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**EVALUATION OF A PATIENT EDUCATION PROGRAM FOR
PATIENTS WITH NON-INSULIN DEPENDENT DIABETES.**

(TYPE II)

BY

Helen M. Walker R.N.

A Thesis Submitted in Partial Fulfilment of the
Requirements for the Award of
Bachelor of Health Science (Nursing) Honours
at the School of Nursing,
Edith Cowan University Perth Western Australia.

Date of Submission: 21st October 1991.



ABSTRACT.

The purpose of this study was to evaluate a group outpatient program for patients with non-insulin dependent diabetes (Type II). It endeavoured to establish whether at the completion of a patient education program, and again at the 3 month follow-up period, the patients were complying with: (a) the recommended dietary plan, (b) the exercise program, and (c) were monitoring blood glucose levels at home, as evidenced by weight loss and metabolic control of their diabetes. The study also investigated factors influencing non-compliance.

The theoretical rationale used for this study was Pender's Health Promotion Model, which theorises that health-promoting behaviour is motivated by a desire for increased well-being and quality of life. Health-promoting behaviours are adopted in order to change behaviour to achieve an improved health status.

The study sample was a convenience sample of 24 outpatients who enrolled in and completed an education program, and who volunteered to participate in the study.

The study used a pretest/posttest design with a 3 month follow-up, with a pretest prior to commencing the education program, the posttest on completion of the program, and a follow-up 3 months later.

Instrumentation included: a questionnaire to measure dietary and exercise compliance, blood glucose monitoring, and factors influencing non-compliance; a blood glucose

test, a glycosylated haemoglobin blood test and body weight recording.

Findings of the study indicate that there was a significant improvement in: (a) dietary compliance at the posttest, but this was not maintained at the follow-up; and (b) the number of subjects performing self blood glucose monitoring at the posttest, which was maintained at follow-up. There were no significant improvements in exercise compliance, nor in the outcome variables of weight and blood glucose levels. However, there was a significant improvement in the outcome variable, blood glycosylated haemoglobin. Factors influencing non-compliance included hunger, temptation, stress, and self-management.

The study has some limitations including the short time span between the education program and the follow-up, which makes it difficult to draw long term conclusions from the study.

The findings of this study have implications for Diabetes Nurse Educators, and the following recommendations are made: (a) that the teaching strategies for exercise be reviewed, (b) that follow-up of patients be implemented on a regular basis, and (c) that the ongoing diabetes education of fellow health professionals be emphasised.

Declaration.

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

-- Signed.

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Chapter 1.

Introduction.

1.1. Introduction.

Diabetes mellitus is a chronic disease, which has been estimated to affect between three and four percent of the Australian population (Zimmet, 1985). A large majority of these people have non-insulin dependent diabetes (Type II), which normally occurs from the age of 40 onwards, at a time when lifestyle habits have become entrenched.

Although Type II diabetes is incurable, treatment regimes aim at controlling the disease by maintaining blood glucose levels within an accepted normal range, so as to prevent long term complications and improve health status. As obesity is most often the contributing factor, major changes in people's lifestyles are required if they are to lose weight in order to maintain normal blood glucose levels. The ultimate responsibility for behaviour change lies with the patients as they determine their lifestyle patterns, but patient education can play a vital preventative role by giving patients the knowledge and skills to enable them to make informed decisions to change their behaviour, and so competently self-manage.

Diabetes patient education has become a highly specialised nursing role, with patients being taught both individually and through group education programs. To ensure that a patient education program meets its objectives, evaluation of the program is required.

1.2. Study Purpose.

The purpose of this study was to evaluate a group education program for patients with non-insulin dependent diabetes, which is offered on an outpatient basis at a Western Australian metropolitan teaching hospital. The hospital's Diabetes Education Centre has been running a three weekly program using much the same format for 5 years, but as the patients are not followed up on a formal basis, there is no feedback available to evaluate long term effectiveness and ascertain whether after leaving the program, patients use the knowledge they gained in the program to change their behaviour.

1.3. Study Objectives.

The objectives of this study were:

1. To establish whether at the completion of a patient education program, and again at the 3 month follow-up period, the patients were complying to: (a) the recommended dietary plan, (b) the exercise program, and (c) were monitoring blood glucose levels at home, - as evidenced by weight loss and metabolic control of their diabetes.
2. To establish whether there were any factors which may have influenced patient adherence to the recommended dietary plan and exercise program.

1.4. Questions for Study.

The questions asked in this study were as follows:

1. To what extent do patients with non-insulin dependent diabetes mellitus (Type II) modify their lifestyles following a group education program?

1.1 Do patients comply with the diet recommended in the education program?

1.2. Do patients maintain a regular exercise program?

1.3. Do patients monitor their blood glucose levels?

1.4. Do patients maintain metabolic control of their diabetes?

2. Are there factors which influence patient non-compliance?

1.5. Operational Definitions.

Diabetes mellitus: A chronic systemic disease in which the ability of the body to metabolise carbohydrate, fat and protein is impaired. It is characterised by blood glucose levels higher than the normal range. (Van Son, 1982, p.1)

Non insulin dependent diabetes mellitus (NIDDMS or Type II): Characteristics of this type of diabetes include maturity-onset and obesity as a predisposing factor. As insulin production does not cease, this type of diabetes is normally able to be treated by diet, or by diet and oral hypoglycaemic medication. (Von Son, 1982, p.5)

Insulin dependent diabetes mellitus (IDDMS or Type I): This type of diabetes normally occurs in children or young adults. As they have an inability to produce their own insulin, they are therefore dependent on insulin injections for their existence. (Van Son, 1982, p.5)

Aerobic Exercise: Physical exercise which stimulates the respiratory and circulatory system for at least fifteen minutes, three or more times per week. Examples of aerobic type exercise are jogging, fairly vigorous walking, swimming, cycling and callisthenics. (Bauman, 1987, p.194)

Compliance: Refers to the extent to which a person's behaviour conforms with the guidelines given in the education program.

Ideal Body Weight (IBW): An acceptable weight-for-height range, adapted by the Commonwealth Department of Health from Garrow-Classification of obesity, and based on a body mass index (BMI) in the range of 20-25.

Body Mass Index (BMI): BMI is calculated by dividing weight in kilograms by height in metres squared.

BMI criteria: 20-25 Acceptable (Least risk for morbidity and minimal mortality.)

25-30 Overweight (Low risk to health.)

30-40 Morbid Obesity (High degree of risk to health.)

Glycosylated haemoglobin: The term used to describe the attachment of glucose molecules to the haemoglobin molecules in the blood. A blood test can be performed to measure the amount of glucose that is attached to a haemoglobin molecule. This test is a valid index of long term glucose control as it reflects the average blood glucose level for the 2 - 3 months prior to the test. Normal level for diabetes < 8%. (Fischbach, 1988)

Metabolic control: The maintenance of blood glucose levels within a normal range (3.5-8mmol/L).

1.6. Hypotheses.

The research hypotheses tested in this study are:

1. There will be a significant improvement in patient compliance with the recommended dietary behaviours, at the completion of the education program, which will be maintained at the 3 month follow-up period.
2. There will be a significant increase in self reported exercise performance by participants at the completion of the education program, which will be maintained at the 3 month follow-up period.
3. There will be a significant increase in the number of participants performing self blood glucose monitoring at the completion of the education program and at the 3 month follow-up period.
4. There will be a significant loss in weight by participants at the 3 month follow-up period.
5. There will be a significant decrease in the blood glucose levels of participants at the 3 month follow-up period.
6. There will be a significant decrease in the blood glycosylated haemoglobin levels of participants at the 3 month follow-up period.

1.7. Study Variables.

The following variables were identified for study:

1.7.1. Dependent variables.

1. Dietary compliance: The extent to which a patient complies with the diet recommended in the education program, - a diet, with three meals a day, no snacks, low in fat,

high in complex carbohydrates, and low in simple carbohydrates.

2. **Exercise compliance:** The extent to which a patient complies with an aerobic exercise program at least three times per week.
3. **Blood glucose monitoring:** The extent to which a patient complies with monitoring his or her blood glucose level at least twice a week.
4. **Weight:** The patient's body weight in Kg.
5. **Metabolic control:** If the patient complies with: (1) the recommended diet, (2) the exercise program, and (3) monitors blood glucose levels; the expected outcome would be metabolic control, which is the maintenance of blood glucose levels within a normal range (3.5-8mmol/L).

1.7.2. Independent Variable.

1. **The testing time:** It has three levels: pretest, posttest, and follow-up.

1.8. Assumption.

The assumption was made that the subjects participating in the study would answer the questionnaires truthfully and to the best of their ability.

Chapter 2.

2. Literature Review.

The computer databases which were searched to locate the literature used in the study, were as follows:

Medline 1984 to 1991; PsychLit. 1983 to 1990; and CINAHL 1983 to February 1991.

2.1. Introduction.

Patient education must be considered an essential component of the clinical management of diabetes, as patients cannot comply with treatment regimens without having the knowledge to understand the disease. This knowledge allows them to follow the dietary and exercise requirements, and to develop the skills necessary to monitor their blood glucose levels. (Zimmerman & Service, 1988, p. 1361)

Numerous research studies have been conducted by health professionals to evaluate diabetes education programs. In a meta-analysis of 47 studies on the effects of patient teaching, on knowledge about diabetes, self-care behaviours, and metabolic control, Brown (1988) concluded that patient teaching has positive outcomes in diabetic adults. Despite the numerous studies, Brown was critical of the lack of nursing research in this area, given that nurses are the "primary health providers involved in diabetes patient education." (Brown, 1990, p. 59.)

2.2. Approaches to Education.

As cited in Wood (1989, p.354) there are two educational approaches: knowledge based and behavioural based, both of which are based on the assumption that learning leads to changed patient performance. The knowledge based approach has been widely researched, and many studies have shown that patients receiving diabetes education have made significant knowledge gains. (Brown, 1988; Dunn, Beeney, Hoskins, and Turtle, 1990; Gilden, Hendryx, Casia, and Singh, 1989; Howard, Barnett, Chon, and Wolf, 1986; Mazzuca et al., 1986) However, according to Howard et al. (1986, p.56), knowledge, although important, does not necessarily result in improved diabetes control or weight loss. Similarly Morgan & Littell (1988) suggest that learning about diabetes and its management does not guarantee changes in behaviour. Wood (1989) also raises the question of whether patients use knowledge gained from an education program in their daily management, and suggests that future studies will need to demonstrate a direct relationship between education programmes and compliance with self-care behaviours. These behaviours must lead to metabolic control in order to prove the effectiveness of education.

The behavioural based learning approach focuses on self-care behaviours and compliance behaviours (Mazzuca et al., 1986). Beeney & Dunn (1990, p.227) suggest that the future focus of diabetes education should be directed towards influencing the attitudes and beliefs of patients in

order to have them change behaviour. Weerdt, Visser, Kok, and Van Der Veen (1990) concur, adding that it is also necessary to educate "the social environment" (p. 614) to provide support in the daily life of the patient with diabetes.

2.3. Behavioural Compliance.

Although patients can be taught what behaviour changes they should make in their lives, there is no assurance that they will remain compliant.

According to Morgan and Littell (1988), of the self-care behaviours required by patients with Type II diabetes, diet and exercise are the most difficult to comply with. In one study, which sought to determine characteristics that enhanced compliance, dietary compliance was found to decrease as the length of time with diabetes increased, but it was also found that those who complied were more health orientated and tended to exercise regularly (Kouris, Wahqvist, and Worsley, 1988). Gilden et al. (1989) reported that in one study of older patients there were improvements in the areas requiring "more intensive and demanding lifestyle changes" (p. 1026) such as diet and exercise, and these persisted for 6 months. However this may have been related to their retirement status.

Despite the importance of exercise in the management of Type II diabetes, very few of the studies reviewed focused on exercise compliance. Exercise has been found to improve glucose levels, to increase sensitivity to insulin and to contribute to weight loss in obese persons with Type II

diabetes (Hartwell et al., 1986, p.449). Hartwell et al. in a study comparing the effect of diet and exercise in Type II diabetes, found that patients assigned to a diet group had greater weight loss than those assigned to the diet and exercise group. This finding could be criticised as the exercise and diet regimes were not undertaken concurrently. In contrast, Wing, Epstein, Nowalk, Koeske, and Hagg (1985) found that those patients who increased exercise experienced most weight loss. Jenny (1986), however, found that the time and difficulty of obtaining regular exercise was frequently noted as a barrier to compliance.

Given that obesity is a major problem in Type II diabetes, there has been surprisingly little research on the behaviour changes associated with weight loss in diabetes (Guare, Wing, Marcus, Epstein, Burton, and Gooding, 1989). According to Campbell, Barth, and Gosper (1989), because of the difficulty in changing dietary habits, long term results are often poor. Hartwell et al. (1986) suggest that the metabolic abnormalities in Type II diabetes may make weight loss difficult. However, they report that there is some evidence that even for the obese, a weight loss of 7 to 10 pounds can be accompanied by a marked improvement in blood glucose levels. The present study measures weight loss as an outcome variable.

Various methods have been used to try to improve compliance. Morgan and Littell (1988) used contingency contracting in their study of Type II subjects but were not

able to show any significant effect. Contingency contracting which is derived from reinforcement theory,

"utilizes the learning principle that behaviours followed by reinforcement are more likely to continue while behaviours without reinforcement are more likely to decrease. Linking the behaviour with the reinforcer is facilitated through a written contract." (Morgan & Littell, 1988 p.147)

Wing et al.(1985) used a behaviour modification approach where different strategies, including contingency contracting, were successful in helping dietary compliance. Campbell, Barth, Gosper, Jupp, Simons, & Chisholm (1990) were also able to demonstrate dietary compliance over a 6 month period after using an intensive educational approach.

Estey, Tan, and Mann (1990) suggest that follow-up reinforcement should be considered as an integral component of diabetes care. The study by Estey et al. using follow up intervention, found telephone contact a cost-effective way of motivating people to comply, but it raised the question as to when follow-up is most advantageous. Kirkley and Fisher (1988) found that persons with Type II diabetes tended to have a series of lapses in compliance often associated with emotional stress, rather than being completely non compliant.

Jenny (1986) and Beeney & Dunn (1990), all voiced concern that Type II diabetes is wrongly perceived as a milder form of diabetes. Ignorance of the severity of the disease could be a possible reason for non-compliance.

Evidence suggests that the occurrence of complications is equally high in both types of diabetes.

Dunn, (1990) suggests that the focus of responsibility for non-compliance is shifting from the patient to other members of the health care team, but stresses that the medical model is inappropriate for managing chronic illness, as doctors are not trained to be educators. The Australian Diabetes Educators' Association, which is a professional organisation comprised of health professionals involved in diabetes education (the majority of whom are registered nurses), is in the process of introducing a Standards of Practice document. The purpose of the document is to: (a) describe the minimum care diabetes educators should provide to clients, and (b) to provide a measure for accreditation of practitioners, thereby ensuring that persons with diabetes receive a high standard of education and care from appropriately trained diabetes educators. (Australian Diabetes Educators' Association, 1991).

2.4. Measurement of Behavioural Compliance.

Measuring behavioural compliance for research purposes is difficult, as the information is gained through self reporting (Oberst, 1989). Brown (1990), Dunn (1990), and Kurtz (1990) all question the accuracy of self report measures as indicators of compliance. Kurtz puts forward the view that qualitative evidence, for example: assessment of coping skills and social support, as well as quantitative evidence, should be used to assess compliance. Hilbert (1984) suggests that reassuring patients of confidentiality

may improve the reliability of self reporting, thus circumventing the need for further measures. Reassuring patients of the confidential nature of research data should, however should be normal practice in research (Burns & Grove, 1987).

The present study uses self reporting to measure compliance to diet, exercise, and self blood glucose monitoring. Some qualitative evidence gained from informal group discussion is used to support the self reported measures.

Brown (1990) and Dunn (1990) are both critical of the lack of reliable and valid research instruments used in the numerous diabetes research studies. They both identify a need for the development of reliable measures of self-care behaviours as evaluation tools. This need remains, as despite an extensive literature search, a suitable instrument could not be found for the present study. Although a reference was found for an instrument to measure dietary intake, the instrument was not designed for diabetes and it involved analysing the composition of all food eaten (Kristal, Shattuck, Henry, and Fowler, 1990). This method of analysis was thought to be beyond the scope of the present study. In the studies reviewed, there were several reports of questionnaires being constructed specifically for each study. Some of these did not report on validity and reliability (Kouris et al., 1988; Wing et al., 1985; Wood, 1988). Other studies acknowledged the lack of availability of suitable instruments and reported validity and reliability figures for questionnaires which had been

developed for their studies (Gilden et al., 1989; Morgan & Littell, 1988). Unfortunately these questionnaires were also found to be unsuitable, as they measured different variables to those used in the present study. Another group of studies, either did not describe the instrument, or did not reveal the source of the instrument used (Howard et al., 1986; Paulozzi, Norman, McMahon, and Connell, 1984).

Because a suitable instrument to measure behavioural changes in diabetes could not be located for the present study, an instrument, the Physical Activity Index, was used to measure exercise, and a questionnaire was constructed to measure blood glucose monitoring, dietary compliance, and demographic factors.

2.5. Recent Technology.

Advances in technology have changed both the teaching and research approaches to diabetes. Patients are now taught home blood glucose monitoring, which means they can check their blood glucose at any time, giving them greater responsibility and control over their disease (Valenta, 1983). Gilden et al. (1990) in a study of older persons, found that self blood glucose monitoring was a practice which was acceptable to the participants in the study.

A recently developed blood test, to measure glycosylated haemoglobin levels, has great significance as a physiological research measure as it reflects the patient's metabolic control for the previous 2 to 3 months (Fischbach, 1988). Brown (1990) suggests that the use of this test in recent studies could be a reason for improvements in

research technique. The improvement that was reported in two studies was interpreted as an indication of definite control rather than just a temporary improvement in preparation for retesting (Mazucca et al., 1986; Paulozzi et al., 1984). The present study uses this test as a measure of metabolic control, an outcome variable of the study.

2.6. Summary.

To summarise the literature reviewed, it is found that numerous studies have researched the knowledge based approach to diabetes education. However, it appears from the recommendations made in the studies reviewed that the future focus of diabetes education research should be directed towards assessing the relationship between diabetes education and behaviour change. It is recognised that compliance to diet, exercise, and self blood glucose monitoring are important behaviours in maintaining metabolic control and for weight loss in Type II diabetes. It is also acknowledged that compliance to these behaviours can be difficult to maintain and measure. The lack of a suitable instrument for measuring behaviour change in diabetes has been raised as a problem in diabetes research.

The question was also raised as to whether follow-up of patients following education is advantageous in sustaining behaviour change, and if so, when. The present study endeavours to address this problem in the following manner: If there is improvement at the posttest, then the program is achieving its objectives. If there is no improvement then the program needs revision. If there is improvement at

posttest but a falling off at follow-up then it supports the notion that patients need follow-up support.

Recent technology has made improvements for both the patient with diabetes and for research technique. The present study endeavours to establish whether the subjects perform the technique of self blood glucose monitoring in their everyday life. The blood test to measure glycosylated haemoglobin levels is used in the study to measure metabolic control.

The present study has been designed to focus on the behaviourally based approach of patient education. It aims to establish whether patients with Type II diabetes use knowledge gained from education in their daily management to change behaviours, and whether this relationship shows weight loss and improvement in metabolic control 3 months after completion of the program.

2.7. Frame of Reference.

2.7.1. Pender's Health Promotion Model.

The theoretical rationale used for the study is Pender's Health Promotion Model (HPM). (Pender, 1987).

The HPM, which was derived from social learning theory, has been developed to complement the Health Belief Model (HBM) originally developed in the 1950's by Rosenstock. The HBM, which has been used previously in diabetes education studies (Dunn et al., 1990; Gorman, Ludemann, and Reichle 1988; Kouris et al., 1988), provides an explanatory framework for health-protecting or preventative behaviour.

According to Pender (1987) health-protecting behaviour is motivated by an individual's perception of the probability of experiencing illness, whereas health-promoting behaviour is motivated by a desire for increased well-being, personal growth and quality of life.

Pender describes health promoting behaviours as "continuing activities that must be an integral part of of an individual's life" (1987, p.59). This may involve change and the learning of new patterns of behaviour to improve health and well-being. Examples of health promoting behaviours include physical exercise and dietary changes. Although health promoting behaviours may have been initiated as a preventative action against illness, they are often continued because of the satisfaction and enjoyment they create.

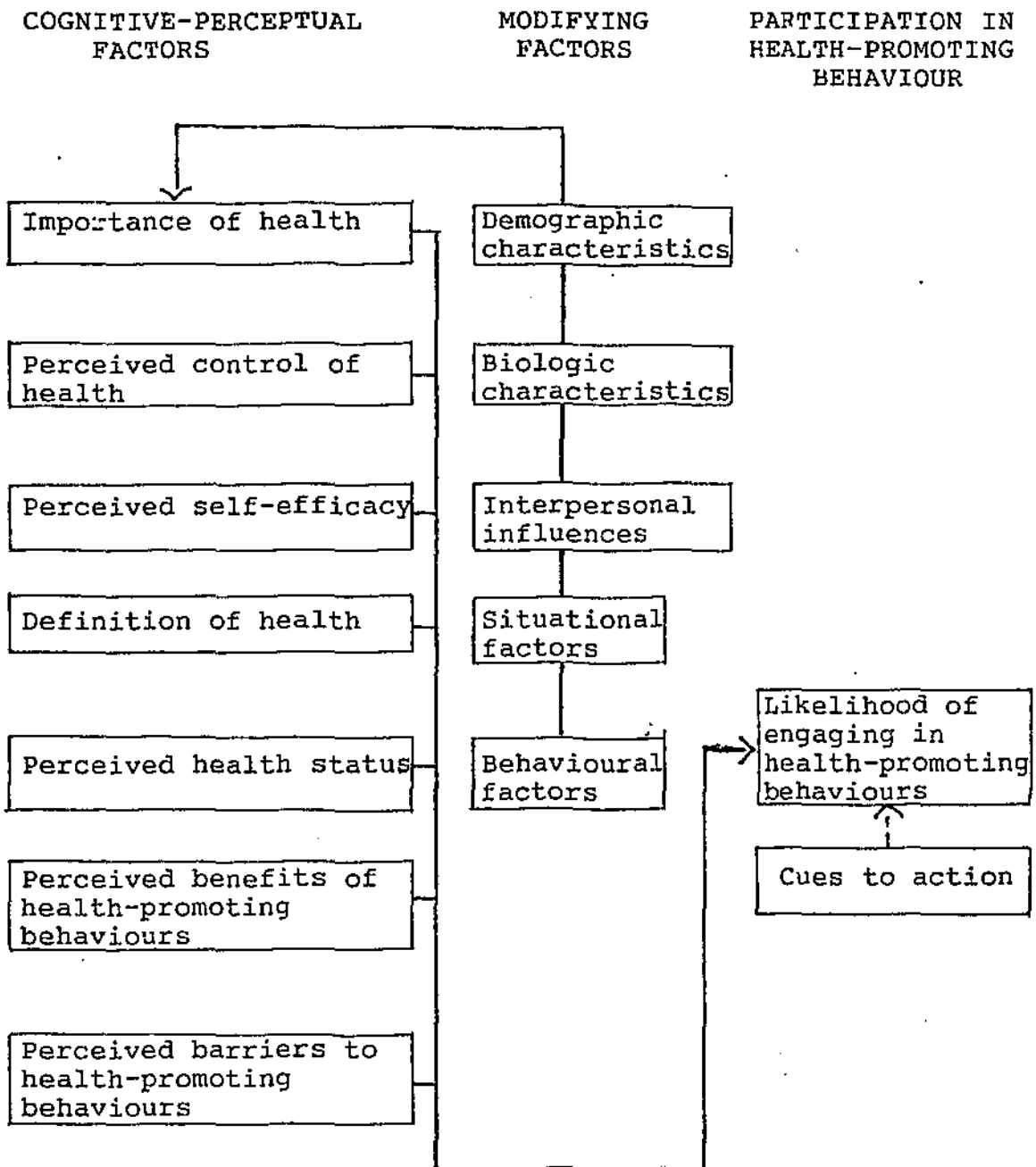
The HPM (Figure 2.1.), which is similar in organisation to the HBM, provides a framework for research in the area of

health promoting behaviours. It is structured in three sections:

1. Cognitive-Perceptual factors: The primary motivating mechanisms for acquiring and maintaining health promoting behaviours. Each factor is thought to exert a direct influence on the likelihood of engaging in health.
2. Modifying factors: Factors which affect patterns of health-promoting behaviours indirectly, by their impact on cognitive-perceptual mechanisms.
3. Cues to Action: The likelihood of health-promoting action taking place also depends on activating cues. For example "feeling good" after exercise can serve as a cue for continuing exercise. (Pender 1987, pp 57-69.)

In summary, Pender's HPM is used as the theoretical framework for the study. It is assumed that the subjects in this study must adopt some health promoting behaviours, in order to change behaviour to achieve weight loss, maintain metabolic control, prevent long term complications and therefore have improved health status.

Figure 2.1. Health Promotion Model. (Pender, 1987 p.58)



Chapter 3.

3. Methods and Procedures.

3.1. Study Sample.

The study sample was a convenience sample of outpatients who enrolled in the group education program for patients with Type II diabetes and who volunteered to take part in the study over a 4 month period.

3.1.1. Inclusion Criteria.

All subjects had a medical diagnosis of Type II diabetes. Both long term and recently diagnosed patients were included. (The time since diagnosis ranged from 1 month to 13 years. The mean was 2 years 7 months and the median was 1 month). Subjects were included in the study only if they were English speaking. They were required to attend an evaluation session and all three teaching sessions.

3.1.2. Exclusion Criteria.

Persons were excluded from the study if they were: (a) taking steroid medications which may have had an adverse effect on blood glucose levels, or (b) having insulin injections, as some of the information given in the program would not be applicable to them.

3.1.3. Sample Characteristics.

As each program group had only 10-12 participants, subjects were included from three group programs to make up

the total sample of 30. Six subjects did not complete the 3 week education program, and were therefore eliminated from the study. One subject did not complete the follow-up, because of family commitments overseas. Therefore 23 subjects completed the study.

The sample comprised of 13 men and 11 women between the ages of 38 and 75 years (mean=58 years). Fourteen (61%) subjects were referred to the Diabetes Education Centre by a medical practitioner, 5 (21%) were referred by hospital nursing staff and 4 (17%) were self-referred. None of the 23 subjects had attended a previous education program. Eleven (46%) subjects were being treated with diet alone and 13 (54%) with diet and oral hypoglycaemics. Sixteen (66%) subjects said they had been given dietary advice prior to the education program. Seventeen (71%) subjects had an education level of Year 10 or below. Five (21%) subjects said they had tertiary education. Only 8 (33%) subjects were employed: two were employed in clerical positions, two were self-employed businessmen, two were employed as tradesmen, one was employed as a fisherman and one was employed in a cleaning position. The remaining 16 (67%) gave their occupation as retired, on an invalid pension, unemployed, or home duties.

3.2. Study Setting.

The study was conducted at the Diabetes Education Centre of a Western Australian metropolitan teaching hospital.

3.3. Study Design.

The study was a pretest/posttest design with a 3-month follow-up. The pretest was given prior to commencing the education program, the posttest on completion of the program, and a follow-up test three months after completion of the program. A control group was not used as there was limited access, through the Diabetes Education Centre, to patients with Type II diabetes who had not previously taken part in the education program. In addition, as patients are referred to the Education Centre for the purpose of receiving education as part of their clinical management, it was considered by the researcher to be unethical to withhold education from patients so that they could act as a control group.

3.4. Ethical Considerations.

Prior to the commencement of the study, written consent was obtained from: (a) The Edith Cowan University School of Nursing Research and Ethics Committee and (b) The Nursing Research Review Committee of the hospital where the study was conducted.

All subjects participating in the study were required to sign a written consent form, which contained an outline of what was required of them in the study (Appendix A).

The subjects were informed that the study was voluntary and they had the right to withdraw at any time. As identities of the subjects were required for follow-up, a number-name key was used, with each subject being assigned a number which was used on the patient's history sheet, data

collection sheets, and the questionnaires. The researcher and the nursing staff who were involved with data collection were the only persons with access to the subjects' identities.

3.5. Pilot Study.

Two pilot studies were conducted (to test feasibility) prior to the main study.

The first pilot study had the purpose of determining whether the questionnaire was appropriate, acceptable, and readable. Seven patients, who attended an education program identical in format and content to that of the main study, were given Section A. (Appendix C) of the questionnaire to answer. As a result of the pilot study, several questions were reconstructed or eliminated from the questionnaire, due to ambiguity or vagueness.

The second pilot study involved nine patients answering the complete questionnaire as a "pretest" prior to commencement and as a "posttest" at the completion of an education program, identical in format and content to the one in the main study.

This pilot study identified two major problems:

1. It was not going to be feasible to conduct the pretest of the study on the first morning of the education program as planned. It was estimated it would take over one hour to collect data from all the subjects in order to gain consent, record data, and give them time to complete the questionnaire. In this pilot study, the research study,

rather than the education program, became the central focus of the morning.

2. Most patients had been seen by the educators and had been given some information about diabetes prior to the commencement of the education program.

The decision was made by the researcher and the diabetes educators, to conduct the pretest of the study on a separate evaluation day, prior to commencing each education program. The subjects would be seen on this day for the first time by the educators.

3.6. Data Collection Procedure.

Research data was collected over a five month period, from March to August 1991.

3.6.1. Pretest.

An evaluation session was held 1 or 2 weeks before the commencement of each education program. At each of these sessions, the diabetes nurse educators assessed each patient to determine whether it would be appropriate for them to attend the group education program. All patients who were deemed suitable for enrolment in the education program, were introduced to the researcher who asked informally if they would participate in the research study. A verbal explanation of what the study would involve was given, then each subject was asked to read and sign a consent form (Appendix A).

1. All subjects were asked to fill in a brief history sheet (Appendix B).

2. All subjects were asked to answer Section A of the questionnaire, which took 5 to 10 minutes to answer. The researcher remained present to assist subjects with reading or visual problems.
3. All subjects were asked verbally what exercise they had undertaken during the previous week (as per Section B of the questionnaire). Answers were recorded by the researcher on the exercise data collection forms (Appendix E).
4. The following measurements were taken by the diabetes nurse educators, and recorded on the data collection forms (Appendix F):
 - i. Blood glucose level.
 - ii. Weight.
 - iii. Height.
5. All subjects were told their ideal body weight range, which was based on a body mass index in the range of 20 -25.
6. All subjects were asked to have a glycosylated haemoglobin blood test prior to commencing the education program.
7. All subjects were taught by a Diabetes Nurse Educator to perform a self blood glucose test using a drop of capillary blood obtained from a fingertip, and placed on a reagent area of a reagent strip. The colour of the reaction obtained was then measured against a colour code to determine the level of blood glucose. Subjects used this procedure to self blood glucose test at home. If subject's chose to purchase and use a reflectance blood glucose meter to measure blood glucose levels, they were taught the correct use of the meter by a Diabetes Nurse Educator.

3.6.2. Intervention: The Education Program.

The education program consisted of three sessions, held on consecutive weeks, each two and a half hours in length. All subjects in each of the three groups were exposed to teaching by two specialist nursing diabetes educators, a physiotherapist, a dietician and a podiatrist.

The education program provided information about diabetes, its management and the prevention of complications. The objectives, teaching methods, and content of each session of the education program is summarised in Appendix H.

3.6.3. Posttest.

The posttest was conducted at the completion of Session 3 of the education program.

1. Subjects answered Sections A and C of the questionnaire.
2. Section B of the questionnaire was answered verbally.
3. A follow up appointment was given to all subjects to reattend the Diabetes Education Centre in three months time.

3.6.4. Follow-up test.

The follow-up test was conducted three months after posttest.

1. One week prior to the test, a phone call was made to each subject to remind them of their appointment, and to arrange a further blood test to measure glycosylated haemoglobin levels prior to the follow-up appointment.

2. The subjects met as a group for the follow-up. Each of the subjects answered Sections A, B, & C of the questionnaire.
3. The following measurements were taken and recorded by the diabetes nurse educators:
 - i. Blood glucose level.
 - ii. Weight.
4. At the completion of the data collection, the subjects were given the opportunity to discuss within the group, any difficulties or feelings they may have been experiencing in relation to their diabetes. The researcher recorded comments in anecdotal form.

3.7. Instrumentation.

3.7.1. Questionnaire. (Appendix C)

Section A: This section which has 20 items, was constructed to measure the following criteria: blood glucose monitoring, dietary compliance, and demographic factors. The dietary component used ten questions published in the "Facts on Fat" and "Fruit 'n' Veg with every meal" health promotion packages developed by the Health Promotion Service Branch of the Health Department of Western Australia. Consultation with nutritionists at the W.A. Health Department established that although these questions were not developed as a research instrument, they were intended to measure dietary behaviour. Questions 5-18 of the questionnaire are "scored" using the scoring system used in the health promotion packages.

Section B: This section used an instrument called the Physical Activity Index to measure physical activity. It was obtained from the Department of Sport, Tourism and Recreation. Questions 23a-23d and 24 of the Physical Activity Index (Appendix G) were used to measure exercise compliance in the study and were asked verbally of each subject. These questions were "scored" according to the Mets formula described in Appendix G, and the activities undertaken were classified as aerobic or non-aerobic. This instrument was developed as a Canadian Activity Index and used in the Ontario Fitness Surveys in 1980 and 1983 (Bauman, 1987). It was modified and used in its present form in the Department of Sport, Recreation and Tourism's "Australian Physical Activity" surveys in January, 1985 and repeated as a comparison in January 1986. Evidence of reliability and validity of this instrument is not reported in any of these surveys.

Section C: This section has five questions relating to reasons for non-compliance.

3.7.1.2. Validity and Reliability.

For the present study, the questionnaire as a whole, has been evaluated by three specialist Nursing Diabetes Educators to obtain content validity. In addition, the questionnaire was pilot tested to ensure that it was understood.

Reliability tests have not been conducted. There was no access to suitable participants prior to their receiving education, to test reliability of the questionnaire by test-retest or other methods. Internal consistency tests of the questionnaire were not appropriate as each question was different.

3.7.2. Weight.

All subjects were weighed at pretest and follow-up on the same Avery upright balance beam scales. Patients were weighed at the same time of day at each of the tests in light clothing.

3.7.2.2. Height.

All subjects had their height recorded.

3.7.2.3. Body Mass Index (BMI).

BMI was calculated by dividing weight in Kg by height in metres, squared (kg/m^2).

3.7.3. Glycosylated Haemoglobin.

This test used 3ml of venous blood which was processed according to laboratory standards. Optimal glycaemic control for diabetes would be at a level equal to or less than 8%. A decrease in the level of this test over a period of time would indicate an improvement in diabetes control (Fischbach, 1988). Medical authorisation for this test was obtained from each patient's general practitioner, who was medically responsible for the patient while

attending the centre (Appendix D). Although the blood samples for this test were processed at more than one laboratory, each subject had both their pretest and the follow-up samples processed at the same laboratory.

3.7.4. Blood Glucose.

This test measures the blood glucose level at the time the test is taken. Normal range for diabetes is 3.5 - 8.0 mmol/L. This test used a drop of capillary blood obtained from a fingertip, and placed on the reagent area of a reagent strip. The result was interpreted using an Ames reflectance blood glucose meter. This test was taken at approximately the same time of day for each recording. To ensure reliability the meter was recalibrated prior to use. The test was performed only by nursing staff who had received a hospital certificate of competency. One nurse was assigned to perform this test on each of the data collection days.

3.8. Limitations of the Study.

This study has several limitations.

1. The size of the study sample was such that the findings cannot be reflective of the general population of diabetes patients undergoing an education program.
2. The convenience sample may have had self selection bias in that those who participated may have been more motivated than others.
3. The absence of a control group prevents comparison with a group of diabetics who did not attend the program.

4. The time scale of 4 months has caused attrition.
5. The questionnaire has not been tested for reliability.
6. There are intervening variables including (a) the extent to which participants are motivated and (b) previous knowledge of diabetes.

Chapter 4.

4. Study Results.

The study results will be described under their respective hypotheses. Responses to the five questions asked in Section C of the questionnaire will then be described.

4.1. Hypothesis 1: Dietary Behaviours.

Hypothesis 1 states that there would be a significant improvement in patient compliance in the recommended dietary behaviours at the completion of the education program, which would be maintained at the 3 month follow-up period.

To test this hypothesis, the scores for Questions 5 to 18 of Section A of the questionnaire were added together to give a total score. The differences in total scores at pretest, posttest and follow-up, were analysed using a repeated measures ANOVA with three levels. Findings revealed a statistically significant effect between pretest and posttest, $F(1,22) = 13.3$ $p < .01$. The difference between posttest and follow-up was not significant, $F(1,22) = 2.73$ $p > .05$. The difference between pretest and follow-up was not significant either, $F(1,22) = 3.22$ $p > .05$. Therefore there was a significant improvement in patient compliance with the dietary behaviours recommended in the education program at posttest, but this was not maintained at follow-up. The minimum, maximum, and mean diet scores for pretest, posttest and follow-up test are shown in Table 4.1.

Table 4.1. Performance Scores for Dietary Compliance.*

	Minimum	Maximum	Mean	S.D.
Pretest	5	27	14	6.75
Posttest	2	17	10.6	4
Follow-up	3	21	11.9	4.8

* The highest possible score was 41. The lower the score, the better the compliance.

The results for each question at pretest, posttest and follow-up are presented in Figures 4.1 to 4.4. Figure 4.1. corresponds to Questions 5 to 8, Figure 4.2. to Questions 9 to 12, Figure 4.3, Questions 13 to 16 and Figure 4.4, Questions 17 and 18. The scores allocated for individual responses to each question are shown as different patterns on the graphs.

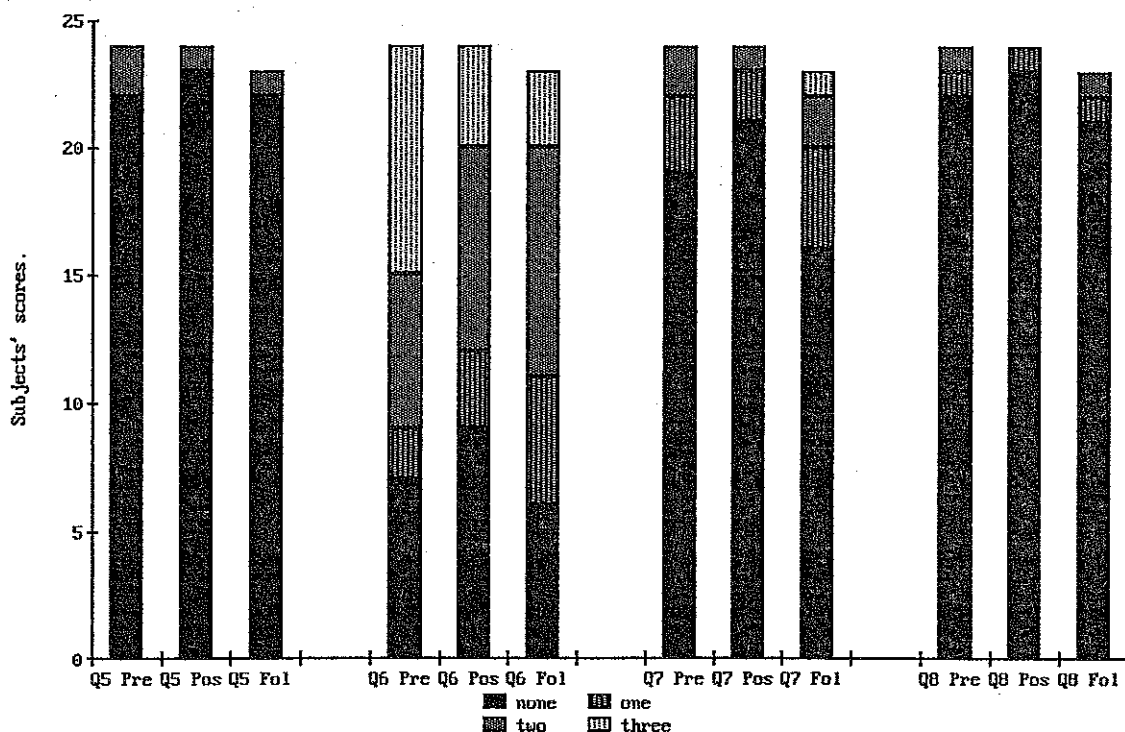


Figure: 4.1. Dietary Compliance: Questions 5 to 8.

Obvious observations are as follows: Questions 5, 7, 8, 17 and 18 all indicated a high rate of compliance at pretest. This high rate of compliance was maintained at posttest and follow-up for questions 5, 8, 17 and 18. Therefore there is little variation in the dietary behaviours relating to these questions.

Question 6 asked subjects how often they had snacks in between their main meals. This question highlighted a difference between the dietary requirements for Type I and Type II diabetes. With Type I diabetes snacks may be required to prevent hypoglycaemia, whereas in Type II the main principle of treatment is to reduce weight, and therefore snacks are discouraged. At pretest 9 (37%) subjects stated that they snacked almost daily, with 6 (25%)

stating that they snacked several times a week. There was a notable improvement at posttest. At follow-up the posttest scores were not maintained.

Questions 7 and 8 asked about the consumption of sweet biscuits, pastries, cakes or croissants. From the responses given the assumption is made that most subjects either (a) were aware that they should not have sugar in their diet if they had diabetes, or (b) were given this advice prior to the education program (bearing in mind that 16 subjects said they had been given dietary advice prior to the pretest). While for Question 8 the compliance does not change at posttest and follow-up, Question 7 indicates a falling off in compliance at follow-up.

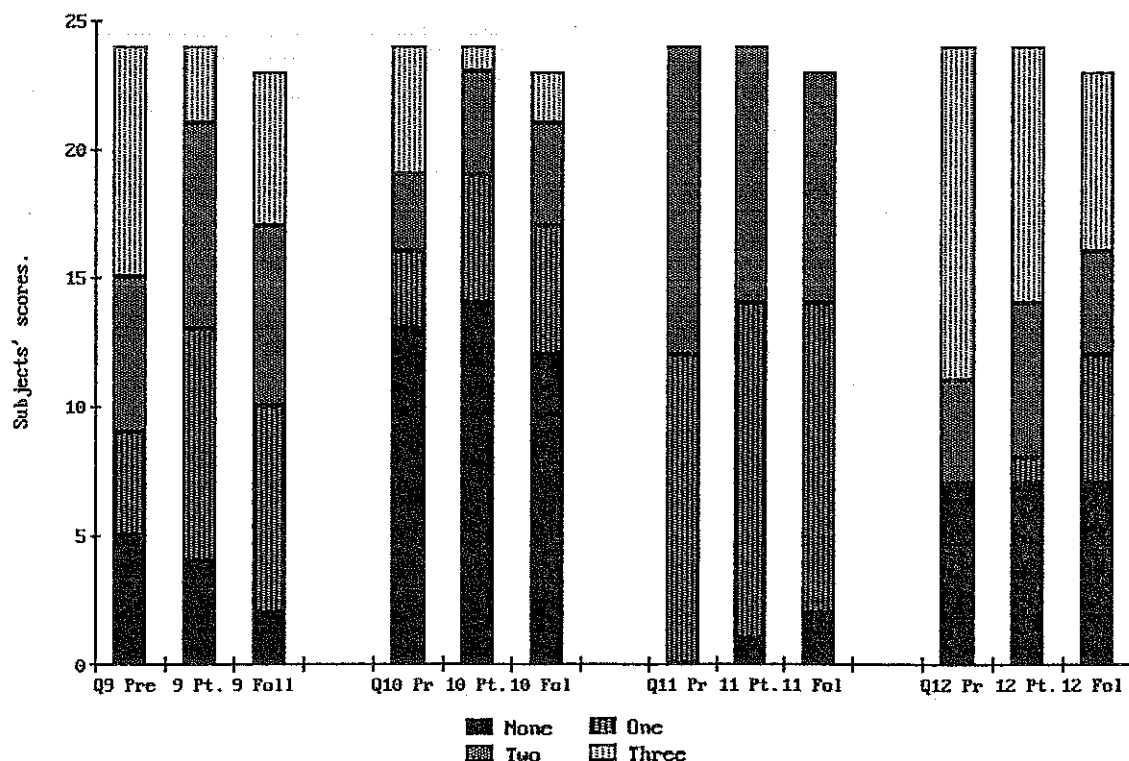


Figure: 4.2. Dietary Compliance: Questions 9 to 12.

Questions 9 to 12 all focus on the consumption of foods high in fat. In looking at them collectively, it can be seen that the subjects were eating less fatty foods at posttest and this was maintained at follow-up.

Question 11 relating to the consumption of fat on meat, is notable because of the lack of "zero" scores at pretest with little change at posttest and follow-up. This can be accounted for because a zero score is awarded if the subjects do not eat meat. Although it would lead to a decreased fat consumption, it is not a requirement of the recommended diet.

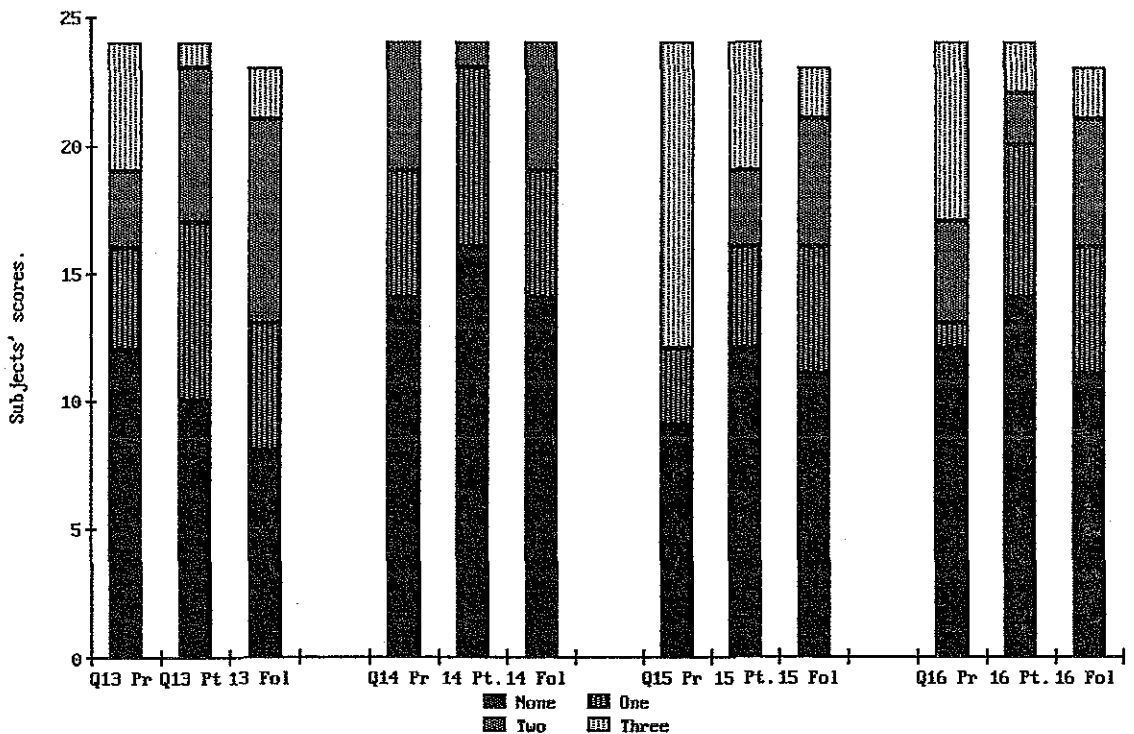


Figure: 4.3. Dietary Compliance: Questions 13 to 16.

Questions 13 to 16 all focus on the consumption of fruit and vegetables. It can be seen that there is a

definite increase in compliance at posttest, which drops off slightly at follow-up.

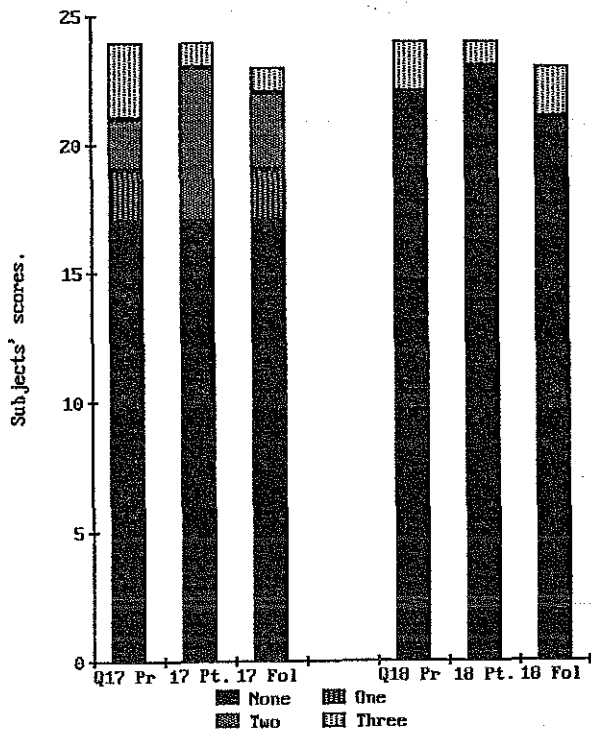


Figure: 4.4. Dietary Compliance: Questions 17 & 18.

Questions 17 and 18 relate to alcohol consumption. According to the recommendations of the diet, alcohol should be restricted as it has a high sugar content. It is assumed that most subjects did not consume a large amount of alcohol prior to pretest, and therefore this behaviour did not change. It is noted though that the 2 subjects who stated that they consumed more than two glasses of alcohol daily were still consuming the same amount at follow-up. At posttest 3 subjects stated that for them the hardest thing about having diabetes was reducing alcohol. One of these subjects stated that alcohol was a reason for being unable to comply with the recommended diet.

In evaluating the results of the questionnaire as a whole, it should be noted that the mean pretest score for dietary compliance was 14, of a possible score of 41. This indicates that many of the subjects had already adopted behaviours that complied with those of the recommended diet. There is evidence to suggest that prior to commencing the education program the subjects had a high awareness of the need to reduce sugar in their diet. However they did not appear to be as aware of the dietary guidelines relating to the consumption of fat, fruit, and vegetables.

It can be seen that there was an improvement in compliance with the recommended dietary behaviours at the posttest, which indicates that the education program had an effect on dietary behaviours. However, it should also be noted that there was a drop off in this compliance at the 3 month follow-up.

4.2. Hypothesis 2: Exercise.

Hypothesis 2 stated that there would be a significant increase in self reported exercise performance by participants at the completion of the education program and at the 3 month follow-up period. To test this hypothesis, a score calculated by using the Mets formula in the Physical Activity Index, was given for each subject at pretest, posttest and follow-up. The difference in scores was analysed using a repeated measures ANOVA with three levels. The results of this test was not significant, $F(2,44) = 0.46$ $p > .05$. Therefore this hypothesis was not supported. There was no evidence that the program had any effect on the

amount of exercise the subjects were doing. The type of exercise performed was noted, and whether the exercise was aerobic. (Performed fairly vigorously for at least 15 minutes three or more times per week.) Table 4.2. shows the number of subjects: (a) not exercising, (b) exercising for at least 15 minutes three or more times each week, (c) exercising fairly vigorously (for at least 15 minutes three or more times per week). Table 4.3. shows the type of exercises performed. Most subjects walked for exercise.

Seven subjects at pretest, and 6 at posttest and follow-up, said they had not been exercising. When asked why they did not exercise, 2 subjects said they were too lazy. Two said they did not have time. Two blamed the weather, even when it had been sunny. One excuse given was "I'm too busy doing other things when it is fine". It should be noted that only 2 subjects made no attempt at all to exercise during the study.

Of the 15 (62%) who were exercising for at least 15 minutes three or more times each week at pretest, 14 (58%) were exercising fairly vigorously, therefore performing aerobic exercise. At posttest, although 17 (71%) subjects said they exercised for at least 15 minutes three or more times each week, only 11 (46%) were performing aerobic exercise. At follow-up 15 (65%) subjects said they exercised for at least 15 minutes three or more times each week, but only 12 (52%) of these were performing aerobic exercise.

Table 4.2. Exercise Characteristics.

	Total No.	Not exercising.	15 mins. & 3+times/wk.	Fairly Vigorously
Pretest	24	7	15	14
Posttest	24	6	17	11
Follow-up	23	6	15	12

Table 4.3. Type of Exercise Performed.

	Walking	Swimming	Cycling	Weights
Pretest	14	2	1	1
Posttest	15	1	2	1
Follow-up	13		2	1

4.3. Hypothesis 3: Self Blood Glucose Monitoring.

Hypothesis 3 stated that there would be a significant increase in the number of participants performing self blood glucose monitoring (SBGM) at the completion of the education program and at the 3 month follow-up period. This hypothesis was tested by totalling the number of subjects performing SBGM at pretest, posttest and follow-up and analysing the difference in the number of subjects by the use of a Cochran Q test. Findings revealed a highly significant effect of $Q(2) = 36.1$ $p < .001$. At pretest 4 subjects were performing SBGM. At posttest 23 of the 24 subjects were performing SBGM. The only subject not performing SBGM at posttest had in fact been performing SBGM

at pretest, but was unable to do so at posttest, because of hand surgery. All subjects were performing SBGM at the follow-up test. All subjects were able to state what the results of their blood tests had most often been for the 2 weeks prior to the posttest and the follow-up. Many subjects also stated the actual results of the blood tests.

The education program emphasised the importance of self management of diabetes with SBGM being taught as a practical tool to enable subjects to self monitor their disease. It was stressed that SBGM was a more reliable measure than urine testing, as urine test results were affected by urinary threshold levels and time delay. Therefore subjects were encouraged to perform blood testing in preference to urine testing. To establish whether in fact the subjects were changing from urine testing to blood testing, Question 1 of the Questionnaire asked if they were urine testing. At pretest 12 (50%) were urine testing. At posttest 7 of the 12 had ceased testing, and at follow-up only 4 were testing. Subjects in this study accepted the practice of blood testing in preference to urine testing.

4.4. Hypothesis 4: Body Weight.

Hypothesis 4 stated that there would be a significant loss in weight by participants at the 3 month follow-up period. This hypothesis was tested by analysing the difference in subjects' weight between the pretest and follow-up by using a *t* test. The result of this test was not significant, $t(22) = 1.75$ $M = 1.67$ $S.D. = 4.56$ $p > .05$. (Mean weight loss = 1.67Kg). This result did not support

the hypothesis. Weight was not measured at posttest, as the time span between pretest and posttest was thought to be too short for many subjects to lose weight.

The minimum, maximum, mean, and standard deviation of weight scores for pretest and follow-up are shown in Table 4.4. The weight differences between pretest and follow-up ranged from a gain of 6 Kg to a loss of 12.5 Kg. Fourteen subjects lost weight. Two subjects remained at the same weight, while 7 subjects increased weight.

Table 4.4. Weight Recordings for Pretest and Follow-up (In Kgs).

	Minimum	Maximum	Mean	S.D.
Pretest	62.5	119	82.45	15.8
Follow-up	57.9	112.6	80.8	15.3

The Body Mass Index: Kg/m^2 (BMI) for subjects at pretest and follow-up is shown in Table 4.5. The minimum, maximum, mean and standard deviation of the BMI scores for pretest and follow-up are shown in Table 4.6. At pretest 18 (72%) subjects had a BMI of over 25, - or over their Ideal Body Weight (IBW). Ten of the 18 had a BMI of over 30, which is in the morbid obesity range where there is a high degree of risk to health. Although 14 subjects lost weight, 17 subjects were still heavier than their IBW, and 10 still had a BMI of over 30.

Table 4.5. Pretest and Follow-up BMI Scores.

Pretest (Subjects)	Follow-up (Subjects)	BMI
5	6	25 or under.
8	7	>25 but < or = 30.
10	10	> 30.

Table 4.6. BMI: Minimum, Maximum, Mean & Standard Deviation.

	Minimum	Maximum	Mean	S.D.
Pretest	22	42	30.09	5.37
Follow-up	20	43	29.65	5.35

Subjects were asked if they considered themselves overweight. At pretest 16 subjects said they were overweight, while 8 said they were not. Of the 8, 5 subjects in fact had a BMI of over 25. At posttest 9 subjects did not consider themselves overweight. The same 5 subjects who had had a BMI of over 25 at pretest still did not consider that they were overweight. At follow-up these 5, again responded that they were not overweight, but 2 had in fact gained weight.

A further 7 subjects who did not consider themselves overweight at follow-up, had lost weight between pretest and follow-up.

Question 4 of the Questionnaire, asked if the subjects had lost weight since their diabetes was diagnosed. At pretest 20 subjects said that they had lost some weight since being diagnosed. The relationship between the difference in weight between pretest and follow-up and the length of time since diagnosis is shown in Table 4.7. (Length of time since diagnosis as recorded at pretest). Fourteen (61%) subjects had been diagnosed as having diabetes within 4 months of the pretest. Ten of these 14 lost weight during the study. These 10 subjects accounted for 71% of the total number of subjects that lost weight. Nine (39%) subjects had had diabetes for 18 or more months prior to pretest. Four of these subjects lost weight, while 4 also gained weight.

Table 4.7. Relationship Between Length of Time Since Diagnosis and Weight Difference.

Time (Mths.)	Total	Lost Weight	Gained Weight	No Change
1 to 4	14	10	3	1
18	1		1	
48	3	1	2	
60	1		1	
84 & over	4	3		1

4.5. Hypothesis 5: Blood Glucose Levels.

Hypothesis 5 stated that there would be a significant decrease in the blood glucose levels of participants at the 3 month follow-up period. This hypothesis was tested by analysing the difference between blood glucose levels at pretest and follow-up, by using a t test. The result of this test was not significant, $t(22) = 0.3$ $p > .05$ $M = 0.1$ $S.D. = 1.67$. Therefore there was no evidence of a decrease in blood glucose levels at follow-up. The minimum, maximum, mean and standard deviation scores for blood glucose levels at pretest and follow-up are shown in Table 4.8. There were no notable changes between pretest and follow-up.

Table 4.8. Blood Glucose Levels: Minimum, Maximum, Mean & Standard Deviation (Expressed as mmol/Litre).

	Minimum	Maximum	Mean	S.D.
Pretest	4.6	17.5	8.9	2.8
Follow-up	4.5	16.9	8.8	3.4

4.6. Hypothesis 6: Glycosylated Haemoglobin.

Hypothesis 6 stated that there would be a significant decrease in the blood glycosylated haemoglobin (HbA) levels of participants at the 3 month follow-up period. This hypothesis was tested by analysing the difference between the HbA levels at pretest and follow-up using a t test. A significant effect was found, $t(22) = 3.56$ $p < .01$, $M =$

0.91 S.D = 1.2. This result supported the hypothesis that there would be a significant decrease in HbA levels at follow-up, thus indicating that the average blood glucose levels for the previous 2 to 3 months have been within the normal limits. The minimum, maximum, mean and standard deviation of the HbA levels at pretest and follow-up are shown in Table 4.9. It should be noted that the mean pretest recording of 7.2 is within the normal limits for HbA. This indicates that for most subjects blood glucose levels were not poorly controlled prior to the study.

Table 4.9. Glycosylated Haemoglobin (HbA) Levels: Minimum, Maximum, Mean and Standard Deviation (Expressed as %).

	Minimum	Maximum	Mean	S.D.
Pretest	4.7	12.3	7.2	1.9
Follow-up	4.2	10.9	6.2	1.5

4.7. Results of Section C.

Five questions in Section C of the questionnaire, were asked at the posttest and again at the follow-up.

Question 1 asked "What is the hardest thing for you about having diabetes?" Responses to this question were similar both times it was asked. Seventeen subjects responded both at the posttest and the follow-up with answers relating to difficulties with diet. Many subjects specified particular difficulties. These responses have been categorised to show the frequency of different

responses. These are displayed along with some typical quotations in Table 4.10.

Apart from responses relating to diet, some of the other responses were as follows: "Gaining and maintaining control", "the stress of not understanding about it", "exercising regularly", "finding time to see the Doctor", "impotence", "blood testing", and "emotional and mental attitude". Four subjects indicated that they did not find it hard: "don't find it difficult", "don't feel as if I have diabetes", "no worries", and "nothing is hard".

Question 2 asked "are you having trouble keeping to your recommended diet?" At posttest 10 (43%) subjects said that they were not having trouble, 11 (48%) said they sometimes had trouble, and 2 (9%) said they were having trouble keeping to the recommended diet. At follow-up 12 (52%) said they were not having trouble, 9 (39%) said they sometimes had trouble and 2 (9%) said they were having trouble keeping to the recommended diet.

Table 4.10. Question 1: Responses Relating to Diet.

Diet Category	Typical Quotes	Posttest (Number)	Follow-up (Number)
Sweets/Chocolates		4	4
Reducing Weight	"Being conscious of what one eats at all times". "not a big eater so find it hard to cut down".	4	2
Sweet cakes/ Biscuits	"find it hard doing without biscuits".	2	2
Alcohol		3	
Snacks	"hard not having snacks between meals".	1	
Dining out		1	2
Stress	"hard maintaining regular eating pattern when stressed".		1
Meal planning			1

Question 3 asked "what is the main reason for not keeping to your recommended diet?" Six of the subjects responded to this question at posttest, the responses were as follows: "hunger", "urge for lollies", "alcohol", "visiting friends", "business commitments", and "stress - emotional anxiety caused through changes." Six subjects responded at follow-up. Three of the six stated that they were not having trouble keeping to the recommended diet at posttest. Responses were as follows: "sometimes I get very

hungry", "difficulty keeping sugar down", "temptation", "stress, time factor and cash flow", "self management", and "when having afternoon tea with friends,- they understand the sugar problems, but will insist on making cheese scones especially for me."

Question 4 asked "is it important to you to control your diabetes?" All subjects answered yes to this question both at posttest and follow-up.

Question 5 asked "why is it important to you to control your diabetes?" Responses to this question were again very similar at posttest and follow-up. Thirteen subjects' responses at each test related to health and quality of life. Typical responses were: "to keep well", "for better quality of life" and "to be able to have a lifestyle with this disability." Five subjects answered with responses relating to avoiding complications when they were older. Two subjects indicated that they wanted to avoid insulin injections, and 1 subject stated a "need to be in control of myself".

Chapter 5.

5. Discussion.

5.1. Major Findings.

The findings of this study indicate that there was a significant improvement in (a) dietary compliance at the posttest, but this was not maintained at the follow-up; and (b) the number of subjects performing SBGM at the posttest, which was maintained at the follow-up. There was no significant improvement in exercise compliance, nor was there a significant improvement in the outcome variables: weight and blood glucose levels. However, there was a significant improvement in the outcome variable: blood glycosylated haemoglobin levels.

The following discussion looks at these findings in relation to (a) the purpose of the study: the evaluation of a Diabetes Education program, (b) the study objectives, and (c) the relevant literature. Conclusions are drawn from the study along with implications for nursing practice and future research.

5.1.1. Dietary Compliance.

The results of this study showed that subjects attending a diabetes education program made changes in their diet, but they had difficulty maintaining this behaviour 3 months after the program. In comparison two studies, both using different approaches to improve dietary compliance, had more significant results. Wing et al. (1985) used a

behaviour modification approach where a variety of behavioural strategies, including contingency contracting and the changing of physical environment, were used to help patients change their behaviour. In that study dietary compliance was maintained at 4 months, but there was a drop off in compliance at 16 months, although there was still a significant improvement over the pretest levels. Campbell et al. (1990) found that an intensive educational approach incorporating extended time, simplified information, repetition and a cognitive motivational approach was associated with significantly greater dietary compliance than a conventional program approach. Dietary compliance in that study was maintained over a 6 month period.

Responses to the Question "are you having trouble keeping to the recommended diet?" indicate that 57% of the subjects at posttest, and 48% at follow-up, were having difficulty some of the time keeping to the diet, indicating lapses in compliance. This finding concurs with that of Kirkley and Fisher (1988) who found that rather than being completely non compliant, persons with Type II diabetes tended to have lapses in compliance.

During the group discussion at the completion of the three month follow-up session, several subjects commented on the method of teaching dietary compliance. The subjects concerned thought that they would have responded better to a more authoritarian approach. Rather than just being given guidelines, they wanted to be told exactly what they were allowed to eat, how much, and when. This highlights a difficulty of the group teaching method, where it is

difficult to meet the individual needs of all the participants. The follow-up session was found to provide an opportunity for the Diabetes Nurse Educators to reassess any of the subjects who were having difficulties with diet or other aspects of their treatment. As a result some subjects were referred to the dietitian for individual counselling.

5.1.2. Exercise Compliance.

Exercise was another area that the subjects in this study had difficulty with. The fact that less people were performing aerobic type exercise at posttest and follow-up than at pretest, suggests that the education program had no influence in this area at all. The question is raised as to whether the introduction of different teaching strategies may have an effect. Pender in the Health Promotion Model suggests that the likelihood of health-promoting action taking place can depend on activating cues. She suggests that by experiencing the beneficial effects of health promoting activities people are motivated to continue performing. This belief was supported by some of the subjects in the study, who after adopting a regular exercise program, commented on the fact that they were feeling much better and that they were motivated to continue exercising as they enjoyed it. The component relating to exercise in the present education program relies solely on the lecture method to inform patients of the recommended exercise regime. By introducing a practical exercise program to

complement the lecture, subjects could be introduced to and experience the benefits of exercise in a safe environment.

The question also arises as to whether the time of year has influenced these results. The pretests were conducted in March and April, in the autumn, and the posttests and follow-up tests were conducted from April through the winter months to August. Repeating this research in the summer may reveal different findings. However, the problem of ensuring exercise compliance is of importance regardless of the time of year. According to Wing et al. (1986) although exercise is known to have an effect on blood glucose control, little is known about when the exercise should be performed, or for how long, to have the most beneficial effect. It seems that there is a need for further research into the benefits of exercise in Type II diabetes.

5.1.3. Blood Glucose Monitoring.

The subjects in this study all adopted the practice of self blood glucose monitoring (SBGM). This highly significant finding concurs with the findings of Gilden et al. (1990), where in a study of older persons, SBGM was found to be a practice that was acceptable to the participants.

Although it was not the purpose of the present study, the question is raised as to whether the subjects are using the results of SBGM in any way to regulate their diabetes. Self regulation would involve performing SBGM and then, according to the result obtained, either adjusting diet or increasing exercise in order to keep blood glucose levels

within the normal range. Being able to perform the skill of SBGM is very different from being able to interpret the results and use them effectively to self regulate diabetes. The only benefit of being able to perform SBGM is to be able to use it as a tool to achieve normal blood glucose levels. Wing et al.(1988) raises the issue that little effort has been made to study the effects of SBGM on treatment outcome or to develop a model for self regulation. It therefore seems appropriate to emphasise self regulation of subjects with Type II diabetes as a future research area.

5.1.4. Study Outcomes: Weight Loss & Metabolic Control.

Weight loss was emphasised in the education program as a major goal of treatment for Type II diabetes. Although there was a mean weight loss of 1.67Kg in the study, it was not statistically significant. It is interesting to note that 71% of the subjects who lost weight, had been diagnosed as having diabetes within the 4 months prior to commencing the study. Twenty nine percent of this group did not lose weight. In comparison, of those who had been diagnosed with diabetes for 18 months or longer, 56% did not lose weight. The assumption could be made from this that people are more highly motivated when newly diagnosed. It would be of interest to know if this level of motivation is maintained over time. This raises the question as to whether those persons with diabetes who were educated soon after diagnosis find it easier to change their behaviour, than those who have had diabetes for a longer period of time, and who have not previously had formal diabetes

education. The implication is that less follow-up may be required if motivation is maintained. This question does not appear to have been addressed in the literature.

It should be noted that at pretest 71% of the subjects in this study were over their Ideal Body Weight (IBW). As part of a group discussion at the follow-up, three men stated that they thought that to achieve IBW was an unrealistic goal. Despite still being well above their IBW, they all stated that they were "comfortable" at their present weight. This suggested that they were not concerned by being overweight. Kouris et al. (1988) in a study that sought to determine characteristics that enhanced compliance to diet, found that the people who were not concerned about reaching their ideal body weight, were also non-compliant.

The results of the question asking subjects if they considered themselves overweight also indicated that some people do not perceive themselves as being overweight. Motivating people to lose weight could be difficult unless they change this perception.

It is appropriate to discuss weight loss further in relation to metabolic control. The blood glucose levels of the study group were unchanged from pretest to follow-up. However, the significant decrease in the blood glycosylated haemoglobin levels (HbA) indicated that the average blood glucose levels over the previous 2-3 months had been within the normal limits or metabolically controlled. In terms of evaluating the education program, the fact that the HbA

blood levels had improved significantly, is evidence that the education program was effective.

It is important to remember that although the HbA levels have statistically improved, that weight, the other outcome variable, did not improve significantly. This could be suggestive of the fact that even the small non-significant weight loss of participants in this study, may relate to an improvement in metabolic control. Hartwell et al. (1986) reported that there was some evidence that even for the obese that a weight loss of 7 to 10 lbs could be accompanied by a marked improvement in metabolic control. Wing et al. (1988) also noted that there was evidence that for some diabetic patients, even small changes in weight or diet could make major changes blood glucose levels. Wing et al. (1988) suggested that by identifying those patients whose blood glucose levels were not responsive to dietary intervention, they could then be taught different strategies, such as a self-regulation program to control their diabetes.

There is cause for concern, given that 17 subjects still had a BMI of over 25, and that some of those subjects felt comfortable even though they were still overweight. The knowledge that their diabetes is well controlled, may not give them incentive to lose further weight. Identifying modifying and cognitive-perceptual factors (as described in the Health Promotion Model), which would have value in motivating the subjects to continue to lose weight, is of vital importance, otherwise the risk of health problems due to obesity still remain.

5.1.5. Factors Influencing Non-Compliance.

In answering the question of what factors influence non-compliance, it seems from this study that there are many factors which may influence whether people remain compliant to recommended dietary and exercise regimes. Some of the factors found in this study include: hunger, temptation, stress, emotional and mental attitude, time, laziness and self-management. These factors are also recognised as perceived barriers to health-promoting behaviours, as described by Pender's Health Promotion Model.

It does raise the question of whether, in fact, it is a realistic expectation that people should be completely compliant to a set of guidelines, given that most of the subjects in this study expressed many difficulties in their quest to change what had become lifelong habits. This adds weight to the suggestion by Wing et al. (1988) that different teaching strategies, such as a self regulation program should be emphasised in diabetes education programs, in addition to focusing on behavioural compliance.

5.2. Study Limitations.

In addition to the previously mentioned limitations of the study the following points should be noted:

The short time span of 3 months between the education program and the follow-up of the study makes it difficult to draw any long term conclusions from the study. It is of importance though to note that despite the short time span there is already a drop in compliance.

The fact that subjects had adopted some dietary behaviours prior to commencing the study could be accounted for by the fact that 16 (66%) subjects had received dietary advice prior to the education program.

5.3. Conclusions:

Behavioural compliance in Type II diabetes presents a complex problem, which many researchers have endeavoured to address. Although many different teaching strategies have been tried, with mixed success, there appears to be no clear-cut solution. Few long term research studies have been undertaken, which makes it difficult to predict the long term effects of diabetes education.

Although the education program which was evaluated in this study has been effective in (a) changing dietary behaviours, (b) teaching the subjects to SBGM, and (c) decreasing blood glycosylated haemoglobin levels, it has not been effective in improving exercise compliance or maintaining dietary compliance for a 3-month period following education.

With reference to the theoretical framework of the study, it appears that while some subjects have adopted and maintained the health promoting behaviours of Pender's Health Promotion Model, others have not been able to maintain behaviour change. Some examples of factors which influenced the likelihood of engaging in health-promoting behaviours were identified in the study. Factors influencing non-compliance could also be described as perceived barriers to health-promoting behaviours.

The fact that there was poor compliance at the 3 month follow-up, implies that compliance may remain a long term problem for some of the subjects. As well as reviewing teaching strategies in the education program, future follow-up of patients will be required to further motivate them and reinforce the principles of the education program. This raises the problem of stretching already overextended resources. There are limitations now in terms of staffing, finance, and time for diabetic education programs. It would seem impossible, given the current constraints, for the specialised Diabetes Nurse Educator to meet the needs of an increasing population of persons with Type II diabetes alone, thus having implications for the future role of the Diabetes Nurse Educator, and for future research.

5.3.1. Implications for Diabetes Nurse Educators.

The results of this study have the following implications for the practice of Diabetes Nurse Educators.

1. Teaching strategies: Given that the results of the study showed that there was not a significant improvement in exercise compliance, it is recommended that the teaching strategies for exercise be reviewed.
2. Follow-up: It is recommended that the follow up of patients at approximately 3 months after completing the education program be implemented on a regular basis.

As the result of the 3 month follow-up session of the study, the Diabetes Nurse Educators involved could identify the benefits of seeing the patients again to: (a) assess progress, (b) reinforce the principles of self-management,

(c) further motivate patients and (d) refer those who were experiencing difficulties to appropriate health professionals for further help.

3. Ongoing education of fellow health professionals:
There is a need for emphasis on the education of fellow health professionals, including medical staff.

Although it will remain important for patients with diabetes to be educated initially by Diabetes Educators, the long term task of follow-up will need to be undertaken within the community where patients live. Patients are now referred back to their general practitioners for follow-up, but unless doctors keep up to date with current trends in education and management of diabetes, the patients will not benefit from this follow-up. According to Dunn (1990) doctors have not been trained to be educators. The continuing education of doctors is imperative, and although it may initially seem a rather daunting task, Diabetes Nurse Educators could assume this role. The fact that the Australian Diabetes Educators Association are implementing a system of accreditation, gives them the credibility to undertake this role.

According to Zimmet (1985), the numbers of persons with Type II diabetes are predicted to increase. As available resources are already over extended, it seems that the ongoing education of fellow health professionals, to assist with the process of reinforcing the principles of self-management, is going to be an increasing role of the Diabetes Nurse Educator.

5.3.2. Future Research.

Based on the findings of this study, it is recommended that future research be directed toward the following areas:

1. The Development and evaluation of effective teaching strategies for improving exercise compliance in Type II diabetes.

2. The evaluation of the effectiveness of patients with Type II diabetes using SBGM to regulate their disease.

3. The evaluation of the effects of further follow-up.

For example, it would provide valuable data to reassess the present study group in a further 12 months.

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APPENDIX A.

(Hospital Letterhead.)

Dear (Subject's name),

The Diabetes Education Centre, with the assistance of a nursing degree student from Edith Cowan University, is conducting a research study to evaluate the group education program in which you have enrolled.

As we would like the people enrolling in the program to take part in our study, we would be pleased if you would consider being a participant.

Participation in the study is voluntary and you would be free to withdraw at any stage if ever you wished. All information given, and identities of participants will be kept confidential. Results of the study will be reported as a group.

You would be required to:

1. Attend the three weeks of the education program.
2. At the commencement of the program, answer a questionnaire, have a blood test, have your weight recorded, and have a finger prick glucose test.
3. Attend a follow-up appointment three months after completing the program, and answer a questionnaire, have a further blood test, weight recording and finger prick glucose test.

All the tests to be taken are normal diabetes tests, and will give you information about your diabetes control.

It is hoped that the information gained from this study will be able to help with planning future programs for persons with diabetes.

If you have any questions about the study, or any problems or questions that may arise while participating in the study, please contact the Clinical Nurse Specialist at the Diabetes Education Centre.

We would be most grateful if you would consider our request to participate in this study.

(signature)
Researcher.

(signature)
Clinical Nurse Specialist.

I agree to participate in this study, and have been given a copy of this consent form.

Date:..... Subject's signature.....

Witness.....

APPENDIX B.

Patient History Sheet.

Research No.....

When was your diabetes diagnosed:.....19.....

How is your diabetes treated?

Diet alone

Diet & tablets.(Type of tablets.....

.....Frequency.....)

Please list any other medications that you take:

.....
.....

Do you have any other illnesses apart from diabetes?

No

Yes - (please list)

Have you been given any dietary advice since you have had diabetes?.....

Have you attended a diabetes education program before?

No

Yes - (State where and when)

Age.....

Sex: Male Female

APPENDIX C.

Diabetes Research Questionnaire.

Research No.....

To answer the questions please put a tick beside the correct response or write your answer in the space provided.

Section A:

1. How often have you been testing your blood or urine for glucose ?

Urine	times per week	Blood	times per week
.....	not testing	not testing

2. What have the results of your tests most often been in the past 2 weeks ?

Urine:	<input type="checkbox"/>	normal	Blood:	<input type="checkbox"/>	normal
	<input type="checkbox"/>	high		<input type="checkbox"/>	high
	<input type="checkbox"/>	low		<input type="checkbox"/>	low

3. Do you consider that you are overweight ?

yes
 no

4. Have you lost weight since your diabetes was diagnosed ?

yes
 no
 don't know

5. How many meals do you eat a day ?

6. How often do you have snacks in between your main meals ?

<input type="checkbox"/>	almost daily	Response Scores	[3]
<input type="checkbox"/>	several times a week		[2]
<input type="checkbox"/>	once a week		[1]
<input type="checkbox"/>	less than once a week		[0]

7. How often do you eat sweet biscuits ?

<input type="checkbox"/>	almost daily	[3]
<input type="checkbox"/>	several times a week	[2]
<input type="checkbox"/>	once or twice a week	[1]
<input type="checkbox"/>	occasionally or never	[0]

8. How many times a week do you eat pastries, cakes or croissants ?

- six or more [3]
- three to five [2]
- once or twice [1]
- occasionally or never [0]

9. What type of cheese do you eat most ?

- high-fat like cheddar, cream [3]
- medium-fat like camembert, edam, cheese spread [2]
- low-fat like cottage, ricotta [1]
- don't eat cheese [0]

10. How many times a week do you eat high-fat or medium-fat cheese ?

- six or more [3]
- three to five [2]
- once or twice [1]
- occasionally or never [0]

11. How much fat on your meat do you eat ?

- all [3]
- some [2]
- none [1]
- do not eat meat [0]

12. How often do you add butter, margarine or oil to food, or eat fried food ?

- almost daily [3]
- several times a week [2]
- once a week [1]
- less than once a week, or never [0]

13. How often do you eat vegetables or salad at lunch ?

- never, or less than once a week [3]
- one to three times a week [2]
- four to six times a week [1]
- every day [0]

14. How often do you eat vegetables or salad with your evening meal ?

- never, or less than once a week [3]
- one to three times a week [2]
- four to six times a week [1]
- every day [0]

15. How often do you eat fruit at breakfast ?
- | | | |
|--------------------------|---------------------------------|-----|
| <input type="checkbox"/> | never, or less than once a week | [3] |
| <input type="checkbox"/> | one to three times a week | [2] |
| <input type="checkbox"/> | four to six times a week | [1] |
| <input type="checkbox"/> | every day | [0] |
16. How often do you eat fruit at lunch ?
- | | | |
|--------------------------|---------------------------------|-----|
| <input type="checkbox"/> | never, or less than once a week | [3] |
| <input type="checkbox"/> | one to three times a week | [2] |
| <input type="checkbox"/> | four to six times a week | [1] |
| <input type="checkbox"/> | every day | [0] |
17. How often do you drink alcohol ?
- | | | |
|--------------------------|--------------------------------|-----|
| <input type="checkbox"/> | daily | [3] |
| <input type="checkbox"/> | several times a week | [2] |
| <input type="checkbox"/> | once a week | [1] |
| <input type="checkbox"/> | less than once a week or never | [0] |
18. If you drink alcohol, do you have more than two glasses daily ?
- | | | |
|--------------------------|-----|-----|
| <input type="checkbox"/> | Yes | [3] |
| <input type="checkbox"/> | No | [0] |
19. What is the highest level of education you had the chance to get to ?
- | | |
|--------------------------|--------------|
| <input type="checkbox"/> | below year 8 |
| <input type="checkbox"/> | year 8 -10 |
| <input type="checkbox"/> | year 11 -12 |
| <input type="checkbox"/> | tertiary |
20. What is your occupation ?.....

Thank you for answering this questionnaire.

Section B. Exercise.

Research No.....

The following questions are to be asked verbally.

1. Have you done any physical exercise in the past two weeks?
2. If you have exercised, what sort of exercise was it ?
3. How many times each week did you do this exercise ?
4. About how many minutes did you spend doing this exercise each time ?
5. Did you perform this exercise:
very vigorously
fairly vigorously
not very vigorously
not vigorously.

Section C.

Research No.....

1. What is the hardest thing for you about having diabetes ?

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

2. Are you having trouble keeping to your recommended diet?

- Yes
- No
- Sometimes

3. (Answer if you answered "yes" to question 2.)

What is the main reason for not keeping to your
recommended diet ?

.....

.....

4. Is it important to you to control your diabetes ?

- Yes
- No

5. (Answer if you answered "yes" to question 4.)

Why is it important to you to control your diabetes?

.....

.....

.....

.....

APPENDIX D.

(Hospital letterhead.)

Dear (Doctor.....),

A research study, with the purpose of evaluating the education program for patients with non-insulin dependent diabetes, is being conducted at the Diabetes Education Centre. A nursing degree student from Edith Cowan University is to assist in this research.

The main objective of the study is to establish whether three months after completing the education program, patients are adhering to: (1) the recommended diet; (2) the exercise program; and (3) are monitoring their blood glucose levels at home, - as evidenced by weight loss and metabolic control of their diabetes.

Your patient (name.....), who is to attend the education program, has agreed to participate in the study. We would be grateful if you could arrange for (name...) to have a blood test to measure glycosylated haemoglobin, prior to commencing the program, and again three months after completing the program. We would be pleased if the results of this test could be made available to us to help us in this research. If this test has been performed recently could you please inform us.

It is hoped that the study, while giving information to the participants about their diabetes control, will also assist us in evaluating whether the program is meeting the needs of the patients, so that we will be more able to help future patients.

If you require any further information please contact us.
Thank you for your co-operation.

Yours sincerely,

(signature)
Clinical Nurse Specialist.

(signature)
Researcher.

APPENDIX F.

Research No.....

Data Collection Sheet.

<u>PRETEST</u>	<u>FOLLOW-UP TEST.</u>
DATE:.....	DATE:.....
WEIGHT:.....KG	WEIGHT:.....KG
BGL:.....mmol/L	BGL:.....mmol/L
HbA:.....%	HbA:.....%

APPENDIX H.

Patient Education Program.

Session 1. (1.75 hours nurses; 0.75 hour physiotherapist).

Objectives: Each patient will increase or consolidate his/her knowledge of: (a) what is diabetes, (b) the difference between insulin and non-insulin dependence, (c) high and low blood glucose levels, (d) the complications of diabetes, (e) the benefits of exercise and (f) how to self manage their diabetes.

Teaching methods: Lecture, with group interaction.

Teaching aids: Whiteboard, models, audiovisual aids.

Content: What is diabetes?; hyperglycaemia, hypoglycaemia; blood and urine testing (reasons for blood testing in preference to urine testing);

Medication: oral hypoglycaemic agents, insulin;

Self-management (principles of control);

Role of Diet: introduction; sick days; complications;

Exercise: benefits; relationship to blood glucose levels and ideal body weight.

Session 2. (1.5 hours nurses; 1 hour dietician).

Objectives: Each client will increase or consolidate his/her knowledge of: (a) insulin resistance, (b) dietary guidelines in order to achieve ideal body weight and (c) normal blood glucose levels.

Teaching methods: Informal lecture with group interaction.

Teaching aids: Whiteboard, diagrams and models.

Content: Overview of insulin resistance; complications in diabetes; Diet: health diet pyramid; "special" diabetic foods; how to choose packaged foods; daily food choices and meal planning.

Revision of home blood glucose monitoring.

Session 3. (0.75 hour Podiatrist; 1.75 hours nurses).

Objectives: Each client will increase or consolidate his/her knowledge of: (a) the effects of alcohol on the body, (b) its relationship to diabetes, (c) the need for footcare; and (d) will revise the principles of self management of diabetes.

Teaching methods: Informal lecture with group interaction.

Teaching aids: Whiteboard and audiovisual aids.

Content: Relationship between alcohol intake and diabetes; and footcare.