinic. It was somewhat disturbing during the interviews to realise that over 50% of these health professionals tended not to have faith in what a diabetic patient may report in a clinic situation. There would have been no advantage for respondents to answer the Diabetes and Exercise Qurestionnaire falsely since it was annonymous. There were several comments and sarcastic remarks about patients' tendencies towards non-compliance and consequent fibbing to cover up.

Motivation, or complete lack of it, was another issue brought up during each interview. One clinic found this issue to be the most depressing and there was a clear perception of the lazy, unmotivated diabetic who would do little to change his/her lifestyle to comply with hospital advice. Since such a person would barely do "the important bits" of insulin and carbohydrate regulation, the effort to promote exercise would simply be a waste of time. Yet the other health professionals were not so gloomy and were keen to gain more resources and to promote exercise amongst their patients. Everyone agreed that their booklets were out of date and written in language that tended to be too intellectual and full of jargon to be very meaningful to most of their "Daily Record" reading patients.

Evidence that any exercise education is at best haphazard, came from one clinic where the liaison sisters stated that they were satisfied with their resources and had plenty on exercise but the consultant, interviewed at a separate time, said he would appreciate new exercise material as they did not have any at all. The focus group situation required the participants to actually think about exercise for at least 30 minutes and towards the end of most of the interviews, the health professionals began to admit that exercise came a very definite last in the diabetes education stakes.

The question about whether exercise actually gave IDDMs any health benefits seemed to result in confused thinking. Everyone was aware of the benefits that exercise has physically and psychologically and many were able to testify how much better they felt after a period of exercise. Yet the responses to Question 5 showed a lack of consideration that exercise be seriously promoted as a protection against cardiovascular disease in diabetes. If exercise was seriously considered as a positive behaviour which would lower the cardiovascular incidents amongst diabetics, then it would be reasonable to expect it to be actively promoted as an essential part of diabetes education. It clearly is not. Many respondents said that it was only discussed if the newly-diagnosed diabetic was **already** active before diagnosis. This confirmed those perceptions of the diabetics questioned in study 2 (chapter 4) where an average of 53% of respondents did not believe that their clinics had told them that exercise was important for good health.

Where education about exercising safely was given, the only consensus reached about advice was that the patient should be encouraged to carry out blood glucose monitoring before and after exercise. However, there was no consensus about what a starting blood glucose should be, except that it should not be less than 6mmol/l. Only two nurses were concerned about patients starting to exercise when blood glucose levels were high and none of the health professionals gave advice to their patients about the dangers of a spiralling hyperglycemic reaction if exercise is begun when blood glucose is above 14m/mol. Gary Mabbut, who has been known for being poor at controlling his diabetes, was even held up as a good role model by one of the doctors explaining why he did not give advice about an upper limit for blood glucose since Gary never went onto the field unless his blood glucose reading was over 20mmol/l. Exercise physiologist, Kris Berg, who has spent many years researching diabetes and exercise has denounced such attitudes as being irresponsible. The swings in blood glucose levels are likely to be the most damaging factor in the development of diabetic complications (Berg, 1986).

All of the health professionals interviewed stated that each exercising diabetic must be treated as an individual, each with varying reactions to exercise, carbohydrate and insulin and they are, therefore, hesitant to give general detailed advice about how to exercise safely. While the recognition of diabetic patients as individuals is to be applauded, it does seem that in reality this results in no advice or encouragement being given to patients who are not already regular exercisers or who do not ask for advice. To counsel newly diagnosed diabetics in exercise would take time that, at present, the clinics are not willing to devote. Lack of time during clinic appointments was expressed many times throughout the interviews but it was apparent that time was not devoted to the third point of Joslin's triad (exercise) because it was not a priority. Yet when pressed about the most important areas for diabetes research, all of the doctors stated that lessening cardiovascular disease and deaths amongst insulin dependent diabetics was priority number one. For this reason alone it is difficult to understand why exercise has not been promoted or more research work commissioned in the exercise arena since exercise is recognised as lessening cardiovascular episodes in the general population.

The transcript of one doctor's reply to priority in research shows a general misunderstanding amongst the medical profession of the value of exercise:-

> "I think other things are more important. I think it's not the number one priority for diabetic research. The number one priority should be cardiovascular deaths...we are getting better to stop patients from going blind or having renal failure and better at stopping them losing their feet. We're picking up a lot of foot problems here but we're not stopping them from

dying from cardiovascular disease. Just now we're looking at intervention in cholesterol and blood pressure. If exercise were to be beneficial there, it would be nice to know."

All of the exercising health professionals had testified to the psychological benefits that they receive as part of their exercise habit. Getting rid of stress, being more alive and energetic, feeling less grumpy and losing anxieties were some of the benefits cited. The participants of one interview session agreed that diabetes was a miserable condition to have and that if exercise could help their patients be happier then they should promote it. It seemed that this thought had not seriously been considered before. Another clinic, however, were unable to translate their own feelings of well-being due to exercise to the understanding that their unmotivated and somewhat depressed clientele may gain similar psychological benefits. They dismissed the promotion of exercise as being impossible as their patients were so lazy and unmotivated that their compliance to hospital advice was very poor.

This study was undertaken after study 2 (chapter 4) revealed that the perceptions of patients in the four west of Scotland clinics were mostly negative when asked what early support, safety advice and present encouragement they received towards exercise at their regular clinic appointments. Except for patients attending clinic b, all positive responses to any of the questions were less than 46%. In clinics d, a and c, only 24%, 25% and 27% respectively, of patients could remember ever being given any advice on how to exercise safely as a person with insulin depenednt diabetes. These figures are very disturbing bearing in mind the risk of hypoglycemia and the anticipated long term damage of wild swings in blood glucose levels. However, they do correspond to the lack of willingness by the health professionals to devote time to counselling their patients in safe exercise unless they are already active. 44% of patients in clinic b remembered they had been told how to exercise safely. More patients in each clinic recollected hearing something about exercise being good for their health when they were newly diagnosed but very few were ever asked about their present exercise habits. This correlates to the admission by the health professionals that exercise is bottom of the list as far as importance in diabetes care and education.

5.6. Conclusions

The most noticeable fact emerging from the analysis of the transcripts and the study of Reports was the lack of consideration given to exercise as part of the normal diabetes education and care programmes in four modern hospitals. Although all respondents were aware of the benefits accrued for themselves from regular exercise, it was not something they had seriously thought about promoting within the diabetes clinics in a consistent manner. The majority complained that lack of time in consultation made it impossible to think about anything other than insulin and diet. In three of the focus group interviews, it was clear that having to think about exercise for 30 minutes was leading to a closer examination on potential benefits for patients. The fact that the interviews were necessarily so short was frustrating as there was insufficient time to witness **real** mind-changing events taking place.

The inconsistentcy of seriously considering exercise as important to the well-being of a diabetic was evident. On the one hand, the health professionals understood exercise benefits but on the other hand, they did not consider exercise research a priority as it was more important to find out how to prevent so many cardiovascular deaths, hypertension and poor cholesterol readings. It was obvoius that doctors, nurses, dietitians and chiropodists are not educated about the protection ability that exercise can have in all of these conditions.

Patients' perceptions of their clinics support, education and encouragement in relation to exercise shown in study 2 were bourne out as being very accurate by this study 3. Most patients do not receive information about safe exercise. Most do not receive encouragement to exercise for a healthy lifestyle. Very few health professionals ever ask their patients about exercise, except when first diagnosed. Clinics do not have up-to-date or relevant information packs about exercise and no one takes responsibility for promoting it. Exercise is definitely "bottom of the list"....if it is on the list at all.

5.7. Recommendations and future directions

This study has shown an ommission in diabetes education in the west of Scotland. There is a need for all health professionals to recognise the importance of regular exercise in the lives of their diabetic patients. There is also a need to keep these health professionals up-dated on recent exercise research so they are able to understand a balanced view of the term exercise and on the intensity necessary for health benefits. Motivational training, particulary for the nurses who are dealing with demotivated, non-compliant patients is required to assist in establishing an exercise habit. A consensus on the issues involved in safe exercise for diabetics must also be agreed.

New publications, video material or other educationg packages will need to be developed and research in diabetes and exercise promoted. Ideally, the appointing of an exercise specialist who will take "ownership" of this particular area should be encouraged.

CHAPTER 6

General Discussion, Conclusions and Recommendations

6.1. Discussion of completed research study

Methodologies, results and conclusions of the three individual studies, while quite different, were all interlinked. During the time spent counselling insulin dependent diabetic subjects in study 1, many worrying questions were raised about the exercise education they had received from their diabetes clinics. Literature searches had failed to reveal any information about the numbers of IDDMs who were active or what factors determined whether exercise would be adopted or dropped. These questions were pursued by constructing the Exercise and Diabetes Questionnaire of Study 2. The perceptions of the people with insulin dependent diabetes towards exercise in Study 2 and the poor input that their hospital clinics were providing for exercise education was balanced by obtaining the perceptions of the clinic staff in Study 3. An holistic view has been sought of present day exercise habits of IDDMs; their motivations and interests in being physically active; their barriers and difficulties for not being as active as they would like; their exercise knowledge and the exercise education and encouragement from their diabetes clinics has been systematically examined. Literature showing important health benefits, both physically and psychologically, for physically active people in the general population has been studied and balanced against the health risk factors accrued by having insulin dependent diabetes. The main points arising from each study are presented below:-

6.1.1. Points arising from Study 1 (chapter 3)

This study involved close contact between 14 young insulin dependent diabetics who were sedentary and the researcher. The aim of the work was to obtain baseline measures of psychological, quality of life and physiological parameters and then to counsel, educate and motivate subjects to exercise on a regular basis. After four weeks of exercise, parameters were re-tested. The instruments were scrutinised for their suitability and sensitivity with this population. Information gleaned from talking with the subjects was of equal importance as that obtained from the instruments.

*The exercise counselling protocol was successful with no cases of hypo- or hyperglycaemia as a result of exercise.

* The exercise prescription of **accumulated** exercise amounts should be promoted rather than the "gold standard" ACSM (1990) prescription as the majority of subjects found it too difficult to fit in three specific exercise periods per week.

* Adherence to the exercise programme was helped by making an exercise pact, keeping an exercise log and having weekly "check-ins" with the researcher as 13/14 subjects returned for re-test after 4 weeks.

* The exercise testing protocol of graduated workloads on a bicycle ergometer was successful for IDDMs.

* Reduction in percent body fat, improvements in self-esteem, mood profiles and quality of life after 4 weeks of exercise adoption are feasible outcomes although it is impossible to say that exercise *per se* caused these improvemnets nor can findings be generalised from this study.

Future directions:

* A similar study with larger numbers, a control group, instruments specially designed for IDDMs and psychometrically tested, should be carried out to find out if exercise *per se* can improve these parameters.

6.1.2. Points arising from Study 2 (chapter 4)

Since the return rate of 73% was high for a mailed questionnaire (Foddy, 1993), a large amount of information was received from the

Exercise and Diabetes Questionnaire specially designed for this study. Qualitative information was also received from over 100 respondents via letters which were included with the returns. The insulin dependent diabetics from this area of the U.K. have consistently shown strong motivation to help others with diabetes and to find out whether exercise can help them in their desire to live well. It is important to remember that the Questionnaire was anonymous and there would be no benefit for any responder to answer in a socially acceptable manner if the answers were not true i. e. there should be no reason to believe that responders answered in a way that they believe the researcher wished them to. The information gleaned should, therefore, be accepted as being the way the responders perceive themselves and their treatment.

* People with insulin dependent diabetes are a highly motivated population (return rate of Questionnaire = 73%)

* 27% of respondents were not intending to exercise in the near future (the pre-contemplators) and 42% of all responders were sedentary and had been for more than six months.

* The pre-contemplators have significant lower scores on all group motivations.

* Those most active (maintainers) have a consistently lower barrier score than the other groups.

* The greatest barriers for all exercise stages of change are those of lack of energy and lack of time **not** fear of a hypoglycaemic event.

* The greatest motivations for all exercise stages of change are those of preventing future diabetic complications and staying physically well.

* The exercise support, education and encouragement received by patients is significantly better in one hospital

but remains inadequate across all hospitals. The majority of IDDMs answered positively about the need for an exercise adviser to be available for consultation at clinic appointments.

Future directions:

* Exercise education requires improvement in diabetes clinics to include more knowledge for safe exercise, more exercise promotion for good health and more motivational tactics designed specifically for the stage of change category of the individual patient.

6.1.3.Points arising from Study 3 (chapter 5)

On analysis of data obtained from Study 2, it appeared that most IDDMs perceived that they did not receive adequate exercise education, support or encouragement from their health professionals. Diabetes researchers, however, have discovered that patients often do not realise that they have been given information when, in fact, they have been (Travis, 1993). It was important, therefore, to allow the health professionals to speak for themselves. Data from this study confirmed the patients' perceptions as being correct. Health professionals stated many times that they simply do not have the necessary time to devote to exercise education during hospital appointments. While it is obviously true that health professionals' workloads are high and time spent with patients in the NHS is clearly unsatisfactory (Dornan, 1994), analysis of the data in this study revealed more insidious attitudes from the health professionals towards exercise.

* Health professionals in the diabetes clinics stated that they do not have time to mention exercise during a normal hospital appointment.

* Exercise is not deemed as being anywhere near as important in diabetes education programmes as diet and insulin education.

* There are no appointed personnel to take "ownership" of exercise so it is never systematically included in education programmes.

* None of the interviewed health professionals could believe that 28% of their own patients were regular exercisers; they believed them to be "fibbing".

* Health professionals do not have an understanding of exercise in health promotion.

* The clinics do not have useful exercise resources.

Future directions:

* Health professionals concerned with IDDMs need a better understanding of the up-to-date research on health benefits of exercise for their patients e.g. that exercise has the potential to alleviate serious health risks, such as CHD and depression, in their patients..

* They also require education in motivation tactics and knowledge of exercise counselling plus improved exercise resources to share with their patients.

* The NHS must be led to re-consider the cost-saving possibilities of exercise promotion for IDDMS and to allow more time for education in a diabetes clinic.

6.1.4. Re-setting the scene

Literature reviewed in chapter 2 showed a growing amount of evidence to support the belief that a lack of physical activity has serious repercussions for coronary heart disease, hypertension, osteoporosis, colon cancer, anxiety and depression (Pate et al., 1995). Diabetes researchers have observed that insulin dependent diabetics are susceptible to at least four of those health risks because of their disease (Berg, 1986; Tomlinson, 1992). Regular physical activity could help to reduce these risks and the risks of other diabetic complications in insulin dependent diabetes. The results of Study 3 reveal that exercise remains low on the priority list of health professionals responsible for diabetes education and diabetes care programmes. The Study also reveals a poor understanding by diabetes health professionals of the values of moderate intensity exercise such as walking; of recent research showing that exercise can prevent or delay cardiovascular disease; of the use of exercise in promoting psychological well-being amongst their patients; of the value of accumulating physical activity (outlined by CDC) rather than expecting people to adhere to a difficult regime of 30 minute bouts of exercise, 3x per week at a moderately high intensity; of any type of motivational tactic or exercise diary to assist in the prevention of "dropping out". The NHS has not made provision for adequate training or re-training of health professionals in the area of exercise benefits or exercise education because it does not recognise those areas as being important. Some Health Authorities do indeed recognise the importance of exercise in well-being but the research information is not universally distributed.

The Study also reveals a difficulty that health professionals have in believing their patients if they answer in a way that is contrary to the way in which health professionals would have expected. For example, none of the health professionals could believe that 28% of their insulin dependent diabetics were regular exercisers and they were declared to be "fibbing" even though there would be no advantage for anyone to answer falsely as all Questionnaires were anonymous. No thought was given to the fact that the health professionals may have been having difficulty separating insulin dependents from non-insulin dependents when trying to assess these figures since all diabetics are seen at the diabetes clinics together. There was also an assumption that only young IDDMs would be likely to exercise and the hospital clinic showing the highest amount of advice given to patients had a significantly lower mean age. Several times during the interviews this misconception about "younger ones" came to the fore. The word "exercise" also seemed to be conceptualised in a very stereotypic manner, especially amongst doctors rather than nurses.

Respondents in Study 2 revealed some kind of general lack of motivation towards listening to advice from the doctor as they reported being highly unlikely to exercise "if the doctor told me to". But the literature review in chapter 2 has underlined the fact that doctors, themselves, do not receive adequate training in good educational methods and are capable only of information giving (the "bucket theory") which rarely meets the needs of a person facing a life-time chronic disease which demands everyday attention (Assal et al., 1985; Anderson, 1986). The work in this thesis has highlighted the need for a re-evaluation of diabetes education which will include exercise education and put each person with insulin dependent diabetes at the centre of his/her own educational process. Those suggestions discussed in chapter 2 (2.3.2.) could act as a starting point for a modern diabetes education programme.

The early pioneers of diabetes management recommended that diabetics exercise but they would not have realised the potentially wide range of health benefits afforded to their patients by remaining physically active. The DCCT, not only showed the importance of glycaemic control, but also of intensive treatment which is closely matched to a person's lifestyle. With the prediction that there will be over 20 million insulin dependent diabetics within the next 20 years,the scene of diabetes treatment should be reset. A cure will always be sought. However, in the meantime, all the best elements of modern educational theory and practice should be given to those health professionals responsible for diabetes education and exercise education should surely be included as an integral part.

6.2. Conclusions

The quasi-experimental method of Study 1, which resulted in 14 sedentary IDDMS begin and continue an exercise programme, has shown the possibility of producing an exercise testing protocol and an exercise counselling protocol that works for people with insulin dependent diabetes. It has also shown some interesting trends towards improvement of physical and psychological profiles. Until a large, experimental, controlled study shows physicians that exercise can have important health benefits for their patients, they are unlikely to spend the time or the effort on seriously promoting it amongst their patients. Because other research has shown such important health benefits in other populations, this study must be undertaken in the near future.

Results from the Exercise and Diabetes Questionnaire specially designed for Study 2 has painted a picture of a highly motivated insulin dependent population who want to stay well in the face of their chronic disease. They are largely interested in exercise if it will help them physically and mentally to stay well but they do not possess as much exercise knowledge for safety as they should. They do not receive this from their hospital clinic. Their barriers are much the same as any other population and are they do not find diabetic adjustments for exercise to be difficult. They are highly motivated to exercise, however, by the possibility that it may help to prevent future complications and may protect their physical well being.

Analysis of the focus group interviews of Study 3 has reinforced the dependability of the patients' perceptions that exercise is not given priority in diabetes education and is not held as important by most health professionals. Statements and comments about exercise showed a lack of knowledge about present exercise research and its potential for health benefits and a lack of understanding about how it may benefit a population facing increased cardiovascular, hypertension, anxiety and depression problems.

6.3. Recommendations

* A large, controlled study be commissioned to find out the effects of regular physical activity on physical fitness, self esteem and psychological profiles of insulin dependent diabetics.

* A longitudinal study be commissioned to compare physical and psychological parameters of physically active and sedentary insulin dependent diabetics.

* An exercise education pack be produced (written in language that appeals to the majority of patients) to include information for safe exercising, reasons why exercise is valuable for health benefits and ways

to overcome barriers and boost motivations especially pertinent to insulin dependent diabetics.

* Diabetes education for health professionals be updated to include exercise education and educational theories on motivation.

* Either Diabetes health professionals be allowed enough time to **listen** to patients so that they may successfully counsel their exercise needs, rather than needs they think the patients have or exercise advisers be employed as part of the health professional team throughout the United Kingdom.

Atkins and her colleagues (1984), working at establishing an exercise programme with her patients suffering from obstructive pulmonary disease, used the words of Robert Louis Stevenson to explain why she was keen to see as many as possible involved with exercise:-

> " Life is not a matter of holding good cards but of playing a poor hand well".

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Appendix 1

UNIVERSITY OF GLASGOW

Department of Physical Education & Sports Science

FITNESS ASSESSMENT

NAME:____

HOME ADDRESS: ____________________________________

____

DATE					
AGE					
TIME					
ROOM TEMPERATURE					
RESTING PULSE					
PRE-EXERCISE BLOOD PRESSURE (Left Arm)					
WEIGHT (kg)					
HEIGHT (cm)					
SKINFOLD (right side)	- Biceps				
	- Triceps				
	- Subscapular				
	- Suprailiac				
	- Total				
ESTIMATED % BODY FAT					
ESTIMATED VO_2MAX LITRES					
ESTIMATED VO_2MAX ml/kg/min					
AGE CORRECTION x _____					
FLEXIBILITY (cm)					
ABDOMINAL MUSCLE ENDURANCE					
POSITION					
ANGLE					
TEACHER'S INITIALS					

Saddle Height	Work Load (watts)	EM EW	Revs/ min	Minutes of Exercise							R.P.E.
				1.00	2.00	2.30	3.00	4.00	4.30	5.00	
75% Max Heart Rate				1.00	2.00	2.30	3.00	4.00	4.30	5.00	
				1.00	3.00	4.00	4.30	5.00			

Saddle Height	Work Load (watts)	EM EW	Revs/ min	Minutes of Exercise							R.P.E.
				1.00	2.00	2.30	3.00	4.00	4.30	5.00	
75% Max Heart Rate				1.00	2.00	2.30	3.00	4.00	4.30	5.00	
				1.00	3.00	4.00	4.30	5.00			

Saddle Height	Work Load (watts)	EM EW	Revs/ min	Minutes of Exercise							R.P.E.
				1.00	2.00	2.30	3.00	4.00	4.30	5.00	
75% Max Heart Rate				1.00	2.00	2.30	3.00	4.00	4.30	5.00	
				1.00	3.00	4.00	4.30	5.00			

Saddle Height	Work Load (watts)	EM EW	Revs/ min	Minutes of Exercise							R.P.E.
				1.00	2.00	2.30	3.00	4.00	4.30	5.00	
75% Max Heart Rate				1.00	2.00	2.30	3.00	4.00	4.30	5.00	
				1.00	3.00	4.00	4.30	5.00			

Saddle Height	Work Load (watts)	EM EW	Revs/ min	Minutes of Exercise							R.P.E.
				1.00	2.00	2.30	3.00	4.00	4.30	5.00	
75% Max Heart Rate				1.00	2.00	2.30	3.00	4.00	4.30	5.00	
				1.00	3.00	4.00	4.30	5.00			

Appendix 2

THE PHYSICAL SELF PERCEPTION PROFILE (PSPP)

WHAT AM I LIKE?

These are statements which allow people to describe themselves.
There are no right or wrong answers since people differ a lot.

First, decide which one of the two statements best describes you.

Then, go to that side of the statement and check if it is just "sort of true" or "really true" FOR YOU.

	Really True for Me	Sort of True for Me	EXAMPLE			Sort of True for Me	Really True for Me
	☐	☐	Some people are very competitive	BUT	Others are not quite so competitive	X	☐

REMEMBER to check only ONE of the four boxes

1.	☐	☐	Some people feel that they are not very good when it comes to playing sports	BUT	Others feel that they are really good at just about every sport	☐	☐
2.	☐	☐	Some people are not very confident about their level of physical conditioning and fitness	BUT	Others always feel confident that they maintain excellent conditioning and fitness	☐	☐
3.	☐	☐	Some people feel that compared to most, they have an attractive body	BUT	Others feel that compared to most, their body is not quite so attractive	☐	☐
4.	☐	☐	Some people feel that they are physically stronger than most people of their sex	BUT	Others feel that they lack physical strength compared to most others of their sex	☐	☐
5.	☐	☐	Some people feel extremely proud of who they are and what they can do physically	BUT	Others are sometimes not quite so proud of who they are physically	☐	☐
6.	☐	☐	Some people feel that they are among the best when it comes to athletic ability	BUT	Others feel that they are not among the most able when it comes to athletics	☐	☐

	Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
7.	☐	☐	Some people make certain they take part in some form of regular vigorous physical exercise	BUT	Others don't often manage to keep up regular vigorous physical exercise	☐	☐
8.	☐	☐	Some people feel that they have difficulty maintaining an attractive body	BUT	Others feel that they are easily able to keep their bodies looking attractive	☐	☐
9.	☐	☐	Some people feel that their muscles are much stronger than most others of their sex	BUT	Others feel that on the whole their muscles are not quite so strong as most others of their sex	☐	☐
10.	☐	☐	Some people are sometimes not so happy with the way they are or what they can do physically	BUT	Others always feel happy about the kind of person they are physically	☐	☐
11.	☐	☐	Some people are not quite so confident when it comes to taking part in sports activities	BUT	Others are among the most confident when it comes to taking part in sports activities	☐	☐
12.	☐	☐	Some people do not usually have a high level of stamina and fitness	BUT	Others always maintain a high level of stamina and fitness	☐	☐
13.	☐	☐	Some people feel embarrassed by their bodies when it comes to wearing few clothes	BUT	Others do not feel embarrassed by their bodies when it comes wearing few clothes	☐	☐
14.	☐	☐	When it comes to situations requiring strength some people are one of the first to step forward	BUT	When it comes to situations requiring strength some people are one of the last to step forward	☐	☐
15.	☐	☐	When it comes to the physical side of themselves some people do not feel very confident	BUT	Others seem to have a real sense of confidence in the physical side of themselves	☐	☐
16.	☐	☐	Some people feel that they are always one of the best when it comes to joining in sports activities	BUT	Others feel that they are not one of the best when it comes to joining in sports activities	☐	☐

	Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
17.	☐	☐	Some people tend to feel a little uneasy in fitness and exercise settings	BUT	Others feel confident and at ease at all times in fitness and exercise settings	☐	☐
18.	☐	☐	Some people feel that they are often admired because their physique or figure is considered attractive	BUT	Others rarely feel that they receive admiration for the way their body looks	☐	☐
19.	☐	☐	Some people tend to lack confidence when it comes to their physical strength	BUT	Others are extremely confident when it comes to their physical strength	☐	☐
20.	☐	☐	Some people always have a really positive feeling about the physical side of themselves	BUT	Others sometimes do not feel positive about the physical side of themselves	☐	☐
21.	☐	☐	Some people are sometimes a little slower than most when it comes to learning new skills in a sports situation	BUT	Others have always seemed to be among the quickest when it comes to learning new sports skills	☐	☐
22.	☐	☐	Some people feel extremely confident about their ability to maintain regular exercise and physical condition	BUT	Others don't feel quite so confident about their ability to maintain regular exercise and physical condition	☐	☐
23.	☐	☐	Some people feel that compared to most, their bodies do not look in the best of shape	BUT	Others feel that compared to most their bodies always look in excellent physical shape	☐	☐
24.	☐	☐	Some people feel that they are very strong and have well developed muscles compared to most people	BUT	Others feel that they are not so strong and their muscles are not very well developed	☐	☐
25.	☐	☐	Some people wish that they could have more respect for their physical selves	BUT	Others always have great respect for their physical selves	☐	☐
26.	☐	☐	Given the chance, some people are always one of the first to join in sports activities	BUT	Other people sometimes hold back and are not usually among the first to join in sports	☐	☐

	Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
27.	☐	☐	Some people feel that compared to most they always maintain a high level of physical conditioning	BUT	Others feel that compared to most their level of physical conditioning is not usually so high	☐	☐
28.	☐	☐	Some people are extremely confident about the appearance of their body	BUT	Others are a little self-conscious about the appearance of their bodies	☐	☐
29.	☐	☐	Some people feel that they are not as good as most at dealing with situations requiring physical strength	BUT	Others feel that they are among the best at dealing with situations which require physical strength	☐	☐
30.	☐	☐	Some people feel extremely satisfied with the kind of person they are physically	BUT	Others sometimes feel a little dissatisfied with their physical selves	☐	☐

Appendix 3

NAME ______________________________ DATE __________

IDENTIFICATION

Below are words that describe feelings and moods people have. Please read EVERY word carefully. Then fill in ONE space under the answer which best describes how you have been feeling DURING THE PAST WEEK INCLUDING TODAY.

Suppose the word is *happy*. Mark the one answer which is closest to how you have been feeling DURING THE PAST WEEK INCLUDING TODAY.

The numbers refer to these phrases:

0 – Much unlike this
1 – Slightly unlike this
2 – Slightly like this
3 – Much like this

MARKING DIRECTIONS

- USE A NO. 2 PENCIL ONLY.
- MAKE NO STRAY MARKS.
- ERASE CLEANLY.

CORRECT MARK ⓪①②● INCORRECT MARK

Item	MUCH UNLIKE THIS	SLIGHTLY UNLIKE THIS	SLIGHTLY LIKE THIS	MUCH LIKE THIS
1. Composed	0	1	2	3
2. Angry	0	1	2	3
3. Cheerful	0	1	2	3
4. Weak	0	1	2	3
5. Tense	0	1	2	3
6. Confused	0	1	2	3
7. Lively	0	1	2	3
8. Sad	0	1	2	3
9. Friendly	0	1	2	3
10. Tired	0	1	2	3
11. Strong	0	1	2	3
12. Clearheaded	0	1	2	3
13. Untroubled	0	1	2	3
14. Grouchy	0	1	2	3
15. Playful	0	1	2	3
16. Timid	0	1	2	3
17. Nervous	0	1	2	3
18. Mixed-up	0	1	2	3
19. Vigorous	0	1	2	3
20. Dejected	0	1	2	3
21. Kindly	0	1	2	3
22. Fatigued	0	1	2	3
23. Bold	0	1	2	3
24. Efficient	0	1	2	3
25. Peaceful	0	1	2	3
26. Furious	0	1	2	3
27. Lighthearted	0	1	2	3
28. Unsure	0	1	2	3
29. Jittery	0	1	2	3
30. Bewildered	0	1	2	3
31. Energetic	0	1	2	3
32. Lonely	0	1	2	3
33. Sympathetic	0	1	2	3
34. Exhausted	0	1	2	3
35. Powerful	0	1	2	3
36. Attentive	0	1	2	3
37. Serene	0	1	2	3
38. Bad tempered	0	1	2	3
39. Joyful	0	1	2	3
40. Self-doubting	0	1	2	3
41. Shaky	0	1	2	3
42. Perplexed	0	1	2	3
43. Active	0	1	2	3
44. Downhearted	0	1	2	3
45. Agreeable	0	1	2	3
46. Sluggish	0	1	2	3
47. Forceful	0	1	2	3
48. Able to concentrate	0	1	2	3
49. Calm	0	1	2	3
50. Mad	0	1	2	3
51. Jolly	0	1	2	3
52. Uncertain	0	1	2	3
53. Anxious	0	1	2	3
54. Muddled	0	1	2	3
55. Ready-to-go	0	1	2	3
56. Discouraged	0	1	2	3
57. Good-natured	0	1	2	3
58. Weary	0	1	2	3
59. Confident	0	1	2	3
60. Businesslike	0	1	2	3
61. Relaxed	0	1	2	3
62. Annoyed	0	1	2	3
63. Elated	0	1	2	3
64. Inadequate	0	1	2	3
65. Uneasy	0	1	2	3
66. Dazed	0	1	2	3
67. Full of pep	0	1	2	3
68. Gloomy	0	1	2	3
69. Affectionate	0	1	2	3
70. Drowsy	0	1	2	3
71. Self-assured	0	1	2	3
72. Mentally alert	0	1	2	3

BE SURE YOU HAVE ANSWERED EVERY ITEM

Appendix 4

MY FEELINGS ABOUT DIABETES

Please indicate by a tick your agreement or disagreement with each of the following statements:

	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
1. I think diabetes is a serious illness					
2. I would enjoy life more if I were not diabetic					
3. I worry about how diabetes will affect me in the future					
4. I try not to think about being diabetic					
5. Diabetes prevents me doing things I would like to do					
6. It is just not possible to control my diabetes well and live in a way acceptable to me					
7. Controlling my diabetes often causes me embarrassment					
8. I dislike having to attend the clinic					

THE EFFECTS OF DIABETES ON MY LIFE

LEISURE

How much do you think your diabetes or its treatment has limited the following activities, or made them more difficult or awkward or less enjoyable in the last three months?

Please tick a box for each activity.

	Does not apply to me	Not affected at all	Slightly affected	Moderately affected	Greatly affected
1. Going shopping					
2. Walking 2 miles or more					
3. Doing housework, gardening, jobs around the house					
4. Cooking					
5. Going out socially to a pub or club, or meeting friends outside the home					
6. Going on outings away, for weekend or on holiday					
7. Eating out					
8. Sports, cycling or other physical activities					
9. Sexual activity with your partner					
10. Driving a car					

THE EFFECTS OF DIABETES ON MY LIFE

WORK

If you have been working in the last 3 months (or a student)

How much do you think your diabetes has limited the following aspects of work, or made them more difficult or awkward or less enjoyable in the last three months?

Please tick a box for each aspect

		Not affected at all	Slightly	Moderately	Greatly
1.	The daily work routine				
2.	The hours you work				
3.	Travelling to/from work or while at work				
4.	Meal breaks at work				
5.	The type of work you can do				
6.	Needing time off work				

FAMILY

1. How much does your diabetes worry your family or others living with you, or cause difficulty for them?

	Does not apply to me	Not at all	Slightly	Moderately	Greatly
Wife/Husband					
Parents					
Others living with you					

2. How much have your family or others living with you changed their own diet as a result of your diabetes?

	Does not apply to me	Not at all	Slightly	Moderately	Greatly
Wife/husband					
Parents					
Others living with you					

3. How much do you and your family or others living with you disagree about the treatment of your diabetes?

Doesn't apply to me: I live alone	Not at all	Slightly	Moderately	Greatly

Appendix 5

EXPLAINATION OF THE RESEARCH STUDY

The purpose of this study is find out how insulin dependent diabetics feel, both physically and in mood, after engaging in regular exercise for four weeks . As a subject in this research, you will be asked to come to your diabetic clinic appointment as usual and then to fill out a questionnaire about how you feel. Your exercise specialist will then give you a fitness test which involves about 11 minutes of easy pedaling on a stationary bicycle so that your heart rate can be measured. At no time will this involve exercise which is too hard for you. You will then be helped to begin your own exercise programme.

You will be given special exercise counselling which will include medical directions about reducing insulin and eating a bit more carbohydrate before exercise, how to start exercising at your own level and how to monitor your own heart rate. You will be asked to exercise 3 x per week, choosing any form of aerobic exercise which you enjoy (swimming, walking, jogging, skating, cycling etc.) You will not need any specialised clothing or equipment and will be able to do the exercise in your own area whenever it suits you best. You will be given your own "Exercise Log" to keep a record of each exercise period and to note whether it was enjoyable or problematic. Your exercise specialist will telephone you every week to answer any questions and if there are any difficulties, you may call her at any time for assistance. You may arrange an appointment with her whenever you feel you need more exercise counselling. You will be asked to repeat the fitness test and questionnaires after 4 weeks of regular exercise.

We hope that you will learn a great deal about how to include regular exercise into your life-style and also the special benefits that diabetics gain from being physically active. We also hope that you will identify the barriers that have prevented you from exercising in the past and learn ways of overcoming them. We believe that the discoveries that we make during this study will, in the future, help diabetics to understand the importance of exercise in maintaining their physical and mental health.

Appendix 6

INFORMED CONSENT FORM

This is to certify that I, ... agree to participate as a volunteer in the scientific study described above. This study has been explained to me by ...., and I understand the explanation. I have also been given the opportunity to ask questions and these have been satisfactorily answered. I understand that I am free to deny any answers to the questionnaire which I may not want to give. I understand that the exercise specialist will only have access to information which I choose to give her plus the results of my lipid profile and glycosylated haemoglobin test. I further understand that my identity will not be revealed in any analysis that is carried out on this information. I understand that in the event of any physical injury, the researcher (or the University involved) will not be held legally or financially responsible. Finally, I understand that I am free to withdraw my consent to be a subject at any time.

I certify that to the best of my knowledge there is no physical or mental reason that would put me at risk by being involved in this study.

Signature of subject ....

Date ....

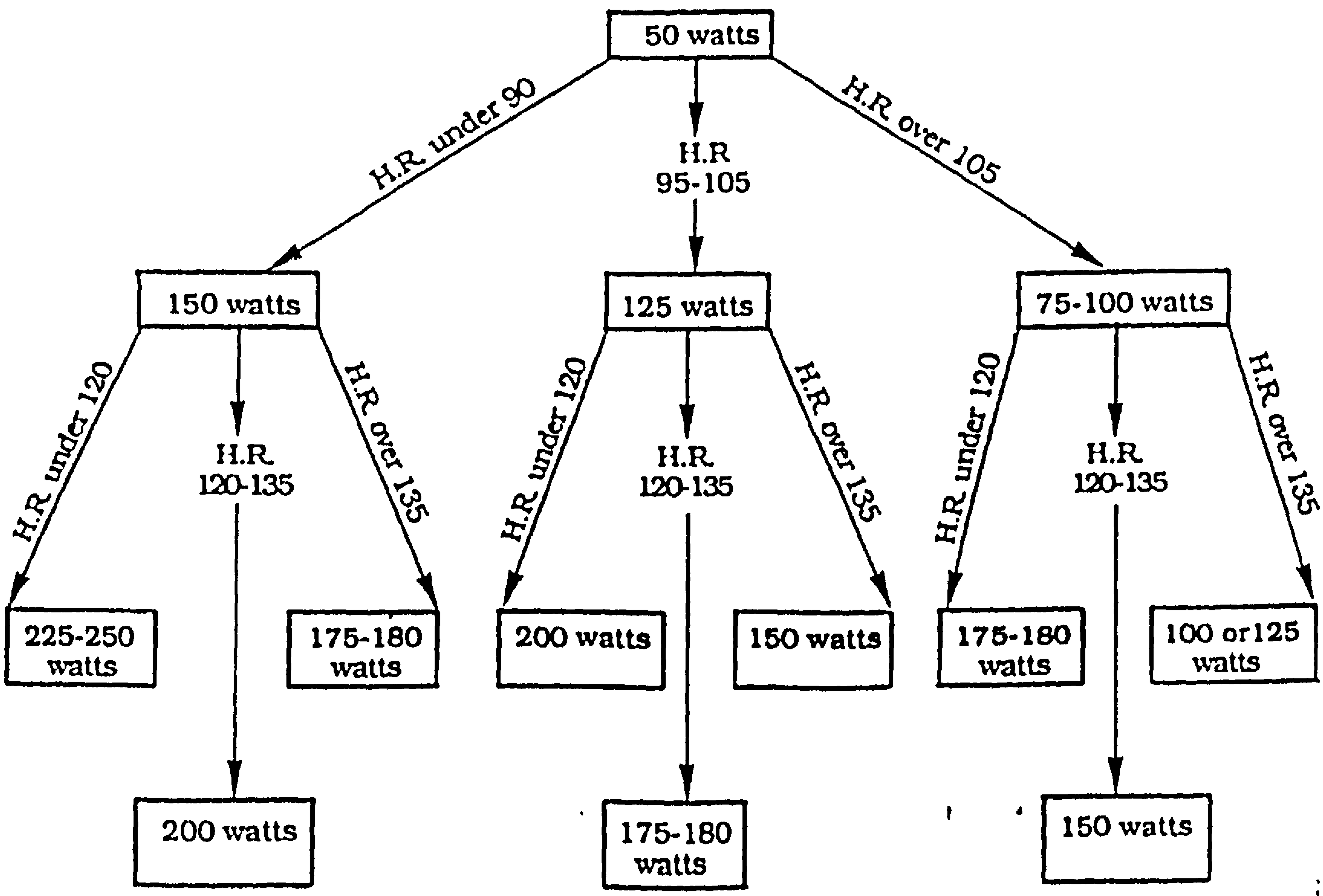
I, the undersigned researcher, have fully defined and explained the study to the above subject.

Signature of Researcher ....

Date ....

Appendix 7

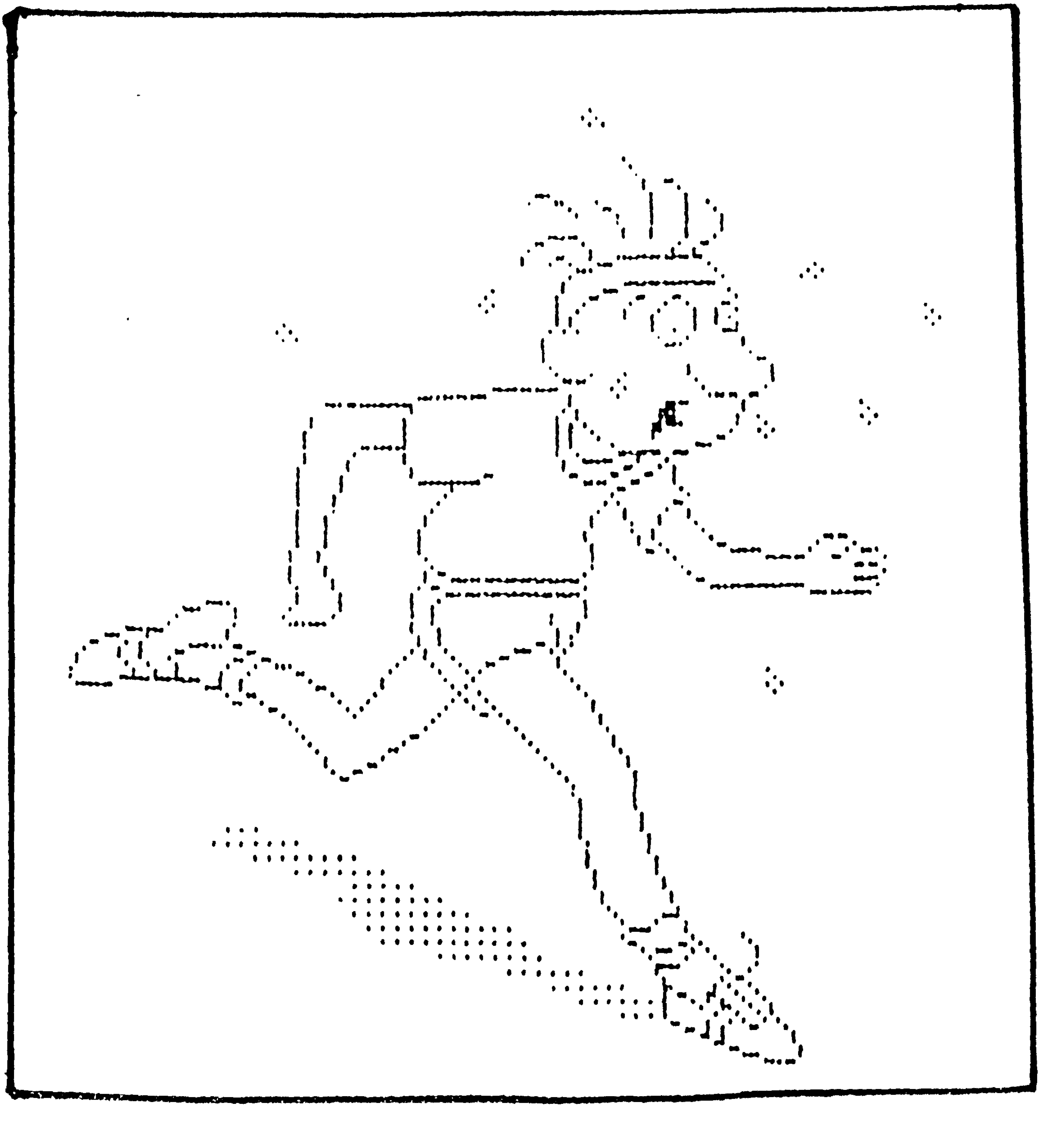
Workload guidelines for aerobic fitness test



Adapted from: Exercise in Health and Disease: Evaluation and Prescription for Prevention and Rehabilitation. Pollock, M.L., Wilmore, J.H., Fox, S.M., Saunders, W.B. & Co. (1984)

Appendix 8

EXERCISE DIARY.



MEDICAL DIRECTIONS FOR COPING WITH EXERCISE

NAME .... DATE ....

Each week you are going to complete 3 sessions of aerobic exercise of your own choosing. Each session should consist of at least:-

5 mins Warm Up
20 mins Aerobic work with heart rate at 60% of your
maximum heart rate (unless increased by your exercise specialist)
5 mins Stretching and Cool Down

AEROBIC WORK can be in the form of:

JOGGING
WALKING
SWIMMING
CYCLING
SKATING
POPMOBILITY
RUNNING GAMES

Before you begin, you will have:-

a) reduced your last insulin injection by ....

b) eaten more carbohydrate i.e. ....

c) checked blood glucose levels. They should ideally lie between 4-10 ml/mol. DO NOT EXERCISE IF YOUR LEVEL IS OVER 13.9 mmol/L AND THERE ARE KETONES IN YOUR URINE. YOU WILL ONLY CAUSE THE LEVEL TO INCREASE IF YOU EXERCISE.

ALWAYS TAKE SOME FAST ACTING GLUCOSE WITH YOU (e.g. Dextasol, Lucozade etc) IN CASE OF HYPOS DURING EXERCISE.

If you do experience the onset of a hypo while exercising, stop and take 2 Dextrasol tablets or the equivalent. Wait until you are sure that you feel better and then only continue gently. Record the hypo on the exercise log. If it happens during the next exercise period, please telephone your exercise specialist for advice straightaway.

NEVER EXERCISE WHEN YOU ARE FEELING POORLY (even just when you have a cold)

After exercise, you will check blood glucose levels again and eat more carbohydrate if necessary. Be aware that the glucose-lowering effect of exercise often continues for several hours after you have finished the exercise. So be prepared to take more carbohydrate even up to 6 hours after exercise. Please record all the measures requested on your exercise log so that we can more accurately assess your personal exercise response. We can then change the exercise prescription as you become fitter.
Study carefully your exercise prescription for the next month and follow it carefully. It has been specially designed for you personally. If you have any problems at all, do not hesitate to telephone your exercise specialist.

EXERCISE PRESCRIPTION

NAME .... DATE ....

You have chosen which form(s) of aerobic exercise you prefer and which days of the week you plan to exercise. They are entered in the prescription below. Try to stick to these as much as possible and if you wish to change them for any reason, please consult your exercise specialist first. Remember to keep to the agreed heart rate intensity for this month.

Please record all the required data on your exercise log and remember to BE HONEST AT ALL TIMES - no one will shout at you if you go wrong!!

Remember to telephone your exercise specialist if you have any trouble keeping to this prescription or if you find you are having any problems during or after the exercise periods.

EXERCISE SESSION	1	2	3
TYPE (eg, Swim)			
DAY			
DURATION			
TARGET HEART RATE			
R.P.E.			

EXERCISE LOG

NAME .... AGE ....

For Week Ending ....

DAY			
DURATION			
TYPE OF EXERCISE			
PULSE RATE (after 20 mins)			
BEFORE EXERCISE a) Insulin reduction			
b) Type & amount of extra carbohydrate			
c) Blood glucose level			
DURING EXERCISE a) Any hypos?			
b) Any other problems?			
AFTER EXERCISE a) Blood glucose level			
b) Extra carbohydrate needed?			

Appendix 9

DIABETES AND EXERCISE

Thank you for agreeing to help in this study. We are trying to find out what insulin-dependent diabetics feel about regular exercise. Your confidentiality is guaranteed so do answer honestly!

PLEASE READ THE FOLLOWING STATEMENT.

"Regular aerobic exercisers are those people who exercise for no less than 20 minutes at least twice a week. The exercise makes them slightly out of breath and is usually either brisk walking, swimming, cycling, skiing, jogging, keep-fit, canoeing or running games."

Are you a regular exerciser? Please circle your answer. (a) Yes

(b) No

Give this sheet to your researcher and she will hand you the correct questionaire.

CODE NO. 1____ SEX____ AGE____ JOB__________________

AGE ON LEAVING FULL-TIME EDUCATION______

NUMBER OF YEARS ATTENDING PRESENT CLINIC__________________________

1) How long have you had diabetes?........................__________

2) Do you have any physical injuries or disability?..........__________

If so, please describe____

3) When did you start to exercise..........................__________

4) How often per week do you exercise?....................__________

5) For how many minutes per session do you exercise?........__________

6) Why did you start to exercise?____________________________________

____

____

7) What type or types of exercise do you do? (e.g. swim, run etc,)____

____

8) Would you expect regular exercise to give you any of the following? (Please circle your answer.)

a. Loss of body fat......................	YES	NO	DON'T KNOW
b. Reduction in cholesterol..............	YES	NO	DON'T KNOW
c. Protection from heart disease.........	YES	NO	DON'T KNOW
d. Protection from strokes...............	YES	NO	DON'T KNOW
e. Bigger muscles........................	YES	NO	DON'T KNOW
f. Better Skin...........................	YES	NO	DON'T KNOW
g. Increased resting heart rate..........	YES	NO	DON'T KNOW
h. Stronger bones........................	YES	NO	DON'T KNOW
i. Need to use less insulin..............	YES	NO	DON'T KNOW
j. Lower blood glucose levels............	YES	NO	DON'T KNOW
k. Better diabetic control...............	YES	NO	DON'T KNOW

9) Please circle the answer that you think describes what the scientists recommend with regards to:

a. How often the exercise should be done?

i) once a week

ii) twice a week

iii) three times a week

iv) every day

b. How long each session should be

i) less than 10 minutes

ii) 10 -15 minutes

iii) 15 - 30 minutes

iv) over 30 minutes

c. What heart rate you should work at?

i) less then 50% Maximum

ii) 50 -85% Maximum

iii) over 85% Maximum

10) Before you exercise, do you change:- (Please circle you answer)

a. Insulin.................................YES NO

b. Carbohydrate..........................YES NO

c. Both...................................YES NO

11) Do you test your blood glucose level? (Please circle you anawer)

a. Before exercise.......................YES NO

b. During exercise.......................YES NO

c. After exercise........................YES NO

12) Would you exercise if your blood glucose level was:- (Please circle you answer)

a. Less than 4 m/mol....................YES NO

b. Less than 10 m/mol...................YES NO

c. 10 m/mol - 17 m/mol..................YES NO

d. Over 17 m/mol........................YES NO

13) Do you think that exercise might harm you because of your diabetes?

YES NO

If YES explain how____

____

14) Were you ever given any advice at the clinic about exercise?

YES NO

If YES what was the advice?____

____

____

15) What do you do if you feel a hypo starting during exercise?________

____

____

16) How many hypos have you had during exercise in the lase 6 months?______

17) Do you always carry glucose with you when you exercise? (Please cirlce your answer)

YES NO

18) Were you actively encouraged to excersie by the diabetic clinic staff when FIRST diagnosed diabetic? (Please circle your answer)

YES NO

19) Circle any of the following statements that are true for you:

a. I exercise because it makes me feel fitter physically?

b. I exercise because it makes mke feel better psychologically

c. I exercise because it is a challenge?

d. I exercise because it keeps my weight down?

e. I exercise because my family/friends do?

f. I exercise because it makes me feel good about myself?

g. I exercise because it helps keep my blood sugar levels down?

h. My exercise means I don't have to use so much insulin.

i. I exercise to train for a specific team/sport.

j. I exercise because I believe it will help prevent diabetic complications in the future?

k. I exercise because I am "addicted" to it.

l. I exercise because I am good at it.

m. I exercise because it is fun.

20) Do you normally exercise:- (Please circle you answer)

a. Alone.................................YES NO

b. With a partner.......................YES NO

c. With the family......................YES NO

d. With others..........................YES NO

21) Were you actively encouraged by anyone else to exercise when you were FIRST diagnosed? (Please circle you answer)

YES NO DON'T KNOW

If "YES" who was it?________________________________

22) Do the staff at the clinic ever ask about you about your exercise habits NOW? (Please circle your answer)

YES NO

23) Would you find it helpful to have someone to advise you on exercise at the clinic or on call? (Please circle you answer)

YES NO DON'T KNOW

24) Is exercise part of your social as well as your physical life?

YES NO DON'T KNOW

25) Do you find it hard to stay motivated to exercise?

YES NO

If you answered "YES" what sort of things do you think would help keep your motivation high?

____

____

26) Do you find any of the following can be barriers to your exercise programme? (Please circle any which apply to you)

a. Lack of time

b. Lack of money

c. Lack of facilities

d. Lack of energy

e. Lack of interest

f. Fear of having a hypo

g. Fear of being mugged/harmed when exercising outside

h. Fear of physical injury

i. Feel too embarrassed

j. Too much effort to stay fit

k. Fear it may upset my diabetes control

l. Lack of someone with whom to exercise

m. Physical discomfort

n. Having to adjust insulin/carbohydrate/ blood test o Feeling poorly

p. Loss of ability to play sports at competitive level

q. Others: Please specify: ______________________________

THANK YOU FOR TAKING TIME AND TROUBLE TO ANSWER THESE QUESTIONS.

CODE NO. 1__ SEX____ AGE___ JOB________________

AGE ON LEAVING FULL-TIME EDUCATION______

NUMBER OF YEARS ATTENDING PRESENT CLINIC________ ______________

1) How long have you had diabetes?.................... __________

2) Do you have any physical injuries or disability?.. .... __________

If so, please describe______________________________________

3) When did you last exercise.............. .. __________

4) How often per week did you exercise?....... __________

5) For how many minutes per session did you exercise?....... __________

6) Why do you choose not to exercise?______________________________

____

____

7) What type or types of exercise did you do? (e.g. swin, run etc.)___

____

8) Would you expect regular exercise to give you any of the following?
(Please circle your answer.)

a. Loss of body fat....................	YES	NO	DON'T KNOW
b. Reduction in cholesterol...........	YES	NO	DON'T KNOW
c. Protection from heart disease.........	YES	NO	DON'T KNOW
d. Protection from strokes..............	YES	NO	DON'T KNOW
e. Bigger muscles......................	YES	NO	DON'T KNOW
f. Better Skin........................	YES	NO	DON'T KNOW
g. Increased resting heart rate.........	YES	NO	DON'T KNOW
h. Stronger bones.....................	YES	NO	DON'T KNOW
i. Need to use less insulin.............	YES	NO	DON'T KNOW
j. Lower blood glucose levels.........	YES	NO	DON'T KNOW
k. Better diabetic control.............	YES	NO	DON'T KNOW

9) Please circle the answer that you think describes what the scientists recommend with regards to:

a. How often the exercise should be done?

i) once a week

ii) twice a week

iii) three times a week

iv) every day

b. How long each session should be

i) less than 10 minutes

ii) 10 -15 minutes

iii) 15 - 30 minutes

iv) over 30 minutes

c. What heart rate you should work at?

i) less then 50% Maximum

ii) 50 -85% Maximum

iii) over 85% Maximum

10) Before they exercise, should diabetics change:- (Please circle you answer)

a. Insulin............................YES NO

b. Carbohydrate........................YES NO

c. Both..............................YES NO

11) Should diabetics test their blood glucose level? (Please circle you anawer)

a. Before exercise.................... YES NO

b. During exercise.....................YES NO

c. After exercise.................... YES NO

12) Should diabetics exercise if their blood glucose level is :- (Please circle you answer)

a. Less than 4 m/mol.................... YES NO

b. Less than 10 m/mol.................... YES NO

c. 10 m/mol - 17 m/mol.................... YES NO

d. Over 17 m/mol.......................... YES NO

13) Do you think that exercise might harm you because of your diabetes?

YES NO

If YES explain how____

____

14) Were you ever given any advice at the clinic about exercise?

YES NO

If YES what was the advice? ____________________________

____

____

15) Do you know what diabetics should do if they feel a hypo starting during exercise? ____________________________

____

____

16) Were you actively encouraged to exercise by the diabetic clinic staff when FIRST diagnosed diabetic? (Please circle your answer)

YES NO

17) Circle any of the following statements which are true for you: -

If I decided to exercise regularly it would be because:-

a. I want to feel fitter physically.

b. I want to feel better psychologically.

c. I want a challenge.

d. I want to keep my weight down.

e. My family and/or friends have also started to exercise.

f. I want to feel good about myself.

h. I wouldn't have to take so much insulin.

i. I need to get fit to play in a team or do a particular sport.

j. I want to lessen the chances of diabetic complications in the future.

k. I want to get "addicted" to it.

l. I want to be good at it.

m. I want to have fun.

18) Would you choose to exercise:- (Please circle you answer)

a. Alone..................................	YES	NO
b. With a partner........................	YES	NO
c. With the family.......................	YES	NO
d. With others..........................	YES	NO

19) Were you actively encouraged by anyone else to exercise when you were FIRST diagnosed? (Please circle you answer)

YES NO DON'T KNOW

If "YES" who was it? ____

20) Do the staff at the clinic ever ask about you about your exercise habits NOW? (Please circle your answer)

YES NO

21) Would you find it helpful to have someone to advise you on exercise at the clinic or on call to help you start your own programme? (Please circle you answer)

YES NO DON'T KNOW

22) Do you find it too hard to get motivated to excercise?

YES NO

23) What, if any, suggestions do you have that would help you to get motivated to exercise?____

____

____

24) Do you find any of the following can be reasons that you don't exercise? (Please circle any which apply to you)

a. Lack of time

b. Lack of money

c. Lack of facilities

d. Lack of energy

e. Lack of interest

f. Fear of having a hypo

g. Fear of being mugged/harmed when exercising outside

h. Fear of physical injury

i Feel too embarrassed

j Too much effort to get fit

k. Fear it may upset my diabetes control

l Lack of someone with whom to exercise

m. Physical discomfort

n. Having to adjust insulin/carbohydrate/ blood test

o Feeling poorly

p. Loss of ability to play sports at competitive level

q. Others: Please specify: ______________________________

THANK YOU FOR TAKING TIME AND TROUBLE TO ANSWER THESE QUESTIONS.

Appendix 10

SECTION 1 .... **ABOUT YOU.** ....

AGE__________ SEX__________ EMPLOYMENT STATUS________________

AGE ON LEAVING FULL-TIME EDUCATION____________

IN THE REST OF THIS SECTION, PLEASE CIRCLE THE ANSWERS THAT APPLY TO YOU.

Every day I smoke the following number of cigarettes -

- none
- less than 5
- 6 - 10
- 10 - 15
- over 15

I have had diabetes for -

- less that 2 years
- 2 - 5 years
- 5 - 10 years
- 10 - 20 years
- over 20 years

I have been attending my present diabetes clinic:

- ever since I was diagnosed
- for the last 2 years
- for the last 5 years

I consider myself to be:

- overweight
- underweight
- about right

At present, my health is.

- good
- moderate
- poor

SECTION 2 ABOUT YOU

Please read the following statement:

"REGULAR EXERCISERS ARE THOSE PEOPLE WHO EXERCISE AT LEAST 2 TIMES PER WEEK FOR 15 - 30 MINUTES SO THAT THEY ARE SLIGHTLY OUT OF BREATH."

Do you consider yourself to be a regular exerciser now? YES NO

Were you a regular exerciser:-

. 3 months ago . 6 months ago . 12 months ago . 2 years ago

. more than 2 years ago

If an insulin - dependent diabetic is a regular exerciser, would you expect exercise to help him/her:-

Stay slim................................YES NO

Use less insulin.......................YES No

Have stronger bones....................YES NO

Have lower cholesterol levels..........YES NO

Have better skin.......................YES NO

Have bigger muscles....................YES NO

Have lower blood glucose levels.........YES NO

Have less risk of heart attack..........YES NO

Have more hypos........................YES NO

Have less risk of strokes..............YES NO

Be more healthy........................YES NO

Before exercise, should diabetics change:

Earlier insulin levels..................YES NO

Amount of carbohydrate eaten............YES NO

5. Should diabetics test their blood glucose level:-

- Before exercise........................YES NO
- After exercise.........................YES NO
- During exercise........................YES NO

6. It is safe for diabetics to exercise if their blood glucose reading is:-

- Less than 4 m/mol......................YES NO
- Between 4 m/mol - 10 m/mol.............YES NO
- Between 10 m/mol -17 m/mol.............YES NO
- Over 17 m/mol..........................YES NO

7. During exercise, if a diabetic feel a hypo starting, should s/he:-

- Keep on going..........................YES NO
- Stop exercise..........................YES NO
- Take some insulin......................YES NO
- Take some glucose......................YES NO
- Test blood glocose level...............YES NO

SECTION 3 ABOUT THE CLINIC

1. Can you remember when you were first diagnosed as insulin-dependent, if anyone at the clinic ACTIVELY encouraged you to exercise?

YES NO

2. Do the staff at the clinic ever ask you about your exercise habits NOW?

YES NO

3. Have any of the staff at the clinic given you advice on how to exercise?

YES NO

4. Would you find it helpful to have someone to advise you about exercise when you visit the clinic for your regular appointments?

YES NO

REASONS FOR EXERCISE

Please indicate by a tick, your agreement or disagreement with each of the following reasons you might have for starting to exercise or for maintaing exercise.

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
To feel better physically.					
To feel better psychologically.					
To set myself a personal challenge.					
To keep my weight down.					
Because my family/friends do.					
To make me feel good about myself.					
To keep my blood sugar levels down.					
To keep my insulin requirements down.					
To train for a specific team/ sport.					
To help prevent future diabetic complications.					
To become good at it.					
Because the doctor told me to.					
Because I like it.					
To get rid of stress/ tension.					
To get out and meet people.					
To have fun.					

BARRIERS TO EXERCISE

Please indicate by a tick your agreement or disagreement with each of the following reasons you might find prevent you from exercising at all or from exercising as much as you would like to.

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
Physical injury or disability.					
Lack of time.					
Lack of money.					
Lack of interest.					
Lack of nearby facilities.					
Lack of energy.					
Fear of having a hypo.					
Too lazy.					
Too shy/embarrassed.					
Too much bother having to juggle insulin and carbohydrate.					
Too much effort needed to stay fit.					
Not a sporty-type.					
Too old/unfit to play sport at competive level.					
No one with whom to exercise.					
Too much hassle to do extra blood checks.					
Being overweight.					
Feeling too poorly.					
Fear of upsetting my diabetic control.					
Don't really know how to exercise safely.					

Appendix 11

SECTION 1 .... ABOUT YOU.........................

AGE_____ _____ SEX__ ____ JOB OR PROFFESSION______________

IN THE REST OF THIS SECTION, PLEASE CIRCLE THE ANSWERS THAT APPLY TO YOU.

Every day I smoke the following number of cigarettes:	none less than 5 6 - 10 11 - 15 over 15
I have had diabetes for:	less that 2 years 2 - 5 years 6 - 10 years 11 - 20 years over 20 years
I have been attending my present diabetes clinic:	ever since I was diagnosed for the last 2 years for the last 5 years or more
Every day, I inject insulin	twice three times four times continuous infusion
I am using a pen injection device	YES NO

I consider myself to be:

overweight

underweight

about right

At present, my health is:

good

moderate

poor

SECTION 2 ABOUT EXERCISE

Please read the following statement:

> "REGULAR AEROBIC EXERCISERS ARE THOSE PEOPLE WHO EXERCISE AT LEAST 3 TIMES PER WEEK FOR NO LESS THAN 20 MINUTES SO THAT THEY ARE SLIGHTLY OUT OF BREATH. THE EXERCISE IS USUALLY EITHER BRISK WALKING, SWIMMING, CYCLING, JOGGING, KEEP-FIT, CANOEING, FOOTBALL OR RUNNING GAMES".

Taking the above statement as a description of a regular, aerobic exerciser

Did you ....exercise regularly in the past but are not doing so currently?

YES NO

PLEASE READ ALL OF THE FOLLOWING STATEMENTS AND CIRCLE THE LETTER OF THE ONE WHICH BEST DESCRIBES YOU NOW:-

(a)I currently exercise regularly and have done so for more than 6 months

(b)I currently exercise but not regularly

(c)I currently exercise regularly but have only just started to do so in the last 6 months

(d)I currently do not exercise regularly but am thinking of starting in the next 6 months

(e)I currently do not exercise regularly and do not intend to start in the next 6 months

PLEASE CIRCLE "YES" OR "NO" AFTER READING EACH OF THE FOLLOWING:-
BEFORE taking part in an exercise session, an insulin-dependent diabetic should have:-

taken a blood glucose reading.............................. YES NO

eaten at least 1 Mars bar..................................YES NO

eaten the usual amount of mealtime exchanges of carbohydrate..YES NO

eaten fewer exchanges of carbohydrate than normal..........YES NO

eaten a few extra exchanges of carbohydrate............... YES NO

injected extra units of insulin at the preceeding injection time..YES NO

injected fewer units of insulin at the preceeding injection time... YES NO

injected the usual amount of insulin.......................YES NO

When an insulin-dependent diabetic has completed a period of vigorous exercise, s/he should:-

take some extra insulin.......................................YES NO

lie down and rest for 15 minutes..........................YES NO

test blood glucose levels immediately.................... YES NO

always take a sugary drink....................................YES NO

take extra carbohydrate only if blood glucose levels are low.. YES NO

test blood glucose 2 hours after exercise .... YES NO

Is it safe for diabetics to exercise if their blood glucose reading is:

Less than 4 m/mol.......................................YES O

Between 4 m/mol - 7 m/mol......................... YES NO

Between 8 m/mol -14 m/mol........................ YES NO

Over 14 m/mol.. YES NO

During exercise, if a diabetic feel a hypo starting, should s/he:

Keep on going.. YES NO

Stop exercise.. YES NO

Take some insulin...YES NO

Take some glucose... YES NO

Test blood glucose level.................................. YES NO

After a period of vigorous exercise, would you expect a well controlled diabetic's blood glucose levels to:-

rise..YES NO

fall.. YES NO

stay the same...YES NO

SECTION 3 ABOUT THE CLINIC

When you were first diagnosed as insulin-dependent, did anyone at the clinic tell you that you should exercise regularly for good health?

YES NO

Have any of the staff at the clinic given you advice on how to exercise safely?

YES

Do the staff at the clinic ever ask you about your exercise habits NOW?

YES NO

Would you find it helpful to have someone to advise you about exercise when you visit the clinic for your regular appointments?

YES NO

REASONS FOR EXERCISE

Please indicate, by a tick, your agreement or disagreement with each of the following reasons *you* might have for starting to exercise or for maintaining exercise.

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
To feel better physically.					
To feel better mentally					
To set myself a personal challenge.					
To keep my weight down.					
Because my family/friends do.					
To make me feel good about myself.					
To keep my blood sugar levels down.					
To keep my insulin requirements down.					
To train for a specific team/ sport.					
To help prevent future diabetic complications.					
To become good at it.					
The doctor told me to.					
To get rid of stress/ tension.					
To get out and meet people.					
To have fun.					
To keep my heart healthy					
The B.D.A. recommend it.					
To be part of a team/ group					

BARRIERS TO EXERCISE

Please indicate, by a tick, your agreement or diagreement with each of the following reasons you might find prevent <u>you</u> from exercising at all or from exercising as much as <u>you</u> would like to.

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
Physical injury or disability.					
Lack of time.					
Lack of money.					
Lack of interest.					
Lack of nearby facilities					
Lack of energy.					
Fear of having a hypo.					
Too lazy.					
Family/partner doesn't like exercise					
Too much bother having to juggle insulin and carbohydrate.					
Other hobbies come first					
Not a sporty-type.					
No team/group to join					
No one with whom to exercise.					
Too much hassle to do extra blood checks.					
Feeling too poorly.					
The weather is too bad					
There's just too much to do every day					

Appendix 12

For further information...

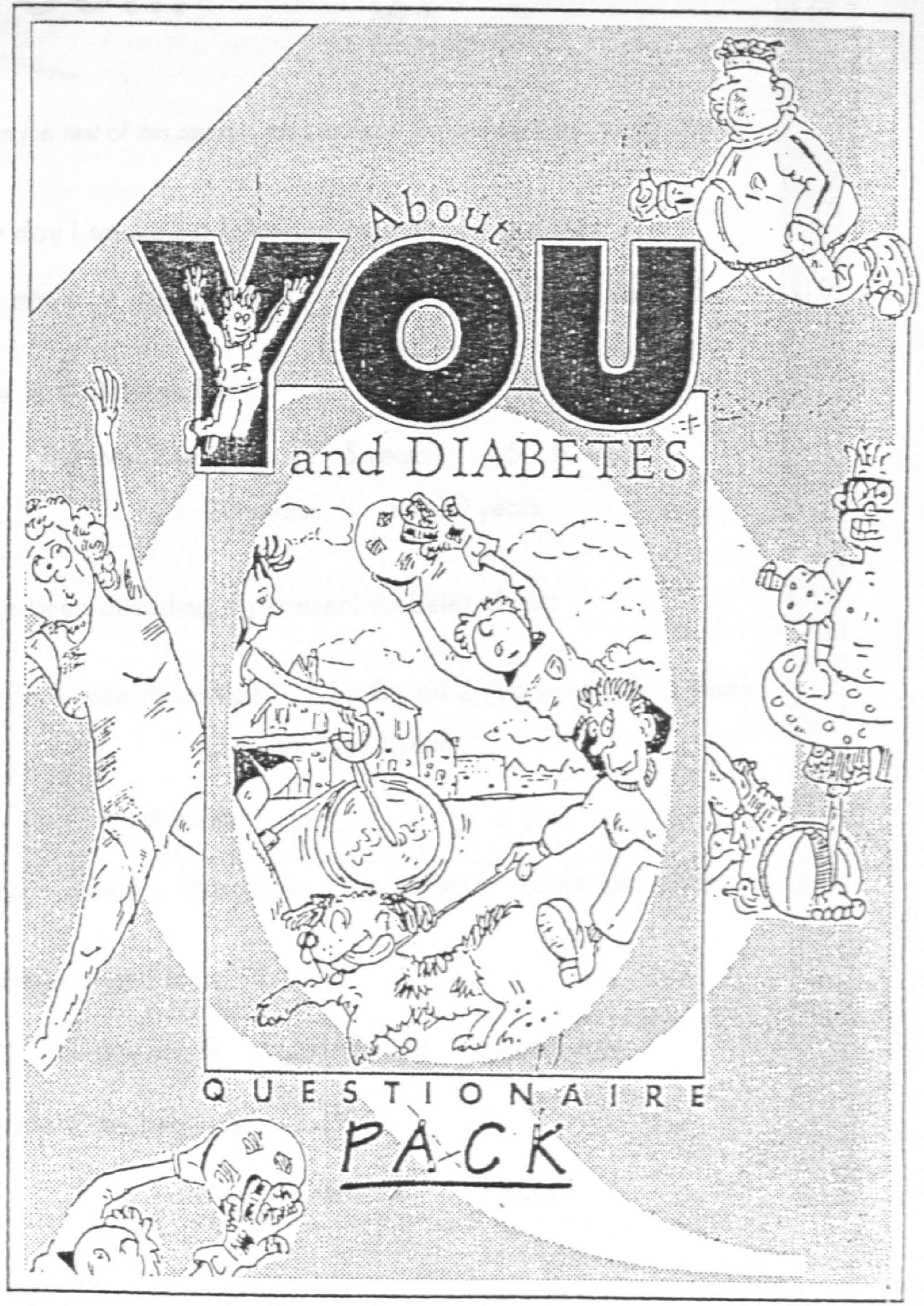
About

YOU

EXERCISE
and DIABETES

Contact:

Elizabeth Marsden,
University of Paisley, Faculty of Education,
Craigie Campus in Ayr, Beech Grove, Ayr KA8 0SR
Telephone: (0292) 260321



Do you blame your diabetes for stopping you doing things?	Always	Usually	Sometimes	Never
Does your diabetes cause you to lose your temper or shout?	Always	Usually	Sometimes	Never
Do you get edgy when out and there is nowhere to eat?	Always	Usually	Sometimes	Never
Do you worry about going into a diabetic coma?	Always	Usually	Sometimes	Never
Do you look forward to the future?	Always	Usually	Sometimes	Never
Do you have a nagging fear of hypos?	Always	Usually	Sometimes	Never
Because of your diabetes do you worry about getting colds or flu?	Always	Usually	Sometimes	Never
Does talking or thinking about your diabetes get you upset or feeling down hearted?	Always	Usually	Sometimes	Never
Do you find it frightening or worrying going into busy or crowded shops?	Always	Usually	Sometimes	Never
Because of diabetes do you find life a struggle?	Always	Usually	Sometimes	Never
Because of your diabetes are you unhappy or depressed?	Always	Usually	Sometimes	Never
Are visits to the diabetic clinic helpful to you?	Always	Usually	Sometimes	Never
Do you feel you would be second choice for a job because you have diabetes?	Always	Usually	Sometimes	Never
Do you feel you cope with your diabetes as well as other people like you?	Always	Usually	Sometimes	Never
Are there more arguments or upsets at home than there would be if you didn't have diabetes?	Always	Usually	Sometimes	Never

WELL DONE! You have completed this questionnaire. .

Thank you for helping in this very important reaearch.

Do not write in this column

About YOU...

Age .... Sex 5,6

Job or 7

Profession 8,9

in the rest of this section, please circle the answers that apply to you

Every day I smoke the following amount of cigarettes:

none less than 5 6-10 11 - 15 over 15 10

I have had diabetes for:

less than 2 years 2 - 5 years 6 - 10 years 11

11 - 20 years over 20 years

I have been attending my present diabetes clinic:

ever since I was diagnosed for the last 2 years 2 - 5 years 12

longer than 5 years

Every day I inject insulin:

once twice three times four times continuous infusion 13

I consider myself to be:

overweight underweight about right 14

At present, my health is:

good moderate poor 15

Do not write in this column

17

YOU and Exercise

Please read the following statement:

"Regular aerobic exercisers are those people who exercise at least 3 times per week for no less than 20 minutes so that they are slightly out of breath. The exercise is usually either brisk walking, swimming, cycling, jogging, keep-fit, canoeing, football or running games"

Taking the above statement as a description of a regular, aerobic exerciser

Did you.... Exercise regularly in the past but are not doing so currently? Yes No 16

Please read all of the following statements and circle the letter of the one (and only one) which best describes you now: 17

a I currently exercise regularly and have done so for more than 6 months

b I currently exercise but not regularly

c I currently exercise regularly but have only just started to do so in the last 6 months

d I currently do not exercise regularly but am thinking of starting in the next 6 months

e I currently do not exercise regularly and do not intent to start in the next 6 months

Please circle Yes or No after reading each of the following:
Before taking part in an exercise session, an insulin-dependent diabetic should have:

taken a blood glucose reading	Yes	No	18
eaten at least 1 Mars bar	Yes	No	19
eaten the usual amount of mealtime exchanges of carbohydrate	Yes	No	20
eaten fewer exchanges of carbohydrate than normal	Yes	No	21
eaten a few exchanges of carbohydrate	Yes	No	22

YOU and Diabetes

Please answer the questions below by circling the answer that is true for you. Please do not spend a lot of time thinking about each question in detail, as we are interested in your first reaction.

Do you avoid going out if your sugars are on the low side?	Always	Usually	Sometimes	Never
Do you throw things around if you get upset or lose you temper?	Always	Usually	Sometimes	Never
Do you hurt or feel like hurting yourself when you get upset?	Always	Usually	Sometimes	Never
Do you wish your diabetes would just go away when things get on top of you?	Always	Usually	Sometimes	Never
Do you worry about doing too much and going hypo?	Always	Usually	Sometimes	Never
Do you let your diabetes go if you are worried or upset?	Always	Usually	Sometimes	Never
Do you lose your temper if people keep on at you about sugar testing or diet?	Always	Usually	Sometimes	Never
Do you avoid going out too far on your own in case of hypos?	Always	Usually	Sometimes	Never
Because of your diabetes do you cry or feel like crying?	Always	Usually	Sometimes	Never
Do you find yourself losing your temper over small things?	Always	Usually	Sometimes	Never
Do you get tension headaches?	Always	Usually	Sometimes	Never
Do you get touchy or moody about diabetes?	Always	Usually	Sometimes	Never
Because of your diabetes do you get depressed?	Always	Usually	Sometimes	Never
Do you even for a moment wish you were dead?	Always	Usually	Sometimes	Never
Do you wish that you had never been born?	Always	Usually	Sometimes	Never

YOU and Exercise Motivation

Do any of the following reasons for exercising encourage you to want to start an exercise programme or to maintain your present exercise levels? *(please circle the answer closest to the way you feel)*

					not write in this column
To feel better physically	Strongly agree	Agree	Disagree	Strongly disagree	78
To feel better mentally	Strongly agree	Agree	Disagree	Strongly disagree	79
To set myself a personal challenge	Strongly agree	Agree	Disagree	Strongly disagree	80
To keep my weight down	Strongly agree	Agree	Disagree	Strongly disagree	81
Because my family /friends do	Strongly agree	Agree	Disagree	Strongly disagree	82
To make me feel good about myself	Strongly agree	Agree	Disagree	Strongly disagree	83
To keep my blood sugar levels down	Strongly agree	Agree	Disagree	Strongly disagree	84
To keep my insulin levels down	Strongly agree	Agree	Disagree	Strongly disagree	85
To train for a specific team/sport	Strongly agree	Agree	Disagree	Strongly disagree	86
Preventing future diabetic complications would be an important reason to excercise	Strongly agree	Agree	Disagree	Strongly disagree	87
To become good at it	Strongly agree	Agree	Disagree	Strongly disagree	88
The doctor told me to	Strongly agree	Agree	Disagree	Strongly disagree	89
To get rid of stress/tension	Strongly agree	Agree	Disagree	Strongly disagree	90
To get out and meet people	Strongly agree	Agree	Disagree	Strongly disagree	91
To have fun	Strongly agree	Agree	Disagree	Strongly disagree	92
To keep my heart healthy	Strongly agree	Agree	Disagree	Strongly disagree	93
The B.D.A. recommend it	Strongly agree	Agree	Disagree	Strongly disagree	94
To be part of a team/group	Strongly agree	Agree	Disagree	Strongly disagree	95

			not write in this column
injection time	Yes	No	23
injected fewer units of insulin at the preceding injection time	Yes	No	24
injected the usual amount of insulin	Yes	No	25

When an insulin-dependent diabetic has completed a period of vigorous exercise, he/she should:

take some extra insulin	Yes	No	26
lie down and rest for 15 minutes	Yes	No	27
test blood glucose levels immediately	Yes	No	28
always take a sugary drink	Yes	No	29
take extra carbohydrate only if blood glucose levels are low	Yes	No	30
test blood glucose 2 hours after exercise	Yes	No	31

It is safe for diabetics to exercise if their blood glucose reading is:

Less than 4 m/mol	Yes	No	32
Between 4m/mol - 7 m/mol	Yes	No	33
Between 8 m/mol - 14 m/mol	Yes	No	34
over 14 m/mol	Yes	No	35

During exercise, if a diabetic feels a hypo starting, should he/she:

Keep on going	Yes	No	36
Stop exercise	Yes	No	37
Take some insulin	Yes	No	38
Take some glucose	Yes	No	39
Test blood glucose level	Yes	No	40

After a period of vigorous exercise, would you expect a well controlled diabetic's blood glucose levels to:

rise	Yes	No	41
fall	Yes	No	42
stay the same	Yes	No	43

12c

About YOU and the Clinic

Do not write in this column

When you were first diagnosed as insulin-dependent, did anyone at the clinic tell you that you should exercise regularly for good health?	Yes	No	44
Have any of the staff at the clinic given you advice on how to exercise safely?	Yes	No	45
Do the staff at the clinic ever ask you about your exercise habits now?	Yes	No	46
Would you find it helpful to have someone to advise you about exercise when you visit the clinic for your regular appointments?	Yes	No	47
Do you use a blood glucose meter?	Yes	No	48
If you answered Yes please tell us... What make is the meter?			49
How long have you used this make?			51,52
Are you fully satisfied with it?	Yes	No	53
Do you use a pen injection device?	Yes	No	54
If you answered Yes please tell us... What is the name of the pen?			
Is it reliable?	Yes	No	55
Is it easy to use?	Yes	No	56

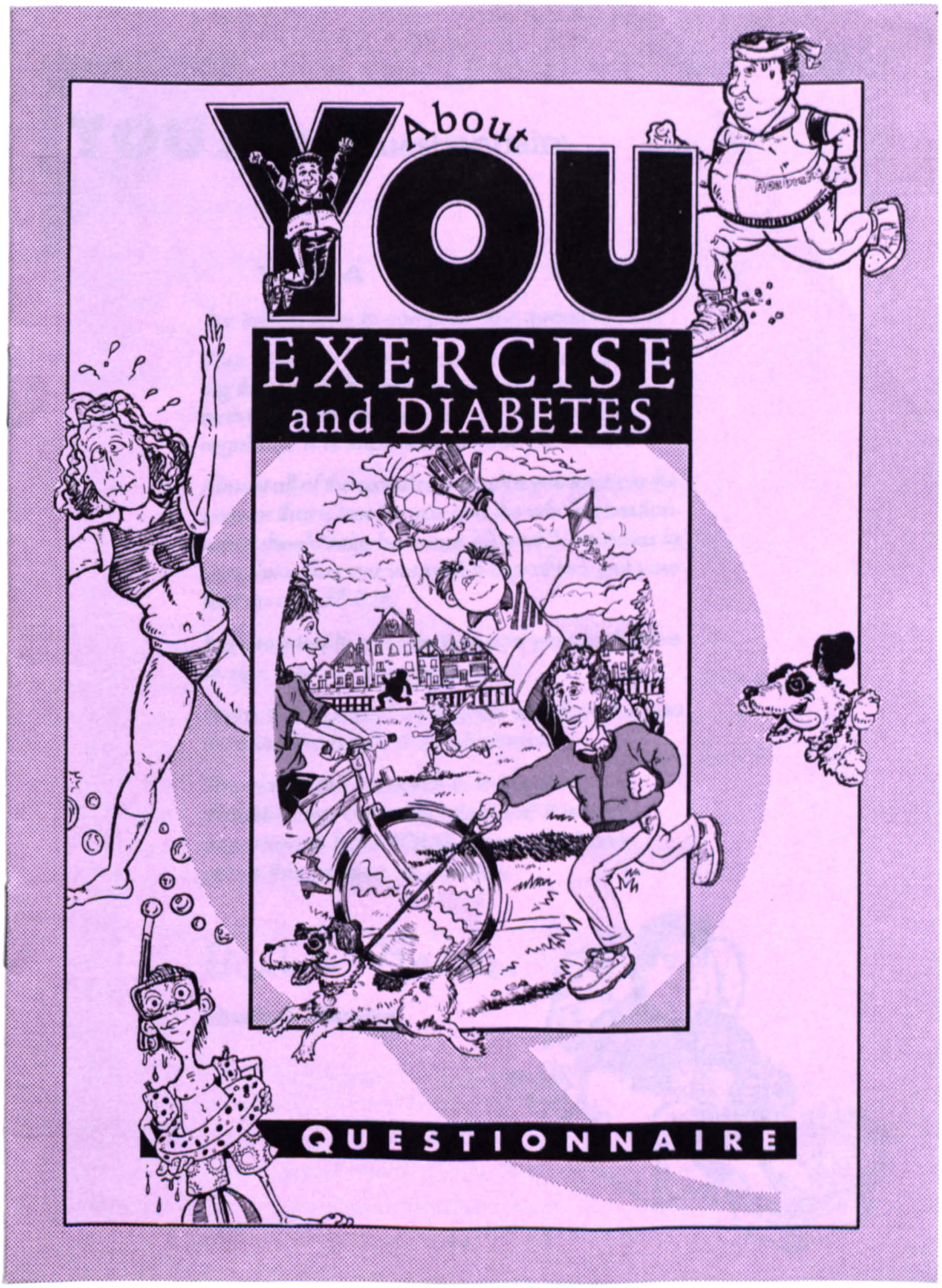
About YOU and Exercise Barriers

Do any of the following barriers prevent you from exercising at all or as much as you would like? *(please circle the answer closest to the way you feel)*

Do not write in this column

Physical injury or disability	Never	Hardly at all	Sometimes	Always	57
Lack of time	Never	Hardly at all	Sometimes	Always	58
Lack of money	Never	Hardly at all	Sometimes	Always	59
Lack of interest	Never	Hardly at all	Sometimes	Always	60
Lack of nearby facilities	Never	Hardly at all	Sometimes	Always	61
Lack of energy	Never	Hardly at all	Sometimes	Always	62
Fear of having a hypo	Never	Hardly at all	Sometimes	Always	63
Too lazy	Never	Hardly at all	Sometimes	Always	64
Family / Partner doesn't like exercise	Never	Hardly at all	Sometimes	Always	65
Too much bother having to juggle insulin and carbohydrate	Never	Hardly at all	Sometimes	Always	66
Other hobbies come first	Never	Hardly at all	Sometimes	Always	67
Not a sporty-type	Never	Hardly at all	Sometimes	Always	68
No team/group to join	Never	Hardly at all	Sometimes	Always	69
No one with whom to exercise	Never	Hardly at all	Sometimes	Always	70
Too much hassle to do extra blood checks	Never	Hardly at all	Sometimes	Always	71
Feeling too poorly	Never	Hardly at all	Sometimes	Always	72
The weather is too bad	Never	Hardly at all	Sometimes	Always	73
There's just too much to do every day	Never	Hardly at all	Sometimes	Always	74

Appendix 13



About
YOU
EXERCISE
and DIABETES
QUESTIONNAIRE

NORTH AYRSHIRE AND ARRAN NHS TRUST

CROSSHOUSE HOSPITAL

AYRSHIRE CENTRAL HOSPITAL
ARRAN WAR MEMORIAL HOSPITAL

Crosshouse Hospital
KILMARNOCK
Ayrshire KA2 0BE
Tel: 0563 21133
Fax: 0563

Our Ref: Your Ref: If 'phoning ask for:

[illegible]

[illegible]
[illegible]
[illegible]

Dear [illegible]

I would be most grateful if you would take the time to fill out the enclosed Exercise Questionnaire and return it in the envelope provided. Elizabeth Marsden has been working with people with diabetes at Crosshouse Hospital for about three years and has our full support in her research. We believe that this work will help improve the quality of life for many diabetics in Britain and we would urge you to return your questionnaire whether you are a regular exerciser or a confirmed 'couch potato'. Your opinion is very important to us and you can be assured it is completely confidential. Should you have any questions about the study, please ring Sister Barbara Stewart at the Hospital and she will be pleased to answer

Yours sincerely

J NIALL MacPHERSON
CONSULTANT PHYSICIAN

enc

Appendix 14

GREATER GLASGOW HEALTH BOARD
WESTERN INFIRMARY/GARTNAVEL GENERAL HOSPITAL UNIT

Our Ref ....

Your Ref ....

If phoning
ask for ....

Gartnavel General Hospital
1053 Great Western Road
Glasgow G12 0YN
Tel No 041-211 3000
Fax No 041-357 4552
Direct Line

June 8th,1994

Dear

We have had many replies to the Exercise Questionnaire from the people in Gartnaval Diabetes Clinic and feel very grateful to receive their views and opinions. These will help to shape both education and provision of services for people with diabetes in the furure. However, **your** opinion is equally important and to get a better idea of what is happening in real life, I would ask your patience in completing the Questionnaire that we sent out a few weeks ago and mailing it back to us as soon as possible. If you have lost the Questionnaire and would like another, then please call :-

> 0292-260321 (University of Paisley,Craigie Campus) and ask for extension 283. You will either get me or the answer-machine. If you leave your name and address, I will send a questionnaire straightaway.

Your opinions ARE important to us.

Yours sincerely,

Elizabeth Marsden and Dr. Michael Small

Appendix 15

Appendix 15

Descriptive Results of Subjects (Study 2)

a) Sex:-

Males	Females
51%	49%

b) Employment status:

Employed	Unemployed	Retired	Student/at school
47%	25%	21%	7%

c) Smoking status (per day):

none	<5	6-10	11-15	>15
76%	3%	6%	5%	10%

d) Number of daily injections:-

1	2	3	4	CI
2%	74%	5%	19%	0.1%

e) Weight status:

overweight	underweight	about right
43%	3%	54%

f) Health status:-

good	moderate	poor
53%	39%	8%

g) length of attendance at present clinic:-

since diagnosis	<2yrs	2-5yrs	>5yrs
37%	10%	17%	36%

h) length of time since diagnosis:-

<2yrs	2-5yrs	6-10yrs	11-20yrs	>20yrs
4%	18%	22%	31%	25%z

Appendix 16

Full knowledge scores of subjects (study 2)

"Before taking part in an exercise session, an insulin dependent diabetic should have :-

	yes	no
taken a blood glucose reading	72%	28%
eaten at least one Mars bar	28%	72%
eaten the usual amount of carbohydrates	62%	38%
eaten fewer exchanges than normal	18%	82%
eaten a few more exchanges	67%	33%
injected extra insulin at previous injection	14%	86%
injected less insulin at previous injection	87%	13%
injected the usual amount	78%	22%

" When an insulin dependent diabetic has completed an exercise session, s/he should:-"

	yes	no
take some extra insulin	15%	85%
lie down and rest for 15 minutes	37%	63%
test blood glucose levels immediately	57%	43%
always take a sugary drink	31%	69%
take extra carb. only if blood glucose is low	80%	20%
test blood glucose 2 hours after exercise	57%	43%

"

It is safe for diabetics to exercise if their blood glucose reading is:"

	yes	no
less than 4mmol/l	16%	84%
between 4 and 7mmol/l	47%	53%
between 8 and 14mmol/l	77%	23%
over 14mmol/l	74%	26%

"During exercise, if a diabetic feels a hypo starting, should s/he:"

	yes	no
keep on going	12%	88%
stop exercise	82%	18%
take some insulin	15%	85%
take some glucose	89%	11%
test blood glucose level	73%	23%

" After a period of vigorous exercise, would you expect a well-controlled diabetic's blood glucose level to:"-

	yes	no
rise	20%	80%
fall	70%	30%
stay the same	40%	60%

Appendix 17

INDIVIDUAL INTERVIEW WITH CONSULTANT (Hospital a)

This interview was somewhat strained as the consultant was quite adamant that he would not allow the tape recorder in the room. This corresponds with the reluctance that I found when dealing with the setting up of a data base of registered IDDMs in order to mail out the Exercise and Diabetes Questionnaire in Study 2. The consultant did not allow me access to patient names and addresses but did arrange for the hospital administration to mail out the Questionnaires directly. All the information and comments made during this interview was recorded from memory within 30 minutes of the interview but may not be a true representation of all the information given.

The consultant exercised himself and was interested in competitive sport. His reflections throughout the interview were directed at young people. He found it difficult to think about older people doing much physical activity though in general he was positive about the benefits of exercise. He was unaware that his own staff had just produced some information about exercise in a pack that they had put together and believed that they did not have any resources about exercise. There does seem to be a certain lack of communication and I do not think an exercise specialist would be welcomed unless s/he had a medical training.

INDIVIDUAL INTERVIEW WITH CONSULTANT (Hospital a)

1) " It's a much higher figure than I would have expected. I would guess that only about 5% exercise regularly. For instance, we took a group of teenagers away to Barcaple and they cut their insulin by half but they kept eating non stop and just had all the signs of non exercisers. So if they don't exercise and they're just young, why should we expect the others to?

2) Yes, I would like to see more exercise because of helping with self-esteem, well being, insulin sensitivity and cardiac risk factors like blood lipids.

3) I don't think we can expect them to take on board exercise when they have to change so much else. It's okay if they already exercise before they are diagnosed but to try to get them to start when they're diagnosed as well as everything else... well, you just can't expect it. It's low down on the list if you like.

4) Yes, we don't have much. That's another thing, a lot of them get told that they have to give up sports etc. when they become diagnosed. If you look at instructional things they often say "before you take up something,like jogging, check with your doctor". Well, that puts them off straightaway. We had a young chap who played fro the local rugby club who was devastated when he came to see us because his own GP had told him that now he was a diabetic, he'd have to give up the rugby. He said he could still play cricket but not rugby! We told him that that just isn't true. They still get told such stupid things from their GPs sometimes. There isn't any education input for the GPs. It used to be as bad in the hospitals when we just had SHOs but now we have clinical people who are interested in diabetes and who receive some training in it.

5) Yes . we don't have any.

6) It would be good if they did more on exercise because exercise is cheap.

7) We ask straightaway when they're diagnosed, if they exercise. If they don't, then we don't push it. But if they do then we have to tell them how to adjust insulin and to do the blood monitoring.

8) We try to get them to realise that it's important to test blood glucose several hours after exercise rather than just straight after. They would probably be best to start exercise with levels at 9-10 m/mol. We don't give them an upper limit or advise them not to exercise if it's above a certain limit. Look at Gary Mabbut who says he would never go onto the pitch with one lower than 20m/mol.

9) No, I don't have one.

10) Yes, I play a lot of football and cycle. I used to do a lot of swimming. But I have an injury just now and I can't do much and it really frustrates me. I get very fed up when I can't exercise. It definitely affects me."

Appendix 18

GROUP INTERVIEW (Hospital a)

This took place in Hospital a on July 26th 1994 at 12.30 p. m. The group was also without the consultant as he was unavailable that day. It consisted of two specialist diabetic sisters; one dietitian and one chiropodist. The one other Physician was on holiday. The group were very relaxed from the beginning . The reoccurring theme coming from the specialist sisters and the dietician was the difficulty of motivating patients to do anything that they do not really want to ; exercise being one of these things. There was a slight feeling of depression amongst the team as they felt that patients will not organise things or take control of improving their own quality of life. They will come to things that the team organise but as soon as the course is finished, they go back to their old ways. One specialist sister felt that the most important thing would be introducing methods of motivating patients to change their lifestyle because at present, she felt completely helpless in improving the situation.

Unfortunately, there was a loose wire in the recording equipment and the result was a difficulty in play-back. I overcame this as best as possible by immediately transcribing the tape myself while I could recall indiscernible sections of the recording.

TRANSCRIPTION OF INTERVIEW (Hospital a)

Interviewer:- " In order to have a common understanding of what an exerciser is, I'd like to read the definition that I gave in the Exercise Questionnaire:

"Regular aerobic exercisers are those who exercise for at least 3 times a week for 20 mins or more so that they are slightly out of breath. The exercise is usually either brisk walking, swimming, cycling, jogging, keep fir, canoeing, football or running games".

The recent survey carried out showed that 28% said that they are regular exercisers. Does this figure surprise you or would you say that is what you would expect?

All:- hmm, well, aah

Nurse 1:- "I think that is quite high. I wouldn't have expected that many to say they do"

Dietitian:- "When I ask patients if they exercise, very few say they do . They usually have some excuse like my leg is sore.."

Nurse 2:- :Or I'm too tired or something. It's surprising what they can think up?

Interviewer:-"So what you're saying is that from what you see, very few of your patients in this clinic actually exercise."

Chiropodist:-"We get some, usually the younger ones, who are quite keen".

Interviewer:-"Would you like to see more IDDMs exercise regularly?"

Nurses 1 & 2:-"Definitely"

Chiropodist:I think it's really important."

Interviewer:-"Why?"

Chiropodist:" Cardiovascular protection"

Nurse 2:-" Their insulin requirements are less"

Dietitian:-" Weight loss is important, even with the younger ones, especially the girls."

Nurse 1:-" It's a matter of good health, general health education. It's important as a whole package along with diet and insulin regime".

Chiropodist:_ "It makes them feel better."

Interviewer:-"What do you mean,B? Can you explain a bit more fully?"

Chiropodist:-" People feel better if they exercise."

Dietitian:-" Do you mean they feel better because they've achieved something?"

Chiropodist:- "Yes."

Dietitian:-"It makes them feel normal if they can exercise the same as other people"

Nurse 1:-"It's a great excuse, being diabetic"

Interviewer:-"You mean for not exercising?"

Nurse 2:-"For not doing all sorts of things! They often blame diabetes for everything and say"oh! I can't do that because I'm a diabetic". It gets them off the hook...at least they think it does."

Nurse 1:-" That's true. Sometimes it's so hard to get them to do anything...not just exercise"

Interviewer:- "Are you saying that diabetics are apathetic?"

Nurses 1 & 2 &Dietitian."Absolutely."

Nurse 1:-"To try to get them motivated to do anything they don't want to is impossible"

Dietitian:-"Diet is the same"

Nurse 1:-"If we knew how to motivate them to exercise maybe it would help us to motivate them to do other things"

Interviewer:-"I think you are answering my next question which is 'do you have any suggestions about tying to improve the number of IDDMs who exercise?'"

Nurse 2:-"It is no trouble if the idea is already in their heads but if not ..well. you're wasting your time"

Nurse 1:-"How did you get on with the group of patients in your pilot study?"

Interviewer:-"DO you mean getting them motivated and did they stick at it?"

Nurse 1:-"Yes"

Interviewer:-"Well as you know I lost X because he changed address in the middle of the study.."

Nurse 2:-" I haven't seen him for ages, come to think of it"

Interviewer:-"But as far as the others were concerned, they all stuck to their plans but I had spent a lot of time exercise counselling them and encouraging them to chose how and when they were going to do their exercise"

Chiropodist:-"Were they also able to choose what type of exercise to do"

Interviewer:-"Yes, that was important that they chose something that they want to do and which interests them. The other thing to remember was that I was in touch with them every week so they were really motivated to keep going with it"

Nurse 1:-"That's the trouble, we don't have the personnel or the time to do that kind of thing'

Dietitian:-"Also, there isn't anyone who actually has the responsibility for exercise. We have the nurses, the chiropodist, the dietitian but while we all mention exercise, no one is responsible for it".

Interviewer:-"It may interest you to know that one of the questions on the questionnaire was "Would you like an exercise adviser to help at the clinic?" and two out of three diabetics said they did".

Nurse 2:-" The clinic might not be the right place

Dietitian:" Yes, they already see so many people and have to take in a lot of information that if we gave them anymore they would shut off."

Nurse 2:" But if we were able to refer them to someone"

Nurse 1:" Yes, some specific person and then tell them they are to make an appointment with this person....that might work"

Interviewer:"Would it help if you had more resources to help in putting over the exercise message or do you feel you already have enough?"

Nurse 1 & 2:" I think we have enough leaflets..the drug companies usually have some."

Nurse 1:" And we've just put together our own pack with some information on exercise in it"

Interviewer:" Could you let me see a copy of that when you've finished it?"

Nurse 1:" Yes "

Chiropodist:"We probably most need a person to advise rather than more packs. Most don't read the packs anyway. Some do. But the person would be the most valuable resource"

Interviewer:"Do you think the research community should be spending more time and money in finding out if exercise does have special benefits for diabetics or do you think other things are more important?"

Nurse 1:"I think we definitely need research into how to motivate them to exercise. It wouldn't really help to just tell them to do it because the research said its going to stop them having comlications etc. Motivation is just so hard.

Chiropodist:" I think it would be useful if we KNEW that the research did "prove" that exercise helped their cardiovascular system because we could then tell them that it definitely does not that it might improve their chances of staying healthy. The trouble is that exercise doesn't have any immediate noticeable benefit"

Dietitian:" It's the same with diet education, there is no immediate effect and they have to work hard at something like weight loss"

Nurse 1:" Part of the problem we have too is that some diabetics do everything wrong and don't care and they get away with no complications. We also get the few who no matter how well they look after themselves,try really hard, do everything they are told and yet they get every complication going"

Interviewer:" It seems that motivation for you is the hardest thing to achieve with your patients and that any research into motivation would be the most useful for the patients here?"

Nurse 1:"Yes"

Interviewer:"Would you with a newly diagnosed diabetic, wait a few months before giving any advice about exercise or would you wait until they ask?"

Dietitian:" It would be sooner that a few months"

Nurse 1:" Probably within a few weeks"

Nurse 2:"It really depends on how you think they're absorbing the information about diabetic care and just introduce it when you think they are ready"

Dietitian:" everyone is very individual"

Interviewer:"What kind of exercise advice do you think it is best to give?"

Nurse 1:" We try to find out if they do any exercise already and go from there"

Chiropodist:" Usually if they exercise before they are diagnosed, then they will carry on. The problem is trying to get those interested who were never interested before they were diagnosed."

Interviewer:"Do you give any specific advice about blood testing and whether to keep their blood glucose levels?"

Nurse 2:" Probably the biggest fear is that they'll have a hypo. They don't mind running high sugar levels but they hate hypos"

Chiropodist:" Its the thing about there not being any immediate effect again....with a high sugar level they feel okay for the time being but with a low one and exercise, the effect will be very dramatic and immediate so they are going to be more concerned about that."

Dietitian:" I try to treat them individually. For instance, if weight is a problem, eating more carbohydrate before exercising is not a good idea so we would look at how to reduce insulin to fit in with the time of exercise."

Interviewer:"Do you,(Chiropodist), give any specific advice on sports shoes etc?"

Chiropodist:" I do if the person is already an exerciser. But again, I'M trying to guess at where the person is in their life. For instance, I would look at the shoes they've come to the clinic in and then talk about other shoes they wear for different activities in their lives. Time, or lack of it, is a problem in any clinic consultation"

Interviewer:"This is the last question for today.....Is exercise an important part of your lifestyle?"

Nurse 1:" Hmm..I hate to say it but definitely not.

Interviewer:"It's perfectly okay to confess this. A lot of people just do not like exercise."

Nurse 1:"Well, I don't!"

Chiropodist:" I do exercise the three times a week and I don't like it if I miss out."

Interviewer:"What do you mean?"

Chiropodist:" I just don't feel right"

Dietitian:L" DO you mean that you feel guilty?"

Chiropodist:" I probably do but that's not the main thing.....I just don't have the well-being if I don't exercise. I feel irritable and grumpy"

Interviewer:" So would you say that you do notice a difference in the way you feel psychologically?"

Chiropodist:" Oh, yes. I feel far less stressed and just generally better"

Dietitian:" Ah, that's your endorphins."

Interviewer:"What about you D?"

Dietitian:" I don't like it but I do 10 mins on the stair machine every morning because I know I'm supposed to exercise but I don't enjoy it"

Chiropodist:" I don't know how you do it if you don't like it. I choose things I enjoy"

Nurse 2:" I get a buzz off exercise but I don't do much in the winter because the weather is so horrible. In the summer I jog mostly. It makes me feel much better. If I get home from work really tired I have to exercise or I won't do anything all evening. I always feel better after the jog and get on and do all kinds of things afterwards."

Interviewer:"Would you say it makes you feel more vigorous?"

Nurse 2:" Without a doubt"

Nurse 1:" I 'm just too lazy to do it"

Interviewer:" I've taken up your lunch hour and I'd like to thank you for coming together and speaking so openly. Please be assured of your anonymity when the tape is transcribed. Thank you"

Appendix 19

GROUP INTERVIEW (Hospital b)

This group interview took place in Hospital b on September 26th,1994. It seemed difficult to arrange a time other than the coffee break, to get this group all together. The clinic had been especially busy this day and the coffee break was very short. The interview, therefore, was done in haste and the consultant particularly was ill at ease about not going straight back to the patients after drinking his coffee.

The members of staff present were three doctors and the consultant, both specialist sisters and the chiropodist. The dietitian was caught up with a patient and did not appear.

The group were a very open group and each had a lot to say and frequently spoke at the same time and across each other with the exception of one doctor who said very little. The main message coming across was that they had so little time to spend with each diabetic to do the"important things" that they certainly did not have time to talk about exercise!! The specialist nurses did ask on diagnosis about a patient's exercise habits as they were concerned that the patient did not suffer any hypos. The group did mention that exercise was good for cardiovascular function but not for metabolic control necessarily. In fact, they were very concerned about some of their patients who had become addicted and were quite "loopy" about it and were not doing themselves much good. They also expressed a concern about their body-builders. Only one person, a specialist nurse, mentioned the psychological benefits which can be gained. The group were not an exercising group generally themselves though the chiropodist and one nurse did exercise. The consultant is a hill climber but does not manage to go frequently.

It is too bad that time was so short for this interview as this group had so much to say!

TRANSCRIPTION OF INTERVIEW (Hospital b)

Interviewer: On the mailed questionnaire's in West of Scotland, I received a 73% return rate and have 1,035 completed questionnaires, what I found out was 28% of IDDMS say the exercise regularly. I gave them this definition of exercise: "Regular aerobic exercisers are those who exercise for at least 3 times a week for 20 minutes or more so that they are slightly out of breath. The exercise is usually either brisk walking, swimming, cycling, jogging, keep fit, canoeing, football or running games." Now 28% said the exercise regularly.

Several: (Laughter)

Interviewer: Is this figure a surprise to you?

Doctor 2: Oh, I think that is such a surprise.

All: Yes it is a surprise (laughter again).

Interviewer: Do you think this is too high a percentage then actually do it?

All: Yes/

Interviewer: You would estimate much less actually do it?

All: Yes.

Interviewer: Would you like to see more IDDMS exercise?

Several: Yes, yes.

Interviewer: Can you tell me why? Is it important do you think for them to exercise? (long pause)

Chiropodist: Could I say, please, in my line of work as a chiropodist, I would like to see more NIDDMs exercise because those are our high risk patients. These are the people who are more vulnerable in out estimation to very severe foot problems, and they're usually, in my experience, the heavy patients and they're less motivated.

Interviewer: Yes, this is what I've heard from the chiropodist. But, if you can concentrate on the IDDMS's just now.....

Chiropodist: Yes, yes. I would definitely like to see them exercising more often so that they could improve their circulation and hopefully delay some of the premature aging process in the arteries caused by diabetes. But we would have to stipulate conditions of exercise as so many of our patients have had severe foot problems and we would then assess them to be a risk of those problems occurring so we would stipulate that they only did certain exercises and avoided others.

Interviewer: Right

Chiropodist: If they had healed ulcers or biomechanical problems which would predispose to further ulceration we would ask for more non-weight bearing exercises such as swimming or even the cycling.

Interviewer: So these are people that you know have already had problems, what about the rest of you , do you have any opinions about your insulin using diabetics?

Doctor 3: We generally need to exercise more.

Interviewer: Would you like to tell me why ?

Doctor 3: The general population isn't exercising as much as the government's recommendations as the healthy heart campaign or whatever. I guess the diabetics within the general population are a high risk category for complications.

Interviewer: As far as cardiovascular complications go?

Doctor 3: Cardiovascular and any other complication.

Interviewer: Right. I think what you've said is that they are at a higher risk and so should be encouraged more.

Doctor 3: They're a target-group to concentrate on.

Interviewer: Right, and you're agreeing with that?

Doctor 2: Yes, and if you're got some of the ones with hypertension as well and you want to modify their lifestyle by including exercise, you can bring down their blood pressure, not vast amounts but quite significant amounts.....

Several: Ah.....Ha.

Doctor 2: ......Without the addition of pills and potions. So if they modify their lifestyle a little bit, they get significant benefits. And the West of Scotland has such an awful heart problem anyway, if you can stem the tide in a minute number of cases, then it's worth doing.

Interviwer: Anyone got anything else to add?

Doctor 1: From the point of view of diabetic control, it should be theoretically a good idea but our enthusiastic exercisers in the IDDMs are not notable as a group for their diabetic control. There are some who do have good diabetic control but there are some who have outstandingly bad control...

Doctor 2: I think you have to be careful about what you are advocating them doing, we don't suggest they take to the Glasgow Marathon or.....

Doctor 1 & 2: These tend to be the jogger types. You mean the luney ones?

Doctor3: They're a bit loopy.

Nurse1: I'm thinking of someone who....

Nurse2: But they compensate by eating more.

Doctor 3: These are some typical over exercisers rather than under exercisers.

Nurse1: Exercise generally......It does make you feel better psychologically. Psychologically if you feel better within yourself you might cope with things better. But, I don't think the people I'm thinking of, that that has helped their control. I might lower their blood sugar that day but it hasn't....

Chiropodist: Overall control.
Nurse2:

Interviewer: So, are you thinking then that feeling better and being better control might be linked up but when you do it yourself, you feel better?

Nurse 1: Yes.
Chiropodist: Yes.

Interviewer: Do you have any sort of experience of the people you know who exercise within you patients, feel better.

Chiropodist:

Nurse 1: Yes, Yes.
Nurse 2:

Interviewer: Do they tell you that?

Nurse 1: Yes
Chiropodist:

Interviewer: Do they seem a happier lot?

Doctor 2: I don't know that they seem happier. They say they feel better. But there are one or two I can think of who are completely obsessed with it.

Doctor 3: (mutter)
Doctor 4: Hmmm.

Nurse 1: They've become obsessive

Doctor 2: Exercise has gone beyond the bounds of rational behaviour.

Interviewer: Are these the ones you find are not in good control?

Doctor 2:
Doctor 4: Yes.

Doctor 2: But again they tend to be the 5-10% who are overexercising and not being realistic about it.

Chiropodist: Quite a few do martial arts.

Nurse 2: And the body builders.

Several: Oh yes the body builders.

Doctor 1: These are a group who cause concern as I don't think they are necessarily doing themselves good.

Several: Oh no.

Doctor 1: In our clinic, there are a large number of young men who are body building and I don't think that group would prove to have good control. And I worry about the hypertension.

Doctor 4: This doesn't actually correlate with what you term as aerobic exercise.

Interviewer: You're right. The definition I gave them was this (points to sheet) but of course when you mention exercise, people have an idea in their head about exercise and for some its body building, even though you say this is what I mean.

All: Yes, yes.

Interviewer: It is difficult when you ask somebody a question to know whether they've actually answered that question?

Nurse 1: Exercise does mean different things to different people.

Chiropodist: Yes

Interviewer: That's why I gave a definition. Well that's been quite interesting really tho' I know we're really pressed for time so I'll nip on to the next question which is have you any suggestions on how to improve the numbers of IDDMs who exercise? In a sensible way, aerobically if we think it's a good thing?

Doctor 2: Certainly, in an ideal world we would have plenty of time to sit down with each patient to talk to then which we just don't have. You could talk....I mean there's a lot of people who we could suggest, maybe no specific exercises, but lifestyle modifications including exercise. If you haven't got the time to do it, you sneak it in whenever you can. The only other thins is some sort of formalised leaflet suggesting suitable sorts of exercise if you are insulin dependent. And specifically mentioning that body building does not fall into the most desirable of categories, neither does running round Galson in army boots with a 10 ton pack, which one of them was doing the other day.

Doctor 4: Was it.....?

Doctor 2: No, not the person you are thinking of. He has given that up, he does it round Queen's Park now!

All: Laughter

Nurse 1: Perhaps we could have an exercise group.

Several: (Hoots of Laughter)

Doctor2: A leotard, I wear for no one.

Nurse 1: If you wear one, I'll wear one.

Interviewer: See again, that's fascinating. The word "exercise" gives this model of a person in a leotard.

Chiropodist: I never wear a leotard.

Nurse 2: But people should be doing exercise because they want to do it, not because they've forced because that defeats the purpose. You get quite a lot of the younger females who tying to lose weight and they join the aerobic and calinetics and that. But then it can be short lived. A lot depends on what their peer group is doing. An important part is saying to the patients "do exercise if you enjoy it" but not you've got to.

Several: No.
Not if you've got to
Not forced

Nurse 2: They have to pick something they like. There's nothing worse then being forces. It won't achieve anything.

Nurse1: There are some areas, I think in the States, that have an exercise group attached to the clinic. Er...... and they have to go through this exercise programme which must cause more stress.

Nurse 2: That lets me out.... I just wouldn't be there.

Nurse1: If you tell the patients they have to exercise, it'll stress them and they'll default and you'll never ever see then.

Doctor 2: There's a lot who feel the haven't got the time to do that. Where as if they can build it into their everyday life like if you go to work by bus and get off a few stops early and walk the last bit. Like John and you go whizzing up the stairs instead of taking the lift. Rather then prancing and dancing ...

Nurse 2: It's talking about life-style changes rather than putting it under the label of exercise.

Several: Yes

Doctor 3: Yes, In your lifestyle.

Nurse 2: That's why you have to be careful about using the word exercise.

Doctor 1: We have to be awfully careful about all the pressure we put on these people. If we start adding exercise as well.

Nurse 1: Yes they won't come.

Nurse 2: The word exercise can be very off putting.

All: Yes

Nurse 2: Including professionals.

Doctor 2: We know perfectly well what we should be doing but at times it's extremely difficult. By blood pressure's up and I'm overweight and you know perfectly well you should have your weight down and......

Nurse 1: Could you organise a swimming pool for us?

All: Laughter

Interviewer: So we know that from what you've said, it is obviously a problem?

All: Yes

Interviewer: For all sorts of reasons, its a problem and forcing someone is no good.

Doctor 3: No

Several : Not force

Doctor 2: And then they don't do the really important bits.

Doctor 1: The West of Scotland life is very exercise unfriendly for everyone.....for patients and ordinary citizens. You try to cycle in Ayrshire and its an uphill struggle and you take your life in your hands. The weather is against you. Were there things in general life that make it easier and more acceptable that would help.

Chiropodist: Perhaps if we had the time to go through each persons life style, even beginning with what do you do in the home? You could perhaps see that they are actually taking a lot of exercise. Some young women, for example, with young families, have to keep running up and down stairs and moving around a lot. When you're out pushing prams ect. you are taking a lot of exercise. But at the time you don't actually categorise it as exercise.

Interviewer: (I know you're worried about the time) One of the questions on the questionnaire was "Would it be helpful for you to have someone to advise on exercise at the clinic?" and 2 out of 3 said "yes". Now they might just have said that but we have discovered that in clinics chiropodists deal with foot problems, the dietitians with food, the nurses with insulin, the doctors with what's going on in the whole body but we haven't got anyone whose responsibility is exercise. This is maybe something you'll want to continue to discuss when you have more time.

Doctor 4: I think it is important but I don't think I'd like to see it formalised in a clinic situation.

Doctor 3: We could have Mr. Motivator in the corner.

Doctor 1: If someone has a research interest with the right kind of personality, it might be useful to develop it for a whole. I would hate to see a situation develop where it was yet another thing that was prescribed like an adolescent clinic and all the other interest groups which have are special area that they have pushed. But someone who was sympathetic and make themselves available could be quite useful for a whole.

Interviewer: Do you think you are under resourced in this area?

All: Yes!

Interviewer: Would you like posters, packs, Videos? Do you feel you haven't got enough to give to the diabetics?

All: Yes, all those things.

Doctor 2: We don't even have time to give them to the diabetics.

Nurse 2: We just don't have time.

Interviewer: Is lack of time to counsel them properly one of the biggest problems?

All: Yes. Never enough time.

Interviewer: Could you tell me what exercise advice you give to the diabetics. Do you give it to them when they're newly diagnosed? or only if they ask?

Nurse 2: We, as nurses, are looking at problems such as hypos so we are interested in exercise and their lifestyles and we specifically ask. And also what is normal for them as an individual and if they play any sports by differentiating, so we need to know where hypos are concerned so we can tell the patient how to deal with certain situations. We would do this fairly soon after diagnosis but on a one to one basis, not in a clinic setting. We do it in the diabetic day centre where we've spending a lot more time with that individual getting to know them as an individual and their life-style.

Interviewer: Do the doctors ever mention it in a consultation?

Doctor 3: Yes, Sometimes
Doctor 2:

Doctor 3: If it's appropriate, I think.

Interviewer: Is is when something hits you rather than as a regular thing?

Doctor 3: If there's an interest or a problem we can bring it in at that stage but we don't pursue relentlessly.

Doctor 2: Yes, that could be a turn off. Usually if there're having hypos or problems with either weight or if they have in the past exercised and given up.

Doctor 3: Uh-Huh

Doctor 2: Maybe somebody's told them "no you can't do that when you're diabetic".

At this point Doctors 1& 4 and Nurse 2 had to leave the room.

Interviewer: Do you exercise yourself?

Doctor 3: Marginally, I think.

Doctor 2: Didn't but do now. I walk, swim and cycle with my son and I'm taking up golf again.

Interviewer: We should try to get people walking more.

Doctor 3: Yes

Chiropodist: I don't do a great deal. I walk with the dog and do some calinetics and aerobics but not an hour at a time. That's another thing, I think a lot are frightened to go to classes because an hour doesn't fit into a busy life style. But like myself you can do things standing at the sink.

Doctor 2: I think you stand a better chance with most of the patients, if you don't label it as exercise.

Doctor 3: Yes as exercise. It's something you were forced to do.

Nurse 1: Do you know what happened to those people in the State who had to do it?

Interviewer: Yes, it wasn't that they were forced to do it. It was part of their treatment plan. They could chose to leave whenever as they pay for it but it was set as part of their treatment programme. Do you exercise N1?

Nurse 1: I swim and ride my bike because I live in Ayr near the sea front It's murder to park so I cycle.

Interviewer: Since everyone is having to rush back to clinic, I'll wind up but thanks for your time today.

Appendix 20

GROUP INTERVIEW (hospital c)

This interview took place in Hospital c Diabetes Clinic on July 14th 1994 at 12.30 p.m. The consultant was on holiday but the rest of the team was present. They were two specialist diabetes sisters; three physicians; two dietitians. The team only had 30 minutes free at any one time and the questions were designed to take this long. The conversation was recorded. There was some hesitancy for about 10 minutes, especially from doctor 1. I think that they had not been briefed very well about the aims of the interview and I had to work hard at getting them to relax. The final 20 minutes was much more relaxed and everyone was contributing more. The youngest dietitian and the youngest doctor remained fairly quiet throughout and I had to address them directly to find out their opinions. The general feel was that the group was helpful after the initial hesitation. They were quite well aware of the exercise issues but admitted that they did not pay it enough attention through lack of time. They would appreciate more written resources and suggested that a specialist would be wonderful. Both specialist sisters were extremely enthusiastic to get things moving and wondered if the drug companies could support a funded person to assist in the exercise area.

TRANSCRIPT OF INTERVIEW (HOSPITAL c)

Interviewer My name is Elizabeth and I have been working with Mike for about the last four years now on and of with patients from Gartnavval. We haven't done any thing terribly official like classes or anything like that but I've been using the patients and asking their opinions etc..

(Introductions of the Health Team followed but for purposes of annonymity, their names have been changed. The team consisted of three doctors, two dietitians, two specialist nurses and a student)

Interviewer ....and you're allowed to speak as well!

Miss A Oh no! My English is no so good.

Interviewer. Oh! OK! So where are you from?

Miss A Germany

Interviewer. Do you want to tell us your name?

Miss A A

Interviewer. Thanks. This is just for anybody to speak about this at all. The first question is, out of my research I've done so far I've only just looked very briefly at the actual statistics but one of the things I was interested to find...this is just for insulin using patients..OK? These are the only ones that I've been targeting and 28% of the questionnaire people, insulin using diabetics, exercise regularly and in order to actually get this from the diabetics, what I did was,this is my definition of exercise..when you say you exercise regularly this is the definition so that we know what we are talking about as far as exercise goes: "Regular aerobic exercisers are those who exercise at least three times a week for no less than 20 minutes, so are slightly out of breath. The exercise is usually brisk walking,(so that just walking comes into this) swimming, cycling, jogging, keep fit, canoeing, football or other running games, but it can just be walking." That's one of the things I wanted to emphasis so that people would estimate whether they did this for 20 minutes three times a week and if they did they were regular exercisers, but only 28% said that they are actually regular exercisers. And I was wondering was this the sort of figure that you would have expected or are you surprised at that figure?...anybody?

Doctor 1 It's the sort of figure I would have expected, I think, about a third.

Dietitian 1 Yes

Nurse 2 Yes

Doctor 3 20%?

Interviewer. 28%

Doctor 3 28% Oh right.

Doctor1 Was it quite a young age group or...

Interviewer. It was anyone...no age limit on it at all. It was anybody that we had on our registrar that uses insulin, so I mean, some people were over 80.

Doctor 3 That's quite a high percentage, I think, for all the people on insulin then...It would be different if it were just like the young, insulin dependents, but considering everyone's on insulin that's ...a third's quite high.

Interviewer. So you feel that that's a pretty good number. OK...

Doctor 1 I would say it was surprisingly high, I wouldn't say it's pretty good, I'm surprised at it. Obviously we would hope for a lot higher percentage.

Interviewer Right so...obviously you have to go on what people say they do, I mean, whether they actually do it is another question, but when you ask that question that's all you can go on. The way I did the question....you're probably interested in it... it was: "Are you a regular exerciser?", and then underneath was: "Do you exercise but not regularly?" . As many people again who said that they do exercise but not as regularly as I had stated there, three times a week foraround 20 mins, so that's almost half that said they did some kind of exercise and there was about a third who said they never exercised and they never wanted to exercise ever and then there was the rest of it there was a few who said they were thinking of taking it up...

Doctor 3 Always thinking about it!

Interviewer. ... and a few that said they had just started in the last six months but hadn't been doing it for long. It would be quite interesting for you to see the figures eventually, I' m sure.
Would you like to see more insulin dependent or insulin using diabetics exercising regularly?

Several Yes...maybe....hmm...

Interviewer. Is that a general consensus?

Doctor 3 Yes, absolutely

Interviewer. Would you like to tell me why that is?

Doctor 3 Makes patients a lot more sensitive to their insulin increases, their well being, makes them reduce weight

Nurse 1 Reduces stress which works on diabetes adversely. Exercises their cardiovascular system.

Interviewer. So, Nurse, I know you've done quite a lot in exercise..you've been involved in trying to get diabetics to exercise? And you mentioned stress...

Nurse 1 Yes in Type Two, the non insulin dependent.

Interviewer. Which is obviously as important if not more so...and you mentioned there stress, have you actually seen this in practice that people seem to be less stressed if they exercise regularly?

NUrse 1 Just anecdotally, yes, if you speak to patients who exercise regularly they will talk about the benefit, the positive psychological benefits of exercising...mm..

Interviewer. Has anyone else had that experience?

Nurse 1 ...the other thing is,sorry, just, when I talked to the Type Twos, I know this isn't.... we're not... when I talk to Type Twos about stress, they will often say that they deal with stress by going out for a walk, so they know that using up energy is actually a stress reliever.

Interviewer. Right That's people talking to Nurse what they do and how they feel about exercise. Do you get the same?

Nurse 2 Yes we get obviously get, you know a lot of the same feedback from patients about exercise.

Interviewer. Do you actually ask them about it, or do they come and tell you?

Several We ask about it, routinely, yes.

Interviewer. Do the doctors do that as well, or are you concerned about other things really?

Doctor 1 No, I tend to have a ..tend to ask them, regarding physical activity I think it's very important...

Doctor 3 I think it's it's a routine question for most, even for Type Two I think we ask every diabetic who comes through the clinic, how active they are , whether it's active in sports or just do they get out and about and at the same time as trying to encourage them to increase the level of exercise...we do that for everyone.

Interviewer. Right, and do the dietitians, do you, you'll be coming across this?

Dietitians Yes we all are encourage...encourage them to exercise

Interviewer. Right. So with the dietitians do you actually sit down with them and say well if you're going to exercise you have to do this with your diet, or...?

Dietitian 1 Yes we do explain the implications of taking extra exercise and either to take more carbohydrate or reduce their insulin dependent on weight.

Interviewer. We've run into another set of questions, really... so we'll get through this quite quickly. Have you got any suggestions on how you might improve the number of insulin using diabetics who actually exercise. Have you got any suggestions how you get more people to exercise?

Nurse 2 I think by running update and education classes for people on insulin was one way to introduce it and how to introduce it and...

Interviewer. Do you do that at the moment, Christine?

Nurse 2 We don't, we don't have the staff to do it...we see people converting to insulin or new insulin dependents on a one to one basis and we don't have the staff or time at the moment to do update classes for them. I think if we had that then that would be.... we could reiterate what we initially said about exercise or encourage it from then on. Once people have actually lived having been on insulin for some time then attitudes change and initially it is not the best time to...to you know, really push exercise or anything because they're really shell shocked about being on insulin. It would really be better if we had the time or resources to do that at a later date.

Interviewer. Right. When you say that their attitudes to insulin had changed when they've been on it for a while...can you expand on that?

Nurse 2 Well, I think they're not so frightened and depending on the length of time have now got over the fact that they are now insulin dependent or insulin requiring or whatever it might be and they will be begin to suggest things like that they think they know they can have a relatively normal life on insulin... they're not worried about going out the door again and Becoming hypo and that type of thing.

Interviewer. We asked another question, Flo, while you were out, why it was basically have you any suggestions how we might improve the number that are exercising and that was Christine's answer really, she was saying about educational update classes. Anybody got anything else to say there?

Doctor 3 Problem is sustaining it, it's the same with everything in diabetes, same with diet, same with exercise, same with general care, it's sustaining it that's the great problem.

Nurse 1 And it needs to be also, I mean, part of that might be help by making it a part of our normal consultation you know, by introducing exercise as one of the questions like have you had any hypos and what are you doing about exercise and getting everybody to do that on a regular basis so that it's not seen as icing on the cake, but actually is a vital part of the the care package...

Doctor 1 Exercise prescription

Nurse 1 Yes an exercise prescription, exactly, yes

Interviewer. Do you have time to do that when you are consulting?

Doctor 3 No

Interviewer That's the problem.

Doctor 3 You'd have to take every patient individually, look at their life style, and assign what they could actually do and patients have to decide that for themselves. It's like telling them to give up smoking or to lose weight, they've got to take it in hand and you can only advise them so much. I don't think there is any evidence that exercise prescriptions would work. I think it's actually been tried in Liverpool...I'm not sure.

Nurse 1 I think with the Type Twos I ask them individually but within the context of a group about what exercise they've done before and enjoyed, because we know there's no point in prescribing exercise that they're not interested in. ..and look realistically at what exercise they can take up now and I think as Sandra says it's exactly the same for insulin dependents, it would have to be done on a very individual basis.

Interviewer. And you need somebody who has got the time to do it..in fact you could almost suggest you need an exercise adviser really. One of the questions on the questionnaire was:" would you find it helpful if there was someone at the time you go to the clinic to specifically advise you on exercise?" 2 out of 3 said" yes".

Nurse 2 I think from the NIDDM groups, we saw that can take them along because they are supervised by a professional who understands.

Interviewer. So, I think what you were saying was the fact that in order to ( ) to get people to change their mind is like anybody else whether they are diabetic or not. Certainly taking up exercise is one thing and sustaining is another and you need various motivational things to keep them going and you would find that would probably be the same with diabetics would you?

Several Yes

Interviewer Do you think diabetics would find it more difficult to sustain their exercise? I mean would you have any idea, that's just to...

Doctor 1 Compared with whom?

Interviewer. With non diabetics.

Doctor 1 What, normal population or other people with a chronic disease process?

Interviewer. No, normal population.

Nurse 1 They could be if they are prone to hypos and haven't sorted out that difficulty.

Interviewer. Do you think that would be the major problem that they would have?

Nurse 1 And some people are very scared...

Doctor 1 They're apprehensive.

Interviewer. Yes

Doctor 2 Yes , for these kind of people, they must have some supervised class where they feel there is someone there. There's a cardiac rehabilitation class where recovering patients get back to exercise with a supervisor.

Interviewer. Somebody who knows what they are actually doing

Several Yes

Interviewer. Thanks very much for that. We're getting through it...em would you like more resources within your own clinic about exercise, like posters packs classes etc? Do you feel you're a bit under resourced?

Doctor3 Yes, absolutely.

Interviewer. Right Can you tell me exactly what you feel you need? If you know.

Nurse 2 Information packs which obviously people can take away and read and digest at their own leisure.

Nurse 1 It would be quite nice to have a pack with what's available in this area. I think we could probably get that together ourselves, but, for example, you know there's various sports centres round the place and they also offer special services to special groups of people like over 55s, swimming afternoons and you know all that kind of thing. It would be nice to know exactly what's available...

Interviewer. To actually give to the patients when they come?

Nurse 1 Yes, to say, this is going on in you area, why not have a look at it.

Interviewer. Right

NUrse 2 I think it would emphasise a point that you need exercise, you know. Always giving people back up, emphasise your point.

Interviewer. Right

Nurse 2 You can always give back up that emphasises your point,

Interviewer. Do you use anything at the moment? Do you have a....

Nurse 2 We've got a exercise booklet that we give them

Interviewer That's the one I saw outside?

Nurses Yes

Interviewer. What do you think about that one?

Several It's OK. It's alright

Nurse 1 There's also a Flora margarine which is also quite good. They're both quite short, quite well written and...

Interviewer. Have they been around for a long time? Those ones?

Several Yes

Interv. They could perhaps do with updating?

Several Yes

Nurse 1 I don't know about the Flora one...I think they've updated their's recently but..I'll just check it..

Interv. Right. Do the doctors feel the same way as well?

Doctor 3 We only get a chance to speak verbally about it. I mean we normally expect getting information we go around sometimes to the nurse specialists but it would be nice to have something , yes, to give out to the patients.

Interviewer. Dietitians?

Dietitian 1 Yes, full agreement, yes. Especially I mean about what's on in the area, so that they can find something that they really enjoy so that they can stick at it.

Interviewer. Right, thanks..

Doctor 1 Do the BDA run any , what would you say, leaflets?

Nurse 1 Not really, they've got diet leaflets, but it's a kind of print from Balance, They should actually have a proper leaflet, I don't know why they don't have that.

Interviewer. Do quite a lot of your patients read Balance?

Nurses Yes, quite a lot do, actually, and you also find we have a leaflet stand and it gets emptied regularly.

Interviewer. Right.

Nurse 1 There's a very high uptake of leaflets.

Interviewer. So they obviously want things.

Nurse 2 Absolutely.

Interv. That's interesting to know.

Doctor 2 It would be useful to have a poster up as well.. of you know, positive things...pushing... you know, pushing exercise so often when people come to the clinic they see negative posters," **no smoking**" etc.

Doctor 3 What we would really like would be a diabetes centre, of course, so that we could have an education room with posters up all over the walls.

Doctor 1 And a step class!

Interviewer. Would you want to go to a step class?

Doctor 1 Yes, I would, I would encourage them to ... I would do the same sort of exercise. I don't think I would cope with 20 minutes three times a week, that's the problem!

Interviewer. You probably do quite a lot already and you don't realise it, you know if you're walking about and...

Nurse 1 He does quite a lot of exercise

Doctor 3 Golf's not exercise!

Interviewer. That's quite interesting about the posters though, that you mentioned even if you put a poster up and it's up for about three months then people don't read it any more, have you noticed that? Even if you had someone to keep changing the posters so that they're interesting and positive.

Nurse 2 I think we'll have to remember a lot of the patients who I contacted became insulin dependent a long time ago and the input for education really was limited.

Nurse 1 It was just crisis intervention wasn't it? People like Flo and I just weren't around then.

Interviewer. would you say that in the old days as well, if you like, that they were actually put off exercise?

Doctor 3 No, I don't think they were, they were actually encouraged in the old days to balance their life up with all these sorts of low carbohydrate foods and to exercise with their insulin, so in fact quite a lot of them take it quite seriously but I'm not exactly sure how they were advised specifically as such.

Interviewer. Yes, but it was still a positive thing that they were to do even in the olden days....

Doctor 3 Yes it was.

Interviewer. Right. Thanks. Do you think that the research community in diabetes should be spending more time in and money on finding out if exercise has an important benefits specifically for diabetics or do you think other things are far more important?

Nurse 1 I personally feel that exercise is very very important because it has such a beneficial effect so many different aspects of health, you know psychological and physical and I think...I've got the feeling that we don't ... that probably it should be more of a priority with us than it is, I think somehow it gets swept tot the edges of our total package of care and it may be that there should be a bit more research on it just to bring it to the foreground a bit more, and that's my own personal feeling actually.

Doctor 3 I'd like to see more research into Type Two diabetics because the Type Ones are younger and may well have a sport or some kind of leisure activity that helps them to exercise but the Type Twos are much more difficult to approach, I think.

Interviewer. Would you say because they're older?

Doctor 3 They're older and they're more established in their ways. They're heavier, more reluctant to change.. and more risk factors..

Interviewer. OK. That's quite interesting because one of the things... why I was sticking particularly to the insulin using ones was because I felt that insulin using diabetics probably have difficulty in balancing their insulin intake, carbohydrate etc in order to accommodate for exercise, but in fact you feel that they're quite positive about doing it, they'll ask you and perhaps because you're thinking about them being younger as well and maybe not so heavy you're actually flagging up the knowledge they might have?

Doctor 3 But they also.. they have more people in the media to look to , football stars and people who are insulin dependent to .. can act as a role model for particularly the younger ones on insulin.

Interviewer. Right.

Doctor 3 And they realise that you can do all these things if you want to, it's just, it's a bit easier to approach them in some ways because you can adjust their insulin to cope with the exercise, which is just a matter of education and allowing them to get used to it.

Interviewer. Right. That's interesting. Thanks for that. Would you, this is I think we've answered this almost... Would you with a newly diagnosed diabetic wait a few months before giving exercise advice or would you wait until he or she asks?

Nurse 2 I think it's mentioned initially but then later on when they are able to cope with all the information and also....

Nurse 1 Because we have to find out if exercise is part of their life and it often is so it is definitely as Christine says...

Interviewer. I get the feeling then that the sister then and the dietitians do ask about exercise but the actual doctors have so much else to do in a consultation that you wouldn't always bring up exercise you would expect the others to do that? Is that...

Doctor 1 I disagree

Doctor 3 I think we bring it up, we definitely ask about it and particularly with younger people we always ask what type of exercise they take and how they see themselves coping with that if they are on insulin and it seems they always ask about carbohydrate and insulin adjustments when they're taking sport and if they show any negative feelings try and encourage them to overcome them and to pursue what ever they have in mind whether its an old sport they have taken part in or something new. I think probably with the Type Twos depending on the age... it's variable how much you approach it in terms of what you do. We would definitely ask them about walking, about these very basic types of exercise and see how much they are doing and encourage them to walk, yes.

Interviewer. And you do the same Scott? And yourself?

Doctor2 Yes

Doctor 1 Uh-huh, certainly

Interviewer. That's great. We're nearly finished. I'm just glad to tell you this! What kind of exercise advice do you think it is actually best to give? When you are taking time with somebody?

Nurse 1 We talk about they type of exercise and the frequency. Is that what you....?

Interviewer. Yes, it's actually what you...you know obviously, if I was talking to somebody and he was going to take some exercise and he was a diabetic I would give him some sort of advice as to how to do it. We would sit down to and we would probably make up a sort of pact...

Nurse 1 Oh, I see, starting from a baseline..immobility... working up to....

Interviewer. If you've got somebody who is just newly diagnosed and say they are about 30 and they were actually insulin using and they don't know what they have to do as far as: I'm now a diabetic, what do I do as far as exercise goes?

Doctor 3 I think you would start with gentle exercise and you would suggest you do something like swimming or walking and cycling and the very sort of basics, particularly when they are a sedentary type of person and then build up from there.

Interviewer. Would you suggest they lower their insulin levels before they exercise or would you try to keep that roughly the same?

Nurse 2 I think that depends...

Doctor 3 Depends on what they're doing, yes and...

Nurse 2 And the weight...

Doctor 3 Yes

Nurse 2 And the type of exercise....if you've a young man and he plays five a side football three times a week often they have to half their insulin level... cut it right down and eat, it just depends...

Interviewer. So what you're saying is it depends on the person.

Several Absolutely

Nurse 2 And I think you've always, as Florence said earlier, in discussing it some kind of exercise, they've got to chose or you really don't succeed at all.

Interviewer. When you're giving advice about insulin levels would you be suggesting a level that that they shouldn't be exercising at if they're glucose, sorry blood glucose level, say it's round about 4 would you suggest that they must go off and take insulin before the exercise or do you give them that kind of specific advice?

Doctor 3 It will vary every time they exercise to what their actual sugar will be beforehand because every day it is going to be slightly different and depending what their previous level of activity's been in the day so most of them will know from trail and error what they have to do if their sugar is four before the exercise.

Interviewer. Right

Doctor 3 And most would take carbohydrate. I mean they've taken their insulin beyond that, before that, so it's a case of taking extra carbohydrate.

Interviewer. Right. So if you have a newly diagnosed diabetic or they've been maybe diagnosed three months and they're now asking about exercise and they've said they are worried about going hypo would you be...how ...what would you actually say?

Nurse 1 I would ask them to do a lot of blood testing, like before, during if possible and after, several hours after but it's very experimental and everybody is different and that depending on the type of exercise .I mean, sometimes they are going to have to reduce their insulin and they would then have to discuss what they've got to plan their exercise if it,s evening exercise we may even have to give them different to accommodate that reduction so they're not having any short but we emphasis the fact that everybody's different and they are having to have to work quite hard at...

Interviewer. Finding out ...

Nurse 1 Finding out for themselves, yes.

Interviewer. Right.

Nurse 1 But with our support.

Interviewer. OK, so...

Nurse 1 depending perhaps on not going hypo and then trying to sort out...

Interviewer. Do you ever advise people that if their blood glucose level is quite high that they should not exercise, I mean I'm thinking about that maybe 22 or something like that would you suggest that they should exercise in order to bring it down or would you , no, don't exercise? What would you say?

Nurse 2 Not routinely, not as a method of bringing it down, no.

Doctor 3 It's not a good idea.

Nurse 1 Well actually some people do. They take themselves out for a walk and miss their tea. That's something that they decide to do for themselves but...

Doctor 3 I think you have to tell the patient that if it's high at that time the reason for it being high is inappropriate insulin dose somewhere else in the day. You've got to sort that problem out.

Interviewer. One of the things that when I was doing my experimental study with diabetics was I was saying OK exactly what you said, Flo, you're individual, but if you're sugar levels to drop to 4 be careful and if you are going to go and exercise be really careful, have extra stuff with you. One of the other things I was suggesting was that if it was over about 15 or 16 to be careful. Do your test because if you exercise with it running at that level you might find in fact that it gets higher rather than drops and that was something they didn't know at all, and I think it is something that probably they don't know.

Nurse 2 I think a lot of people don't know that . Also,the delayed effects of exercise.

Interviewer. I think what you said, Christine about updating it and the educational thing with diabetics is really important.

Nurse 1 I think tha actually, it seems that very few people know about the fact that it can go up.

Interviewer. Right. Do you use a booklet, I've asked you this one. You use the aims booklet to illustrate your advice, but you don't really suggest anything else?

Nurse 1 And the Flora margarine book

Interviewer. Thank you. And the last question. Is exercise an important part of your life style?

Dietitian 1 i was only playing badminton last night!

Nurse 1 I'm going to aerobics tonight

Several Yes

Interviewer. And if so why, not just yes, but if so why

Nurse 2 Keeps the weight down, makes us feel better, social activity

Nurse 1 Psychological and physical well being, but I have difficulty in making it three times a week

Interviewer. Yes

Nurse 1 And I have times when I make it 4 or 5 times a week and then no times the week.

Interviewer, Is it time that's the biggest problem with you?

Nurse 1 Making it a priority all the time is the problem, yes. I think it would only work if ( )other things it can have a regular routine its not ( ) if you go every Tuesday and Thursday and do something, but...

Interviewer What about the doctors?

Doctor 3 No comment!

Interviewer You can say no, it's not part of my life style.

Doctor 1 I'd love to play golf three times a week, it would suit me down to the ground.

Doctor 3 it's time. Time is the great factor.

Doctor 1 Time

Doctor 3 We all agree in principle that we should do something to make us feel better, to look better, whatever, but it's when you work in medicine you're on call it's impossible to arrange regular. It's really difficult to have regular

Interviewer. Some people don't like it either, and that's OK. It's OK to say that I hate the feeling

It's my job and I hate the first few minutes of it, and I actually say why am I doing this, and when I get the benefits of it.

Scott, what about you?

Dcotor 2 Yes, sort of exercise quite a lot now, not, there was a period when I qualified and when I was doing my GHO years and I didn't have as much time and that really annoyed me because I used to be a lot of exercise at school through University and sort of started doing and t get it back to it.

Interviewer. Nurses, the main barrier..... it's been time for you. It's the same for the dietitians.

Dietitian 2 I was running last night and it's aerobics on Thursday

Interviewer. So you do go, and does it make you feel better?

Dietitian 2 It does, yes. Makes you feel less tired as well.

Interviewer. And you as well?

Dietitian 1 I don't have regular exercise, but I think I exercise the whole time, climb stairs and my work spend my time walking

Intervlewer. So basically what you're saying is you know you should exercise, you try to, but the lack of time is the biggest problem for you, really. How do you could get over that? I mean if something was organised...

Nurse 2 If we had a diabetes centre with a multi gym!
And a small swimming pool.

Nurse 1 Actually, Dr Small has bought the team two tickets for the swimming pool and the gym over at the pond.

Doctor 3 So what we need each is one afternoon a week off

Interviewer. Or even to go with a pal to do it is...

Doctor 3 Better to go with a friend or in a group than for to do it on your own.

Nurse 1 but the aerobics class that started up a few weeks ago in Gartnaval on a Tuesday and I've been going quite regularly to that so it's helped me to have it on you door step and a good time, just at the end of the working day,is actually very useful

Dietitian 1 The physios here used to do a lunch time aerobics class which was good, because you could spare the time to get there.

Interv. Was that a difficult time for people to get there though?

Dietitian 1 It was at half past twelve, no it was OK. You had to do without your lunch!

Interv. Yes, that's not so good. So the end of the day is a good time really.

Several Yes.

Interv. Right. Can I thank you all very much for this time and I have taken half an hour and I realise that you will be running late and that people will be after you, but thanks ever so much for that. The last thing I would like to say to you is that the diabetics have given me such support with returning their questionnaires at the moment, they're still coming in from Gartnaval there's a 75% return rate for a mailed questionnaire which is really amazing and I'd like to thank them, so I wondered if I could actually do a poster and pop it up in Clinic 2 to say thank you and leave it up for 6 months just to say thank you. So thank you very much indeed and I'd like to see you in the future somewhere

Doctor 3 Maybe in the gym!

Appendix 21

GROUP INTERVIEW (Hospital d)

This took place in Hospital d on Friday, July 29th 1994. The team were all present and included the consultant; the Specialist Sister; the Chiropodist and a doctor who helps occasionally. There is also a new dietitian who has been involved with diabetics for 3 months but she was on holiday. The part-time doctor took little part in the discussion and even when prompted declined to add anything. I think she did not consider herself as a real part of this team and that most of the questions did not apply to her. The group were relaxed and the presence of the consultant did not seem to inhibit discussion at all (except maybe that of the other doctor?). A very telling comment came towards the end of the discussion when the consultant seemed for the first time to really consider whether they should in fact spend **some** time talking about exercise. The group were the most exercise-involved group with every person within it taking some form of regular exercise. The chiropodist felt that his job was quite heavy as so many of the patients have dreadful foot problems. They did not say directly but I picked up the fact that the diabetics in this town have really not had proper care for YEARS until the present team were appointed and they are reaping the harvest of this poor care. They also need help from someone whose remit is exercise as they just do not have enough "bodies" to do the job. It does seem that they are terribly understaffed and time to talk about or encourage exercise is nonexistent. Their policy is mainly to find out about the patient's lifestyle and then build on that. So if the patient already exercises, then they will help that patient continue.

TRANSCRIPT OF INTERVIEW (Hospital d)

Int.- The questionnaire that I have not got back, I have got a thousand and thirty two replies from the West of Scotland, so it's quite a body of information.One of the questions that I have set myself was to find out how many insulin using diabetics actually exercise regularly. In order for them to understand what I meant about exercising, actually for you to understand what I mean, I have them a definition.When you talk about exercise it means different things to different people. So this is really exercise as far as as I mean.

> "Regular aerobic exercisers are those who exercise at least three times a week but no less than 20 minutes so that they are slightly our of breath. The exercises usually are brisk walking, swimming, cycling, jogging, keep fit, canoeing, football and other running games."

It's actually not particularly at a high level so that if you are not used to exercising if you walk up a hill for 20 minutes you probably would be slightly our of breath. Twenty eight percent of the one thousand respondents said that they exercise regularly and the first question to you is----

Is this figure one that you would have expected or is it a surprise to you?

Doctor 1 They're fibbing! 28 % do not exercise.

Int You say you think it's less

Doctor 1 I think it's less and I think they've answered in the way they think we want them to rather then you the genuinely should. I don't believe it's anywhere near as high as that.

Chiropodist I would say not 28% of my patients that I see exercise.

Int And that's with their exercise definition of as far as even walking goes?

Doctor 1 I don't thing 28% of the population exercise on a regular basis and I think diabetics would exercise even less.

Int That's what you would expect. You would expect maybe about a thirdmaybe a fifth or a third of the normal population to exercise regularly and like you said, I would have expected it to be less.The way I actually set the questionnaires, the first question was--

Do you exercise regularly and have you done so for more than six months? and the next question was
Do you exercise but not regularly?

There was almost the same number said "Yes" to each question.
There was about a third of the one thousand who actually said "I don't exercise, I never want to exercise" An then there was the rest in between. Quite a few said that they were thinking about it. A few said they had just started in the last six months. So that's a surprise.

Would you like to see more of you insulin using diabetics exercise regularly?

Several Yes

Int Why?

Doctor 1 Because exercise has been shown to benefit......though you have to exercisean awful lot before you reduce insulin requirements. I think in terms of general fitness, well being, self esteem and this kind of thing......

Int There's a lot all rolled into one there. You said fitness, I think was one of the things you said

Doctor 1 There's two different things.....Is exercise good for anyone? I'm quite convinced it is......I'm kind of biases or skewed in that way and then there's the specifics if you're an insulin, exercise can improve you diabetic control. But you do need an awful lot of exercise to improve that. I would like to see more of the patients exercise and more of the population exercise.
I believe that exercise especially with diabetes, destigmatizes and gives them a better sense of being like other people.

Int Lots again, there you are talking about the social aspects.

Chiropodist I believe in exercise as well because mostly my job is to keep people as ambulant as I can. So that means walking, running, anything at all to get patients moving. A lot of my treatments that I give out are exercised based maybe flexibility exercise. I they are not inclined to walk anywhere they will be less inclined to do any sort of exercise. Its important that they are in the right frame of mine that patients are willing to do some sort of exercise whether it be walking three times a week for 20 minutes or whatever.

Int So from a chiropodist's point of view, are you looking at the cardiovascular system or vascular system in the legs or is it the joints and flexibility?

Chiropodist A bit of both, mainly the flexibility of joints so that they are not getting clogged toes, hammer toes and the muscles are exercised as well. Mechanically speaking the have a better chance.

Int Do you find any problems with those who exercise a lot, with their feet?

Chiropodist Yes, Overuse problems.

Int What do you do?

Chiropodist I give them a mechanical assessment to see if I can improve the way they're walking. Mechanically speaking if they can improve the way they are walking or accommodated better, so that may be advice in flexibility exercises, it could be advice in footwear, running shoes, it could be simple athletics or more complex athletics, or referral onto doctor or orthopaedic guys, depending what the trouble is.

Int Anybody else got anything to say? The question was "Would you like to see more diabetics exercising?

Nurse 1 Yes, Definitely, I thing one of the problems is that patients, insulin dependent overweight doing various exercises and between diet and.......

Int Is this because they're overweight, do you think?

Nurse 1 I think it's a combination and they are overweight because they don't exercise and it might well be they don't exercise because they are carrying excess weight. I think even from that point of view to try to get them to do a bit more exercise to get their weight down for general well being.

Int Do you find when you are talking to overweight patients and you mention exercise the look glazed because they think they can't possible do it.They think of leotards and again this high level, exercise image?

Nurse 1 It's the image they have of themselves, particularly the young ones, who are overweight won't go to the swimming and to try to motivate them to do regular exercise, so that they can work out their insulin, is quite difficult and getting me to adjust their insulin on a regular basis if they are doing regular exercise but it doesn't always work out that way. I think a lot of the younger one's will not go to aerobics because they see the standard model there of working out and feeling quite self-conscious

Int Do they actually say these to you when they talk to you?

Nurse 1 They couldn't possible to out in their costume etc. We try to get them to do other forms of exercise, something that they will enjoy because if they don't enjoy exercise then they are not going to do it regularly.

Int Have you anything to add?

Int The other thing was mentioned by D1 and N1 was "well being" . Can you actually explain what you mean by that?

N1 Healthy cardiovascular system that you exercise your heart as well....

Doctor 1 It's not just.......I think a lot of people exercise and they feel better. It's their endorphins levels. I've no doubt you don't have to be a fully trained athlete but when you exercise regularly, you do feel better,and that carries over, not just at that time. I think diabetes is a miserable enough condition to have that if we can do anything to make them feel better....and again it's not unique to diabetes. Diabetes in a large of cases is an inhibitor.

Int So you are saying that to help your self esteem is one thing obviously. You feel that if you exercise regularly your self esteem will go up. Why ever whether it's because you feel more normal or whether there's some other mechanism making it happen.

Doctor1 Yes, Yes, psychological, hormonal, and physiological

Nurse 1 I thing there is no doubt that if you do regular exercise it does stimulate your overall well being and you will be a bit more active overall, whereas if you sitting about doing nothing then you feel more tired and it's a vicious circle.

Int That's certainly what happens, other research has shown if you exercise regularly your depression levels go down and you actually vigour when you think you would be exhausted after but it seems to go up. That's way it was interesting to pick up what you said about diabetes is a miserable enough to have anyway.

Doctor1 Well to some folks it is. I'm a great believer in making my patients feel happier.

All I agree

Int Have you got any suggestions to improve the number of insulin using diabetics who exercise? Any ideas on how to improve those numbers?

Doctor 1 I think you may actually have to be very specific...... the group of people who interest me, who have taken on exercise in the illness category are the cardiac-rehab people. These people often haven't exercised at all and they get into it. Obviously, there's a more sudden onset and very pointed episode so they've got more motivation. I think a small group with somebody teaching them what to do, somebody to supervise, I think if you could apply this to diabetes with somebody tilling them what to do and it might be small groups and I think you might have to do it three or four times and then the patients would be asking to do it themselves. I think that might work I think just generally give them a wee bit of paper telling them to go and exercise probably is no use.

Nurse 1 I think if you've got something constructive its alright sitting discussing it but if you are not there discussing it with them all the time and they don't see you for x amount or months again, that's it. You need something more structured to offer them.

Int Some sort of motivational strategy? Anyone else go anything to say here?

Chiropodist I think if you put somebody on a structured programme they either want to do it or they won't do it at all. If they go into programme probably they will go right through it.

Doctor 2 Probably it would only be those who want to do it, that go on the programme

Chiropodist Motivated anyway. Possible if there is a structured programme there is a better chance of success.

Doctor 1 The cardiac rehab people are motivated by their illness. It's a question of how to motivate diabetic patients to the same level. We emphasis a great deal about diet. I always go on and on about diet and then it's diet plu tablets or diet plus insulin. Maybe we should be including it when we talk about things in the clinic. Previously the Jolsen's triad in America included exercise , maybe we've forgotten about exercise. Everyone's forgotten about exercise, partly because it's harder to do.

Int Do you have a cardiac rehab group that do exercise in hospital?

All Yes. Twice a week

D1 It's been running for a while and is formally funded. I'm very struck by the success of it.

Nurse 1 We have a very high attendance rate from these patients.

Int You are bringing up some interesting points and I won't carry on because there are more questions and I think they will probably link in with these. Would you yourselves like more resources in the exercise are to help diabetics, posters, packs etc.

Doctor 1 I would quite like to see how the responded to classes, to be honest.

Nurse1 Yes, even if you could offer them in small groups....

Doctor 1 We're particularly interested in people who have been on tablets, then failed-on-tablets, and they put on a lot of weight despite diet. They would be the most interesting to get to exercise. Though the others would be interesting as well. But they start on insulin "cold", as it were. You can choose when to start them and you could tie it in wit a programme of exercise at the same time. That would be the best way.

Nurse 1 Well, the best group. They tend to be well motivated. Uh Huh. Getting the at that time would be beneficial

Int One of the things to do with these successes if people. You find you don't have the time to do it, you really could do with people. Certainly the other clinics are the same, they don't have time to deal with exercise.

Doctor1 We don't have the time, of course, ideas but we do need more bodies if we are to put ideas into practice. We need more bodies.

Int One of the clinics said we have a dietitian for the diet side of things and doctors for insulin but we don't have anybody for the exercise and to take responsibility for it so it isn't done.

Doctor 1 I think generally speaking on a national bases not something that would be routine for diabetic clinics. Nurses, doctors, dietitians, psychologists even, but I don't think there's normally anyone for exercise. I suppose the physiotherapists are the ones who would have to do it.

Int One of the questions on the questionnaire was for the diabetics---"Would you find it helpful to have an exercise adviser at the clinics to help you. Two out of three said "yes". I might be talking myself into a job here!
Do you think the research community should be spending more time and money on finding out if exercise does have important benefits for diabetics specifically or do you think other things are far more important? Anyone can answer/

Doctor 1 It's a loaded question. I think other things are important, I think it's not the number one priority for diabetic research. The number one priority should be cardiovascular deaths and doing things. We are getting better to stop patients from going blind or having renal failure and better at stopping them losing their feet. We're picking up a lot of foot problems here, but were not stopping them from dying from cardiovascular disease. Just now we are looking at intervention in cholesterol blood pressure. If exercise were to be beneficial there, that's sometime, that's nice to know. The practicalities of this are enormous as you might need one hundred and one thousand of patients to prove it. so I think it is of some importance might not be practical.

Chiropodist Obviously I would like to see more research put into foot problems with diabetes. I think exercise is involved in a big way. The more exercise you give a patient, the more pressure you put through their feet. Slightly different from what you're meaning, I think, the more likelihood of pressure sores there is. I would like to see research being done that way.

Int So it's linked in very much with you work?

Chiropodist Yes

Int One of the other things you said D1 was if you can make patients happy that's good. We've looked at exercise as a therapeutic programme for people with depression and anxiety and it looks very promising. Nobody actually except myself in the minor way has been looking at that side of things with diabetics to see if it actually improves their quality of life. I've been quite shocked at America which is at the forefront of exercise and diabetes in many ways and Germany too on physiological side of things hasn't done any work on the psychological benefits. I'm still looking at papers and I haven't come across anything. So, that's really what spurred my on to do the whole thing.Would you with a newly diagnosed diabetic wait a few months before giving exercise advice, or would you wait until he or she asks? In a way I'm already presumptuous that you actually do give exercise advice, maybe you don't? I don't know.

Doctor 1 We tend to ask them on the social side of things. What their hobbies and interests are so, if they've got a sport then we would give them advice for it. If they've not doing it, then I don't think you should say "start doing it" at this stage.

Nurse 1 I think it would be discussed early on and it would depend on what they have been doing up until they were diagnoses. Some patients follow exercise in their careers and that point the must have help on how to deal with insulin and how they'll adjust things depending on what they are doing.

Int So, what your trying to diagnose is where they are in their life. If they don't exercise would you give them any advice at the time in the future?

All We try to do that anyway.

Doctor 1 You try to give them specific advice on insulin. You say that even if they're not doing regular exercise and they're going to do something then they need extra carbohydrate and if they prolong the exercise they'll need to reduce the insulin.

Nurse 1 I try to bring it up at the beginning with all of them and what you say to them is "Do you do exercise" and they say, " I don't exercise" I say " Do you go out walks with the dog? Do you go round the shopping centre etc......" That's a form of exercise if you go out a long walk with the dog you might not realise just how long you have been walking and your insulin is acting etc. They might not think they are exercising, but they are to a certain degree.

Int I think from what I understand, you look at what they are doing and you help them with that. You are not necessary pushing them in a small way to do more.

Nurse 1 Some people think when you say exercise you mean jogging, aerobics or whatever/

Int I think that's maybe the biggest drawback, using the word "exercise", a "physical activity". They have this image of what if might mean. I wish we could get the population just to walk more.

Chiropodist I always ask what their lifestyle is. It's important to assess it to know what foot care they need. I usually ask the older ones if they are bowlers and the younger ones if they play sport. Quite often they are looking for advice on footwear. That's usually one of the questions I ask. What are their pastimes and do the play sport.

Doctor 2 I don't see many newly diagnosed

Int Did you mention exercise as well?

Doctor 2 Probably more in terms of weight control.

Int Do they have a glazed look over their faces when you mention it?

Doctor 2 Yes

Int What kind of exercise advice do you think it is best to give? Can you expand on that a bit. So if you have someone who is moderately active and are newly diagnosed for instance, what advice would you actually give them as far as insulin and carbohydrate etc. goes?

Nurse 1 I think if they have been moderately active I would encourage them to do what they have already been doing obviously: discuss what the eat and the pattern of their insulin activity, if they were doing it on a regular basis then I would advise doing monitoring and either adjusting their carbohydrate or reduce their insulin.

Int Would you tell them to ear more carbohydrate?

Nurse1 It depends on a lot of things,e.g. their weight. I don't really encourage them to take extra carbohydrate if they are doing regular exercise. They maybe don't want their weight to go up but obviously at the beginning to developpatterns and wait and see how things are going. In the early state theirinsulin can be adjusted so we have to be a bit more cautious about it to get the right balance and they're confident with what they are doing. A lot of thepatients tend to be a bit apprehensive about going back to exercise because their insulin and hypos worry them.

Int Do you give them a level if they are going to test their blood before exercise?

urse 1 A level for their age. Depending on what age they are and what they aredoing. If the level was quite low and they were about to exercise Then I would say it is not a good idea.

Int What sort of level would you suggest for different ages?

Nurse 1 If its for the young then their blood should be sitting around four and theywere about to go and swim thirty six lengths of the baths then I would say that's not a good idea.

Doctor1 I would say that it if it is less than six before you start exercise then you are likely to have problems.

Nurse 1 And we have to talk about delayed hypos later on, particularly later in thenight.

Doctor1 It might not just be shortly after if but they should be looking for it later on.As a rule if you exercise vigorously for more than an hour then you are going to need to cut your insulin and form some folk maybe it would even be less vigorously. How much you reduce it is slightly trial and error by monitoring.

Int Do you find that on the whole diabetics actually run their sugar levels higher than six because they are frightened of hypos.?

Nurse1 Some do.

Doctor1 Obviously we are trying to persuade them not to. Obviously it would reduce the therapeutic goals of exercise. That's the challenge to all of us. To get the best pattern of insulin and exercise that fits into the lifestyle of the patients.

Int Do you ever encourage them if their sugar is a bit higher maybe about nine, that they should exercise to bring it down?

Doctor1 No, I think that's wrong to be honest. There are some patients who adjust their insulin when they find that their sugar levels are high and what happens is the take more of their next insulin and then the sugar swings. If your sugar is nine then the exercise should have been before it no after it, just that if your sugar is high and your need more insulin , it should have been the insulin taken before. I don't encourage patients to make that kind of adjustment because then you are really saying you have to monitor your blood sugar all the time. You are looking for patterns.

Nurse1 Some patients think if their sugar is high then they shouldn't eat and that's dangerous.

Int Do you ever give them an upper level if for instance their sugar is running at seventeen, that they shouldn't exercise or their sugar will get worse.

Nurse 1 If they are poorly controlled and they were doing vigorous exercise then we would discourage it at treat point until things are better controlled.

Int One of the questions on the questionnaire was "Is it safe for a diabetic to exercise when blood glucose is over fourteen and most of them said "Yes" They thought that was fine.

Doctor1 But its less common that those patients would feel like doing any exercise.

Int Do you use a booklet to illustrate your advice when you are talking about exercise? Do you have one?

Nurse1 I have got pamphlets on exercise in diabetes

Int Is that from BDA or AMES?

Nurse 1 AMES

Int Is that the only one you've got

Nurse 1 Yes. Also in "Balance" there is a bit about exercise but other than that, this is the only booklet

Int Ch do you have any?

Chiropodist Most of them are very specific. I do flexibility exercises and as far as I am aware their isn't any good literature on that. I did a search on that last year and we didn't come up with any good published literature at that time.

Int Do you use anything else?

Doctor1 As a general form of education I tend to give the information verbally and then get the nurses to back it up.

Nurse1 I think a lot of patients wont read the literature if it doesn't look interesting and it's not very attractive to look.

Int What do you feel about the Ames booklet?

Nurse1 I don't think it's all that great and I don't think it is something the patients would........

Doctor1 I think that's too generous.....We're aware of the deficiencies but to find the time to redesign the booklet.....it would be nice to do .....I know some places do it if there's one thing they feel strongly about. There are deficiencies....The language is too middle class Oxford style language; patients don't usually read like that. It needs to be in Daily Record language, something that's easy to read.

Int So if you are moderately educated, you can cope with the Ames booklet but actually the majority of patients wouldn't bother reading it.
So there is a need for a Daily Record style?

Doctor1 The words have got to be easily understood and the message put over clearly.

Chiropodist User Friendly

Nurse 1 And with pictures and attractive to read

Int How about posters? Do you have any posters that the BDA give out?

Nurse1 To be honest, there's not an awful lot that I came across

Doctor1 We don't have a designated area for the diabetes service. I had posters up in here and they have now moved and downstairs we have a small area we'll have a lot more opportunity when we get a centre.

Int You're going to have a centre?

Doctor1 Hopefully, well a drop in area anyway.

Int Is exercising an important part of you lives? If so what do you do? Why?

Nurse 1 Yes , I go to aerobics and I quite enjoy that but I prefer swimming.

Int Is if to keep weight down or to feel better?

Nurse1 A combination actually, it makes you feel good. I enjoy it, I find it relaxing.

Int Can you say a bit more specifically how it makes you feel good?

Nurse 1 I think it stimulates me a bit mentally

Int Do you find you have got more energy?

Nurse 1 Much more energy. I find if I sit down and do nothing then I will do nothing all night whereas if I go out and do some exercises then I get on with things.

Int Do you find it changes your mood as well-- from what to what?

Nurse From being stressed to feeling better and less anxious. It's a form of relaxation for me

Int That's something research has shown ---stress is lessened. Does it make you stop being rude etc? Isn't important to you at all?
Doctor2 Yes

Int Do you do it fairly regularly?

Doctor2 I do a lot of hill walking and aerobics from time to time. Most weeks

Int Is there an aerobics class in hospital?

Doctor2 I wouldn't go to it

Int What's the trouble with the one in the hospital?

Doctor 2 Depends who you work with. I don't way to strut myself in front of them.

Int Do you find it has an effect on the way you feel?

Doctor 2 Yes

Int Is is a good hobby of yours?

Doctor 2 Yes

Int What about you?

Student No

Int Do you find it's not really your thing?

Student No, I hate it

Int Have you always hated it since you were at school?

Student Some things I do like but not much

Int Was It a bad experience at school

Student No, things like tennis I could play but I was absolutely hopeless at it but I don't have the ability to do it.

Int What about you Ch

Chiropodist Believe it or not I do exercise quite a lot. I do it mainly to keep my weight down because I have a very sweet tooth and I eat all day. I cycle three to five times a week for about ten miles.

Int And that's especially to keep you weight down?

Chiropodist Basically and stress too. Gets rid of hospital things. It's great fun at night to do it and forget everything.

Int Does it make you feel better?

Chiropodist Yes It's a release.

Doctor 1 I cycle a lot just now but it doesn't stop me being grumpy. Its for fitness. It's not for weight...I don't have that trouble. A sense of well being and certainly in terms of an escape. I cycle to and from work and also at the weekend. By the time I get home in an hour a lot of the things in your head at the start, they're gone.

Int So is it an hours ride?

Doctor 1 It's an hour when I'm slow but I can do it 47 minutes if I get the head down. It is an escape and it makes you feel good.

Int I'd like to thank you for your time is answering all these question.