SELF-EFFICACY, SELF-CARE AND GLYCEMIC CONTROL IN INDIVIDUALS WITH NONINSULIN DEPENDENT DIABETES MELLITUS

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by

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Abstract

Self-Efficacy, Self-Care and Glycemic Control in Individuals with Noninsulin Dependent Diabetes Mellitus

The purpose of this study was to investigate the relationships among diabetes self-efficacy, diabetes self-care and glycemic control in a sample of individuals with a diagnosis of noninsulin dependent diabetes mellitus. Bandura's self-efficacy theory was used to guide the study.

A convenience sample of 136 subjects participated in the study. All participants completed the three questionnaires: (a) the modified Insulin Management Diabetes Self-Efficacy Scale (modified IMDSES), (b) the modified Insulin Management Diabetes Self-Care Scale (modified IMDSCS) and (c) the Demographic Questionnaire. Glycemic control was assessed by the participants' glycosylated hemoglobin (HbA1c) levels.

The results of the study demonstrated statistically significant relationships among diabetes self-care, diabetes self-efficacy and glycemic control. Diabetes self-efficacy beliefs were highly correlated with diabetes self-care behaviors. Each of the subscale scores and the total score of the modified IMDSES correlated with its counterpart of the modified IMDSCS (r values ranged from .77 to .89,

p<.01). Diabetes self-care behaviors (general, diet, exercise and total) were negatively correlated with glycemic control (r values ranged from -.21 to -.38, p<.01). Diabetes self-efficacy (general and diet) were negatively correlated with glycemic control: general (r = -.26, p<.01) and diet (r = -.19, p<.05). Diabetes self-efficacy and gender contributed significantly to the prediction of diabetes self-care (F(5,130) = 31.74, p<.0001) accounting for 55% of the variance in total self-care. Total self-efficacy (Beta = .72) was a stronger predictor of self-care than was gender (Beta = .12). Each of the subscale scores (general, diet, exercise, insulin and medication) of the modified IMDSES emerged as the best predictor of their counterpart of the modified IMDSCS. Total self-care behaviors and gender together accounted for 15% of the variance in glycemic control.

The findings of this study indicated that incorporating the concept of self-efficacy in diabetes education programs may be of benefit. Further research is warranted using nursing interventions to increase self-efficacy and examining its impact on both diabetes self-care behaviors and glycemic control.

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Chapter I

The Problem and Purpose

Diabetes mellitus is a universal and prevalent chronic disease that is increasing in incidence (King & Rowers, 1991; Morsiana, 1989; World Health Organization (WHO), 1985). In this study the terms diabetes mellitus and diabetes are used interchangeably. It is estimated that one hundred million people in the world and approximately sixteen million people in North America have diabetes (Krall, 1986). A National Diabetes Task Force (1985) estimated that approximately 850,000 Canadians had diabetes in 1985, costing an equivalence of 1.2 billion U.S.dollars. The prevalence of diagnosed diabetes mellitus is estimated to be 5% in Canada (Tan & Wornell, 1991). In Newfoundland and Labrador, the estimated prevalence rate of diagnosed diabetes varied from 3.5% (Worrall, Fodor & Butt, 1991) to 5% (Newfoundland Department of Health & Department of National Health and Welfare, 1990).

The prevalence of diabetes is known to increase with age (Huse, Oster, Killen, Lacey, & Colditz, 1989; Wingard, Sinsheimer, Barrett-Connor, & McPhillips, 1990; Worrall, et al., 1991). Therefore, we can expect an increase in incidence with the current trends in aging.

The global mortality rate related to diabetes is higher

than that of the general population (Morsiana, 1989; WHO, 1985). The long term complications of diabetes, such as cardiovascular and renal diseases, account for a significant portion of this higher mortality rate. A WHO study group on diabetes mellitus (1985) reported that diabetes was one of the leading health problems in the world and ranked it between the fourth and eight cause of death in most developed countries.

The morbidity associated with diabetes is also considered to be great (Carter Center, 1935; Hood & Dincher, 1992; Huse, et al., 1989; WHO, 1985). Jacobs, Sena and Fox (1990) reported that in the United States, individuals with diabetes were 22 times more likely than were those without diabetes to be admitted for treatment of skin ulcers, 15 times more for peripheral vascular disease, 6-10 times more for heart disease and stroke, 10 times more for atherosclerosis and 16 more times for renal disease. Hospitalizations for eye problems were also increased for those with diabetes mellitus and older than 65.

The estimated prevalence of diabetes mellitus and its associated mortality and morbidity rates is astounding. However, the numbers are most likely underestimated (Bransome, 1992; Krall, 1986; Worrall, et al., 1991).

People living with diabetes have to deal with many problems which may arise from a number of personal and

environmental sources. The disease itself may be the primary source of some of its problems.

The Problem

Diabetes Mellitus is a chronic disease of impaired metabolism of carbohydrates, fats and proteins reflected in an imbalance in the body's glucose and available insulin. Insulin is a glucose-regulating hormone produced by the pancreas. There are two main types of diabetes mellitus: insulin dependent (IDDM) or Type I diabetes; and noninsulin dependent (NIDDM) or Type II diabetes. Insulin dependent diabetes is thought to account for 10% of the diabetes population and noninsulin dependent 90% (Brunner & Suddarth, 1992; Krall & Beaser, 1989; WHO, 1985). Insulin dependent diabetes is characterized by the non-production of insulin by the pancreas. These individuals require exogenous insulin to survive. For those with noninsulin dependent diabetes, insulin is produced by the pancreas but either the amount is insufficient or the insulin is ineffective to maintain normal blood glucose levels.

Both types of diabetes require complex treatment regimens to maintain near normal blood glucose levels which are thought to prevent, minimize or delay the onset of complications that lead to the morbidity and mortality associated with diabetes (Clarke, Mulmed, & Whitehouse,

1991; Hood & Dincher, 1992; Krall & Beaser, 1989; Watkins, Drury, & Taylor, 1990; WHO, 1985). It is generally felt that adherence to a set of therapeutic self-care behaviors will yield good glycemic control with decreased complications (Clarke, et al., 1991; Hood & Dincher, 1992; Krall & Beaser, 1989; Rosenstock, 1985). Nonadherence to the treatment regimen is thought to be part of the reason for poor glycemic control (Ary, Toobert, Wilson, & Glasgow, 1986; Glasgow, Wilson & McCaul, 1985; Kurtz, 1990; Rosenstock, 1985; Wing, Epstein, Nowalk, Scott, & Koeske, 1985).

Diabetes information and self-care behaviors (continuous activities required by individuals to maintain glycemic control) are communicated to patients through patient education. Thus, diabetes education is an integral part of diabetes management. The American Association of Diabetes Educators (1992) defined diabetes education as the teaching and the learning of the body of knowledge and self-management skills related to the control of diabetes with the ultimate goal being to promote the behavior changes necessary for optimal health outcomes, psychosocial adaptation and quality of life. A combination of methods such as teaching, counselling and behavior modification techniques have been employed to influence patients' knowledge and health behavior.

Diabetes research has investigated the relationships among diabetes education, diabetes knowledge, psychological factors, social factors, demographic variables, self-care behaviors and glycemic control. The results of these studies, however, have provided mixed findings on the relationships among self-care behaviors, glycemic control, and the factors that are thought to be associated with these two variables (Brownlee-Duffeck, et al., 1987; Cox, et al., 1984; Mazzuca, et al., 1986; Polly, 1992; Wilson, et al., 1986). Research is needed to further explore the relationships among variables which are thought to promote desirable self-care behaviors and glycemic control. Diabetes self-efficacy has consistently predicted diabetes self-care behaviors (Crabtree, 1986; Hurley & Shea, 1992). Few studies, however, have investigated the relationships among all three variables of diabetes self-efficacy, diabetes self-care and glycemic control. Also, the majority of diabetes research has been conducted outside of Canada and has not included individuals with NIDDM. The focus of this study is to examine the relationships among diabetes self-care behaviors, diabetes self-efficacy and glycemic control in a sample of Canadian individuals with noninsulin dependent diabetes mellitus. Identification of factors that have an impact on self-care and glycemic control may ultimately reduce complications and health care costs.

Summary of Past Research

Research has indicated that diabetes patient education is effective in promoting improved outcomes (Brown, 1990; Mazzuca, et al., 1986; Padgett, Mumford, Hynes, & Carter, 1988; Rubin, Peyrot & Saudet, 1989). However, a number of studies have also reported that increased knowledge alone does not necessarily lead to the behavior changes necessary to achieve glycemic control (Beeney & Dunn, 1990; Brown, 1990; Mazze, 1984; Nagasawa, Smith, Barnes, & Flincham, 1990; Redekar, 1988). A common theme throughout the diabetes literature is that interventions employing a combination of behavioral interventions, skills training and social learning theory strategies yield greater benefits for self-care and glycemic control than do programs that focus on acquisition of knowledge alone.

Many psychosocial factors (social support, motivation, health beliefs, self-efficacy, attitudes, locus of control, coping appraisal, coping strategies) are thought to affect the management of diabetes and explain more of the variance in diabetes self care behaviors and glycemic control than demographic variables or knowledge (Armstrong, 1987; Becker & Janz, 1985; Connell, 1991; Dunn, Beeney, Hoskin & Turtle, 1990; Hurley, 1989; Jacobson, 1986; Schafer, Glasgow, McCaul, & Dreher, 1983; Schlenk & Hart, 1984; Wilson, et al., 1986).

Studies which have investigated the relationships among demographic variables, diabetes related variables, self-care behaviors, and glycemic control have reported inconsistent findings. Some studies have found that demographic variables (age and gender) and diabetes related variables (number of complications, severity and duration of diabetes) have contributed to some of the variance in self-care behaviors (Crabtree, 1986; Grossman, Brink & Hauser, 1987; Wilson, et al., 1986). Other studies, however, have reported different results (Brownlee-Duffeck, et al., 1987; Glasgow, et al., 1989). Glasgow, McCaul and Schaffer (1987) found that demographic variables (age and gender) and duration of diabetes accounted for 17% of the variance for glycosylated hemoglobin levels. Rost, Flavin, Schmidt and McGill (1990) found, however, that demographic and diabetes related variables did not significantly predict glycosylated hemoglobin levels.

Research has demonstrated that the concept of self-efficacy which is a sense of `I can do' has a significant effect on health behavior (Bandura, 1977, 1982, 1986; Crabtree, 1986; O'Leary, 1985; Strecher, DeVellis, Becker & Rosenstock, 1986). A strong relationship has been found between diabetes self-efficacy and self-care behaviors (Crabtree, 1986; Hurley, 1989; Kingery & Glasgow, 1989; Padgett, 1991; Uzoma & Feldman, 1989).

A theme throughout the diabetes literature has been that diabetes and its treatment regimens are very complex. So are the interactions of the psychosocial and disease related and demographic variables that are thought to play a role in its management.

Rationale for the Study

Individuals with NIDDM constitute 90% of the diabetic population. NIDDM is cited as one of the most common chronic diseases of the elderly group (National Diabetes Data Group, 1984; Wingard, et al., 1990; WHO, 1985). The risk of diabetes related complications is very real for individuals with NIDDM and those complications often occur shortly after diagnosis of diabetes (Clarke, et al., 1991; Hernandez, 1989; National Diabetes Data Group, 1984) or are present at the time of diagnosis (Harris, Klein, Welborn, & Knuiman, 1992). Self-care activities such as weight reduction and exercise are viewed as the cornerstone of treatment for NIDDM. Research has found a significant relationship between higher levels of self-efficacy and increased weight loss and exercise in individuals with NIDDM (Glasgow, et al., 1992; Rubin, et al., 1989). It follows that strategies directed at enhancing self-efficacy in diabetes education programs may benefit clients.

Purpose

The purpose of this study was to explore the relationships among diabetes self-efficacy, diabetes self-care and glycemic control in a sample of Newfoundland individuals with noninsulin dependent diabetes (NIDDM). More specifically, the study attempted to answer a number of research questions as indicated below.

Research Questions

1. Is there a relationship between individuals' diabetes self-efficacy beliefs and their diabetes self-care behaviors?
2. Is there a relationship between diabetes self-care behaviors and glycemic control?
3. Is there a relationship between diabetes self-efficacy beliefs and glycemic control?
4. Which of the variables (gender, age, diabetes education, diabetes duration, diabetes self-efficacy beliefs) are the best predictors of diabetes self-care behaviors?
5. Which of the variables (gender, age, diabetes education, diabetes duration, diabetes self-care behaviors, diabetes self-efficacy beliefs) are the best predictors of glycemic control?

Definition of Terms

For the benefit of the reader definitions have been provided for three key terms used throughout the study - self-efficacy, glycemic control, and self-care behaviors.

Self-Efficacy.

Perceived self-efficacy is one's belief in his/her ability to perform a behavior (Bandura, 1977, 1986; O'Leary, 1985; Stretcher, et al., 1986). For the individual living with diabetes, self-efficacy refers to one's belief in one's capability to monitor, plan and perform daily activities required to manage his/her disease. The Insulin Management Diabetes Self-Efficacy Scale (IMDSES) developed by Hurley (1989) was modified and used to measure self-efficacy in this study.

Glycemic Control.

Glycemia is defined as the presence of glucose in the blood (Krall & Beaser, 1989). Glycemic control in this study was measured by the participants' glycosylated hemoglobin (HbA1c) level. Hemoglobin A is a minor hemoglobin molecule found in the blood stream. Hemoglobin A undergoes changes to form HbA1c when glucose attaches to it. HbA1c is formed at a rate dependent on the glucose concentration to which the erythrocyte is exposed. It is considered a reliable

indicator of the average blood glucose level for the previous two - three month period (Bunn, 1981; Bodor, et al,. 1992; Fischbach, 1992; Hood & Dincher, 1992; Jovanovic & Petersen, 1981; Larsen, Petersen, Horder & Mogensen, 1990; WHO, 1985). According to Fischbach (1992) the normal nondiabetic range for HbA1c levels is .04 to .07, however, individuals with diabetes who have HbA1c levels below .09 are considered to have good glycemic control. Blood for the participant's HbA1c level was drawn on the day of the clinic appointment when the demographic, diabetes self-care behaviors, and diabetes self-efficacy data were collected. Thus, the HbA1c level reported in this study reflects the average blood glucose level for the two - three month period immediately before data collection.

Self-Care Behaviors.

Orem (1991) defined self-care as the activities that individuals perform on their own behalf to maintain life, health and well-being. For individuals with diabetes mellitus, self-care behaviors are those activities of monitoring, planning and implementing behaviors necessary to control their diabetes. Thus, diabetes management requires a complex set of self-care behaviors that must be applied daily in various settings. The Insulin Management Diabetes Self-Care Scale (IMDSCS) developed by Hurley (1989) was

modified and used to measure self-care behaviors in this study.

Summary

This chapter has presented diabetes as a major health problem internationally, nationally,and provincially. Diabetes and its management have been discussed. A brief overview of past research which indicates the need for this study has also been presented. The rationale for the study, the purpose and specific research questions have been identified. The three variables investigated in the study have been defined. Chapter II will review the literature and describe the theoretical framework used to explain the proposed relationships among the variables investigated in this study.

CHAPTER II

Literature Review and Theoretical Framework

This chapter reviews a selection of research studies that have investigated the concepts of self-care, self-efficacy and glycemic control in diabetes mellitus. The literature review is based on the concepts of self-care and self-efficacy and their application to diabetes mellitus. The theoretical framework used to guide the study is also discussed.

Concept of Self-Care

The concept of self-care has a wide range of meanings which may vary with both individual and academic discipline perspectives. Gantz (1990) noted the varied definitions of self-care offered by six health related disciplines. While these definitions have similarities, they also have differences. The meaning of self-care also differs with its function. Barofsky (1979) noted four functions of self-care: (a) to alleviate illness (ie. reduce salt intake), (b) to alleviate symptoms (ie. self-medication), (c) to prevent disease (ie. exercise), and (d) to regulate body processes (ie. eating and drinking).

The four functions of self-care noted by Barofsky (1979) and the various definitions noted by Gantz (1990) have common characteristics. These characteristics include individual, goal directed behaviors focused on maintaining health, preventing illness and decreasing the detrimental effects of disease.

The terms adherence, compliance and self-care are used interchangeably in the diabetes literature. Self-care is used to denote the behaviors individuals perform to manage their diabetes and are often measured as the degree of adherence to or compliance with a therapeutic regimen. These behaviors are focused on maintaining health, preventing the long and short term complications of diabetes and decreasing the effects of these complications. Thus, the view of self-care presented in the diabetes literature is consistent with the common characteristics of self-care noted by Gantz (1990) and the functions of self-care noted by Barofsky (1979).

Nonadherence/noncompliance are terms used in the diabetes literature to discuss the lack of adherence/compliance to the therapeutic treatment regimen. However, adherence/compliance are not unitary constructs. Adherence/compliance to one aspect of the treatment regimen does not indicate adherence/compliance to other aspects of the regimen (Glasgow, et al., 1985). Therefore, a person

cannot be defined as a good or poor adherer/complier.

In this study, when discussing past research the term (adherence/compliance/self-care) used in that particular study will be used. In this present study, however, the term self-care will be the one adopted for general use.

Weight loss and glycemic control are the major treatment goals for noninsulin dependent diabetes. These require that individuals carry out multiple diabetes self-care behaviors. The regimen of strict diet control, exercise, medication/insulin administration and glucose monitoring necessitate self-care behaviors which are difficult to achieve for many. Individuals must also make decisions about their self care and implement these in various settings.

Diabetes Self-Care and Glycemic Control

Diabetes research investigating the relationships between diabetes self-care behaviors and glycemic control have presented inconsistent findings. Some studies have found a significant negative relationship between self-care behaviors and glycemic control (Brownlee-Duffeck, et al., 1987; Kaplan, Chadwick, & Schimmel, 1985; Rubin, et al., 1989). However, reported adherence to the treatment regimen does not necessarily mean good glycemic control or the absence of complications (Glasgow, et al., 1987; Glasgow, et

al., 1989; Strowig & Raskin, 1992; Wilson, et al., 1986).

Schafer et al. (1983) reported that three adherence behaviors of the previous seven days correlated negatively with glycosylated hemogoblin levels for a convenient sample (n = 34) of adolescents. These behaviors were measured by a self-report questionnaire and are as follows: diet adherence ($r = -0.35$, $p<.05$), reported care in measuring insulin doses ($r = 0.44$, $p<.01$), and the number of daily glucose tests ($r = -0.50$, $p<.001$). Higher levels of self-care were associated with lower HbA1c levels. The number of days that subjects exercised was not significantly associated with glycosylated hemoglobin levels.

Brownlee-Duffeck et al. (1987) also studied the relationships among regimen adherence and glycemic control in a convenience sample of individuals with IDDM. These researchers studied the relationships among health beliefs, regimen adherence and glycemic control. Diabetes regimen adherence was measured by a self-report questionnaire developed for this study. Internal reliability was determined by Cronbach's alpha (.79). The validity of the instrument was not reported. A significant correlation was reported between glycosylated hemoglobin values and the adherence composite scores ($r = -.27$, $p<.001$). Health beliefs were found to account for 41 - 52% of the variance in adherence and for 19% - 20% of the glycemic variance. A

limitation of the study may be that only 8 of the 16 items on the adherence questionnaire were seen as having a direct impact on glycosylated hemoglobin values. Other items pertained to foot care and diabetes identification.

Rost et al. (1990) studied diabetes self-care behaviors and glycemic control in a group of individuals with NIDDM. Using a cross-sectional design these researchers studied the relationship between self-care behaviors of the previous two weeks and glycemic control in a sample (n = 84) of individuals with NIDDM. Sixty were treated with insulin, nineteen with oral agents and five with diet only. Sociodemographic and health characteristics did not predict a significant amount of the variance in glycosylated hemoglobin levels. However, the two self-care behaviors assessed in the study (meal skipping and frequency of blood glucose monitoring) predicted 26% of the variance in glycosylated hemoglobin levels. Glycosylated hemoglobin levels were positively related to meal skipping ($p<.0008$) and negatively related to blood glucose monitoring ($p<.0025$). Glycosylated hemoglobin levels increased with the frequency of meal skipping and decreased with the frequency of blood glucose monitoring. The interaction between self-care behaviors and insulin treatment did not demonstrate additional variance in glycosylated hemoglobin levels.

Aikens, Wallander, Bell and Cole (1992) also found a

relationship between regimen adherence and glycemic control. These researchers studied the relationships among daily stress, regimen adherence and glycemic control in 62 adults with IDDM. Diet adherence was measured by two methods. Subjects rated their diet adherence for that day on a Likert scale. They also listed all the food they had consumed for that day. Calorie content was determined by a computer software package and the difference between calories consumed and calories prescribed was computed. An overall diet adherence was then obtained. The researchers also noted that proper exchanges and proportion of calories from various sources were not measured. Insulin adherence and glucose monitoring were measured by the subjects rating themselves on a Likert scale for that day. Scores in each adherence area were analyzed as separate variables. Daily stress was measured for the same days as was self-care. Individuals were contacted by phone in the late evening and requested to complete the stress and self-care questionnaires for that day. These measures were obtained for six days during a two month period. Glycemic control was measured by HbA1c levels. Multiple regression path analysis supported the hypothesis that regimen adherence predicted glycemic control ($F(3.58) = 5.30$, $p<.01$). However, follow up tests of regression indicated predictive power for insulin adherence and glucose monitoring but not for diet adherence.

Daily stress accounted for significant variance in glycemic control.

The preceding studies have found significant negative relationships between self-care behaviors and glycemic control, however, other studies have not yielded such optimistic findings.

Schafer, McCaul and Glasgow (1986) found that glucose monitoring was the only self-care behavior that significantly correlated with glycemic control (HbA1c) for an adult sample (n = 54). Insulin administration and diet adherence did not approach significance with glycemic control. For the adolescent sample (n = 18) none of the adherence subscales showed a significant correlation with HgA1c levels. Self-care was measured by a self-reported summary of adherence for the previous week.

Glasgow et al. (1987) studied self-care behaviors in four regimen areas (insulin administration, glucose testing, diet adherence and exercise activity) and glycemic control in 93 individuals with IDDM. Multiple measures were used to assess both self-care and glycemic control. These measures were repeated six months later. Dietary self-care was measured by retrospective self-reports, daily diaries, daily check lists and absolute levels of food consumption calculated by experienced dieticians. Insulin administration and glucose monitoring were assessed by self-report.

Exercise was measured by daily self-report of activity levels. These activity levels were used to estimate the number of daily calories expended. Subjects also wore an activity monitor to provide an index of activity levels. A self-report questionnaire was also used to measure the number of days in the previous week that the subjects had exercised for at least 20 continuous minutes. Glycemic control was measured by glycosylated hemoglobin levels and records of home glucose monitoring (urine and blood). This study did not find a significant relationship between adherence and glycemic control. The degree of adherence also varied for the various regimen areas. The subjects showed a high adherence to insulin administration, moderate adherence to glucose testing and a lower adherence to the dietary and exercise aspects of their regimen. Age, sex and duration of diabetes (combined) correlated with glycoslated hemoglobin levels (GHB) ($r = .48$ $p<.001$) and accounted for 17% of the variance in GHB levels. While a strength of this study was the use of multiple measures to assess self-care, the limitations noted by the researchers were the use of inappropriate and unreliable measures. The test-retest reliabilities of some of the adherence measures were reported as low to moderate. However, these test-retest reliabilities were over a relatively long period (2 & 6 months). The two month reliabilities were higher than the

six month values. Thus, it is difficult to determine if the low correlations were due to unreliable measures or changes in behaviors over time.

Cox et al. (1984) also found that self-care behaviors did not significantly correlate with HbA1c levels. This study investigated relationships among daily hassles, Type A personality trait, social support and compliance in a sample of 60 adults with IDDM. Subjects were selected from three clinics (an inpatient unit, an outpatient clinic, and an endocrinology clinic). A self-report questionnaire was used to measure self-care, including adherence to diet, exercise, and glucose testing which were highly correlated with each other. However, none of these correlated significantly with HbA1c levels. The variables of hassles, Type A personality, social group, insulin compliance and other compliance (composite of diet, exercise and glucose testing) were entered in a multiple regression equation to determine their contribution to variance in HbA1c levels. Only the Hassles Scale significantly contributed to the prediction of HbA1c levels. The reliability and validity were not reported for any of the instruments.

Wilson et al. (1986) studied the relationship between diabetes self-care behaviors (compliance) and glycemic control (HbA1c levels) in a sample (n = 184) of individuals with NIDDM. Four diabetes self-care behaviors (medication

taking, glucose testing, diet and exercise) were measured by self-report. Several psychosocial variables (diabetes knowledge, stress, depression, anxiety, diabetes health beliefs and social support) were also measured. The psychosocial variables scores were combined to yield a composite measure. The psychosocial variables composite score and the demographic variables (sex and age) together accounted for approximately 25% of the variance in self-care. However, none of the psychosocial, demographic or self-care variables individually contributed to the prediction of glycemic control.

A recent study by Polly (1992) examined the relationships between diabetes-specific health beliefs, adherence to the diabetes regimen and glycemic control in 102 subjects with NIDDM. Adherence was measured by a self-report questionnaire, health beliefs were measured by a diabetes health beliefs questionnaire and glycemic control was measured by HbAlc levels. Multiple regression revealed that perceived barriers were negatively related to adherence, ($r = -.24$, $p<.02$) and that perceived severity of diabetes was related to glycemic control ($r = .21$, $p<.03$). These were the only two variables that correlated significantly with self-care or glycemic control. A significant relationship was not found between glycemic control and adherence. A limitation of the study was that

the reliability and validity were not recorded for the instrument used to measure adherence. Also, the subjects had a high level of self-reported adherence when compared to similar studies. Polly (1992) postulated that the high level of adherence may be due to the fact that the subjects were all from a diabetes clinic rather than from the general health care setting.

Hanestad and Albrektsen (1991) extended the research on diabetes self-care beyond measuring regimen adherence, to include the subjects' perceived difficulty in adherence to the treatment regimen. The sample was 247 adults with IDDM who attended a Norwegian diabetes clinic. The self-rating scale used to measure perceived difficulty in adherence to the treatment regimen had a Cronbach's alpha of 0.67. Content validity was determined in a pilot test of fifteen subjects with diabetes and discussions with diabetes care staff. This sample reported the most difficulty with adhering to control of smoking, increased physical exercise, control of weight and diet. Women reported more difficulties in regimen adherence than did men. There was a significant relationship ($p<0.018$) between perceived difficulties in adherence and HbA1c levels for the women - the greater their perceived difficulties with adherence the higher their HbA1c levels. For the men there was not a significant relationship between perceived difficulties in adherence and HbA1c

levels. Several limitations of this study were noted by the researchers, including the sole use of self-report for adherence measures, the use of a convenience sample and the use of only a diabetes clinic for sample selection. Selecting subjects solely from a diabetes clinic may have resulted in a sample of individuals with more severe diabetes. This was also indicated by the fact that 68% of the sample were receiving multiple daily insulin injections.

There is also evidence of intervention studies which have investigated the effects of self-care behaviors on blood glucose levels.

Palernostro-Bayles, Wing and Robertson (1989) studied the effects of exercise on blood glucose levels of ten women with NIDDM who controlled their diabetes with diet or diet and oral medication. Exercise sessions were conducted on a stationary cycle. Glycemic responses to exercise were found to be related to the duration of the exercise, 20 minutes of exercise decreased blood glucose by 16 mg/dl. The effect of exercise was maintained over a 30 minute rest period. This data suggested that exercise can produce a significant decrease in blood glucose levels of a group of women with NIDDM. However, adherence to other aspects of the treatment regimen and glycosylated hemoglobin levels were not assessed in this study. This was an intervention study and the small nonprobability sample did not permit generalizations to

other populations.

In summary, past diabetes research provides mixed findings on the relationship between self-care behaviors and glycemic control. Researchers have noted that the difficulty in identifying links between adherence and control may be due to the complexity of diabetes, idiosyncratic metabolic factors and the measurement of both adherence and control (Brownlee-Duffeck, et al., 1987; Glasgow, et al., 1987; Kurtz, 1990). Glasgow et al., (1985) noted several problems with the measurement of adherence. They concluded that: (a) diabetes regimen adherence is not a unitary construct - a person cannot be identified as a good or a poor adherent because of the variation in adherence within a given person, (b) there is often a lack of direct correspondence between regimen instructions and measures used to assess adherence, (c) the widely disparate regimens make comparing the adherence of individuals and groups questionable, (d) individuals may not have been given appropriate regimen prescriptions and (e) there is a lack of reliable and valid measures of adherence. To add to the problem, there are no universally accepted measures of adherence. Instead, a variety of measures (self-report, self-monitoring, significant others report and behavioral observations) each with its own strengths and limitations, have been used (Hilbert, 1985; Glasgow, et al., 1987). Glycemic control,

however, can be specifically measured. Blood glucose monitoring and glycosylated hemoglobin assays have been shown to be reliable and valid measures of glycemic control (Bodor, et al., 1992; Hood & Dincher, 1992; Jovanovic & Peterson, 1981; Krall & Beaser, 1989; Larsen, et al., 1990; WHO, 1985). However, glycemic control cannot be used as a sole indicator of adherence because the two can not be equated (Brownlee-Duffeck, et al., 1987; Kurt, 1990; Polly, 1992). Brownlee-Duffeck et al. (1987) further noted that both self-care and glycemic control have value in diabetes research, as true adherence likely lies somewhere between the two. They postulated that self-reports typically overestimate self-care behavior while glycoslyated hemoglobin levels probably underestimate actual self-care behaviors. Thus, there is a need to further investigate both in diabetes research. As previously stated, the literature indicates that psychological and social factors play a part in diabetes management. The next section of the literature review examines the concept of self-efficacy, since diabetes self-efficacy has been found to be associated with diabetes self-care.

Concept of Self-Efficacy

The concept of self-efficacy, derived from Bandura's social cognitive theory, has been postulated as an important

psychological variable in behavior change (Bandura, 1977). According to Bandura (1986), "perceived self-efficacy is defined as people's judgements of their capabilities to organize and execute courses of action required to attain designated types of performances" (p. 391). Knowledge and skills are necessary, but are insufficient determinants of behavior. Motivation is also necessary to institute a behavior. Perceived self-efficacy can affect one's level of motivation. Thus, According to Bandura (1977), behavior change can result by creating and strengthening one's perceived self-efficacy. Self-efficacy is behavior specific and can be enhanced by knowledge and skills related to that behavior (Bandura, 1977, 1986; Schunk, 1984).

Recent diabetes research has revealed a positive relationship between diabetes self-efficacy and self-care. Diabetes self-efficacy has been found to be positively correlated with self-care behaviors (Crabtree, 1986; Hurley, 1989).

Diabetes Self-Efficacy and Diabetes Management

This section will discuss the research examining the concept of self-efficacy in the context of diabetes management.

Hurley and Shea (1992) studied the relationship between self-efficacy and self-care in an adult sample (n = 142)

with IDDM. Self-efficacy was measured by the Insulin Management Diabetes Self-Efficacy Scale (IMDSES). Self-care was measured by the Insulin Management Diabetes Self-Care Scale (IMDSCS). Since, these instruments were modified to measure self-care and self-efficacy in this present study, their psychometric properties are reported in chapter three of the thesis. The IMDSCS was an item for item corollary of the IMDSES. Both instruments consisted of three management subscales (general, diet and insulin). The researchers reported adequate psychometric properties for both instruments. Data were collected in two phases. Phase one was the administration of the IMDSES prior to discharge from a diabetes treatment center. Phase two was the completion of the IMDSCS at home approximately thirty days after phase one. Positive associations were found between total diabetes self-efficacy and total diabetes self-care ($r = .578$, $p<.001$). Positive relationships were also found between each of the self-efficacy subscales and their corresponding self-care subscales: general management ($r = +.398$, $p<.001$), diet management ($r = .37$, $p<.001$) and insulin management ($r = +.67$, $p<.001$). Multiple regression analysis revealed that diabetes self-efficacy reported prior to discharge from the inpatient diabetes treatment center predicted self-care behaviors a month later. The researchers noted among the limitations of the study the nature of the sample, which was

convenient and homogeneous.

In a sample (n = 100) of low income, inner city, adult, black individuals with diabetes, Uzoma and Feldman (1989) studied factors affecting adherence with insulin administration. Subjects were selected from a diabetes outpatient clinic. The prediction variables examined were: perceived self-efficacy with insulin administration, perceived social support, perceived severity of diabetes and age. Perceived self-efficacy and age best explained the variance in adherence to insulin administration. The researchers did not state whether or not the subjects had been diagnosed with IDDM or NIDDM.

Grossman et al. (1987) assessed the relationship between self-efficacy and glycemic control in a sample (n = 68) of adolescents. The subjects were recruited from two diabetes adolescent camps in Massachusetts. Self-efficacy was measured with a diabetes self-efficacy scale. Locus of control and self-esteem were also assessed in this study. Glycemic control was assessed by the following four indices: (a) averaged blood glucose levels, (b) double-voided preprandial urine glucose levels, (c) urine acetone levels and (d) 24 hour glucosuria. The daily overall score for each subject was the sum of the four indices. Daily overall scores were averaged for four days to give a measure of glycemic control (higher scores were indicative of better

glycemic control). There was a significant positive relationship between diabetes self-efficacy and glycemic control ($r = .40$, $p<.01$) reported for the girls. For the boys, however, no such relationship was found. Correlation of locus of control and self-esteem scores with glycemic control were not significant. The researchers recognized that the HgAlc values would have given a more reliable measure and recommended that this measure be used in further studies.

Littlefield et al. (1992) extended the diabetes self-efficacy research to include a sample ($n = 193$) of Canadian adolescents and included glycemic control as an outcome measure. Diabetes self-efficacy and diabetes self-management (adherence) were measured by self-report questionnaires. Binge eating was assessed by self-report for the past three months, self-esteem was assessed by the Rosenbery Self-Esteem Scale and depressive symptoms by the Children's Depression Inventory. Glycemic control was measured by HgAlc levels. Significant relationships were found between a lower adherence rate and the following: (a) lower self-esteem ($r = 0.45$, $p<0.001$), (b) lower self-efficacy ($r = 0.057$, $p<0.001$), (c) more depressive symptoms ($r = -.50$, $p<.001$), (d) more binging ($r = -.36$, $p<0.001$). Adherence and HgAlc levels were negatively related ($r = .-24$, $p< 0.001$). Higher levels of adherence were

associated with lower HbA1c levels. The psychological variables of binging, self-efficacy and depression combined, accounted for 50% of the variance in adherence. Self-efficacy emerged as estimating 20% of the adherence variance, depression 12% and binging 2%. Thus, self-efficacy was the variable which independently accounted for more of the variance in adherence. A limitation of the study was that the adherence and self-efficacy measures were not tested for reliability and validity before their use in the study. Also, the adherence was a general measure rather than a measure of specific behaviors. A measure of specific behaviors as well as general measures are thought to give a more reliable measure of diabetes regimen adherence (Glasgow, et al., 1985; Kingery & Glasgow, 1989).

Crabtree (1986) studied the association of self-efficacy, social support and self-care in a convenience sample of 143 adults. The sample contained individuals with either NIDDM or IDDM. Self-efficacy was measured by the Diabetes Self-Efficacy Scale with adequate psychometric properties: the internal consistency of each of the subscales and total scale ranged from .66 to .79. The test-retest reliabilities for the subscales and the total scale ranged from r = .69 to r = .86. Content validity was determined by experts in self-efficacy theory and diabetes management. Diabetes self-management was determined by a

questionnaire which had a reported reliability of .59. Self-efficacy was found to be predictive of diabetes self-care behaviors. Total self-efficacy accounted for nearly 50% of the variance in self-care. Diabetes self-efficacy of general management, diet management and exercise management were the best predictors of self-care in each respective self-care management area. Medication management was not predicted by self-efficacy but rather by age and the number of diabetic complications. Social support, defined as emotional support and aid, was not found to be predictive of self-care. Crabtree noted the limitations of the study including: (a) convenience sample, (b) sample was a mixture of both individuals with IDDM and NIDDM but primarily IDDM individuals, (c) variables were measured solely by self-report (d) reliability of the instruments varied from adequate to low (e) sample size was only minimally adequate for a predictive study.

Rubin et al. (1989) also included individuals with either IDDM or NIDDM in a study which investigated the effects of diabetes education on self-esteem, anxiety, depression, self-efficacy, knowledge, self-care behaviors and glycemic control. All variables except glycemic control were measured before a five-day out-patient diabetes educational program, immediately after and six months postprogram (n = 124). Glycemic control was measured prior

to the program and six months postprogram. Individuals showed a significant improvement in all variables. Self-efficacy showed the greatest improvement. It rose from a mean of 113.4 +/- 1.4 preprogram to 124.8 +/- 1.3 postprogram. Six months postprogram self-efficacy remained higher than the preprogram level ($\underline{M}$ = 121.8 +/- 1.4), $\underline{p}<.001$). Self-care behaviors also showed an improvement. Binging decreased and exercise and self-blood glucose monitoring increased ($\underline{p}<.001$). HbA1c levels decreased from 11.5% +/- 0.4 preprogram to 9.5% +/- 0.3% postprogram ($\underline{p}<.001$). The researchers noted the following limitations of the study: the participants were motivated enough to attend a five day diabetes educational program and included a large number of highly educated individuals, the possibility of an Hawthorne effect, and the 25% attrition rate for the six month follow up period. A further limitation was that the reliability and validity were not reported for the measurement instruments.

Glasgow et al. (1989) studied the relationships among self-care, social learning variables and glycemic control in a sample ($\underline{n}$ = 127) of American individuals with NIDDM. Self-care was assessed by self-monitoring in the three regimen areas of diet, exercise, and glucose monitoring. Dietary intake was assessed by a three-day food record. Exercise and glucose monitoring were measured by seven-day self-

monitoring records. Composite scores were formed for each regimen area. Social learning variables included four categories: (a) diabetes knowledge, (b) beliefs/ expectations, (c) skills and (d) environmental support. A composite measure for each category was used for the predictive analysis. The beliefs/expectations category included measures of (a) self-efficacy, (b) outcome expectations, (c) frequency of negative self-statements and (d) self motivation inventory. These four measures contributed to the composite score for the beliefs/ expectations category. The reliability and validity were not reported for any of these measures. Glycemic control was assessed by glycosylated hemoglobin assays. Multiple regression analysis revealed that the social learning variables (combined) was a stronger predictor of self-care than were the demographic variables. The variables grouped in the beliefs/expectations category were not entered into the regression separately, therefore one cannot determine which of the four variables were the stronger predictors of self-care. The relationship of diabetes self-care to glycemic control was not significant. The exercise composite score was related to glycosylated hemoglobin levels (GHb) ($r = .24$, $p<.01$) but this was not in the expected direction. The direction of this relationship was such that increased exercise was associated with higher GHb levels. Correlations

between GHb levels and the diet and glucose monitoring composites were also not statistically significant. A major limitation of this study was the grouping of several specific measures of social learning variables into a single category. The beliefs/expectations category included measures of four variables that were collectively compiled to form a composite score for that category. Thus, it is impossible to determine which of the variables had the most predictive ability. Another limitation was that the psychometric properties were not reported for the instruments used to measure the variables of the diabetes beliefs/ expectation category. Medication/insulin adherence was not assessed as a part of the self-care behaviors. Yet, 30% of the sample were prescribed insulin and 45% were prescribed oral hypoglycaemic medications.

Self-efficacy has also been studied in a sample of individuals with NIDDM outside of the United states. Padgett (1991) studied factors thought to be associated with self-efficacy in a sample (n = 147) of Croatian individuals with NIDDM. The sample was selected randomly from an Endocrinology and Metabolic Disease Outpatient clinic. Diabetes self-efficacy was measured by a modified version of the Diabetes Self-Efficacy Scale (DSES) used by Crabtree (1986). Depression was measured by the Zung Self-Rating Depression Scale which had a reported high reliability, but

its validity was not addressed. Adherence to the diabetic regimen was measured by two rating scales (a physician and a subject scale). Glycemic control was measured by HbAlc levels. The diabetes self-efficacy composite score was significantly correlated with physician rated adherence ($r = 0.20$, $p<0.05$) and self-rated adherence ($r = 0.40$, $p<0.01$). However, a significant relationship was not found between HbAlc levels and adherence or diabetes self-efficacy. Self-efficacy was significantly associated with males, younger age, higher education and lower levels of depressive symptoms. A limitation of this study was that the Diabetes Self-Efficacy Scale was translated into the Croatian language and adapted from 25 items to 18 items but the reliability and validity for this sample was not reported. Strengths of this study included the use of a random sample and the assessment of glycemic control as well as adherence.

Kingery and Glasgow (1989) added to the diabetes self-efficacy research by including outcome expectations (the belief that certain behaviors probably lead to desired outcomes). These researchers studied the relationships among self-efficacy, outcome expectations and self-care in a sample ($n = 127$) of individuals with NIDDM. Subjects were selected from two diabetologists' patient lists, family practitioners and internists. Self-care, self-efficacy and

outcome expectations were measured twice, at six month intervals. Self-efficacy was measured by a diabetes self-efficacy scale developed by McCaul et al. (1987). This scale was expanded and adapted for this present study to make it more applicable to persons with NIDDM. The original instrument had established test-retest stability for two and six month intervals, r = .60 and r = .54 respectively. Outcome expectations were measured by a diabetes belief questionnaire, which reported test-retest reliability correlations of .68 and .57 respectively for the two and six month intervals. Self-care was measured by a composite score obtained from a self-report questionnaire and a self-monitoring measure. The researchers reported that self-efficacy moderately predicted self-care in the diabetes exercise regimen, but weakly predicted self-care in glucose monitoring and did not predict dietary self-care.

Summary of Literature Review

The research reviewed in this chapter indicated a consistent positive relationship between diabetes self-efficacy and self-care. However, many of the studies that investigated the relationship of these variables to glycemic control presented inconsistent findings. Yet, it is important to note that each study documents findings for a particular group of subject, in a particular contextual

setting at a given point in time. A lack of evidence that a relationship exists between self-care behaviors and glycemic control and between self-efficacy and glycemic control does not mean that self-care and self-efficacy are unimportant in glycemic control. It may mean that glycemic control is affected by factors other than self-care and self efficacy. Also, methodological issues may contribute to the inconclusive findings regarding the relationship between glycemic control and both self-care and self-efficacy. The reliability and validity for some measuring instruments of both self-care and self-efficacy have not been reported. The general trend is to use nonprobability samples, thus the results of the research cannot be generalized to the diabetes population and may be due to factors other than the variable/variables investigated. Many studies have combined participants with both IDDM and NIDDM. Although IDDM and NIDDM have many similarities, they have different etiologies and treatments (Canadian Diabetes Association, 1992). Thus, NIDDM and IDDM warrant individual research attention. Diabetes research has mainly focused on American subjects with IDDM. Several studies have attempted to determine the relationship between self-care and HbA1c levels, but have measured self-care for only one or two week periods. HgA1c levels reflect glycemic control of the previous two-three month period. Therefore, to expect a correlation between

self-care and HgAlc levels in these studies one would have to assume that the self-care behaviors for the time reported were similar to those of the previous two - three month period.

Some important points emerging from the diabetes literature include: (a) the relationships between diabetes self-efficacy and diabetes management have received research attention; (b) reliable and valid measures of diabetes self-efficacy have been developed; (c) the relationship between diabetes self-efficacy and specific areas of diabetes self-care such as diet, exercise, glucose monitoring, medication/insulin have been studied and (d) some researchers have attempted to correlate glycemic control with diabetes self-efficacy and diabetes self-care.

The literature indicates a need for further investigation of diabetes self-care, diabetes self-efficacy and glycemic control in a sample of individuals with NIDDM. As previously discussed, individuals with NIDDM are very prone to the complications of diabetes and are thus in need of research attention. There is also a need to extend the diabetes self-efficacy research to a Canadian sample. Thus, this study will investigate the relationships among diabetes self-efficacy, diabetes self-care and glycemic control in a Canadian sample of individuals with NIDDM.

The selection of the variables for this study was

guided by Bandura's self-efficacy theory which was also used as the study's theoretical framework.

Theoretical Framework

The self-efficacy theory was derived from the framework of social learning theory (Bandura, 1977). Bandura (1977) first discussed the self-efficacy theory and its application to human behavior. The self-efficacy theory postulates that people's perceptions of their capabilities affect their behavior, motivation, thought patterns and emotional reactions in demanding situations (O'Leary, 1985). Self-efficacy has been proposed by Bandura (1977, 1982, & 1986) to be an important psychological variable in predicting and understanding behavior.

Self-efficacy relates to beliefs about capabilities of performing specific behaviors in particular situations, it is not a personality trait (Bandura, 1986). An individual's self-efficacy will vary with the task and the context (Strecher, et al., 1986). Self-efficacy is noted to vary along the three dimensions of magnitude, strength and generality (Bandura, 1977, 1982, 1986). "Magnitude" has to do with the hierarchically ordering of tasks by difficulty level. Individuals with a low magnitude feel capable of performing only the simpler tasks while those with a high magnitude feel capable of performing more difficult tasks.

"Strength" refers to one's confidence in one's ability to perform a certain task. "Generality" is the extent to which efficacy extends from a particular activity to other related behaviors.

An individual's behaviors are seen as a consequence of his/her self-efficacy. When an individual has the knowledge, skills and an incentive to carry out the behaviors, his/her level of performance increases proportionally with his/her level of self-efficacy.

There are four principal sources of information that contribute to an individual's self-efficacy development: enactive attainment; vicarious experience; verbal persuasion and physiological state (Bandura, 1982, 1986; Bandura & Adams, 1977; Schunk, 1984). Enactive attainment is based on the individual's own mastery experiences. Past successes raise efficacy appraisals and repeated failures lower them. This is considered the most potent source of efficacy expectations (Bandura, 1986). Vicarious experience involves learning that occurs through viewing others as models - individuals persuade themselves that if others can achieve a goal or behavior then they can too. Verbal persuasion is used to talk people into believing that they have the capabilities to perform a certain behavior. Bandura (1986) postulated that verbal persuasion boosts people's self-efficacy, leading them to try harder to succeed, thus

promoting the development of skills and a sense of self-efficacy. Verbal persuasion will only be as strong as the recipient's confidence in the person using this tactic. One's physiological state has an effect on one's self-efficacy. Consequently, high arousal usually debilitates a person's performance. People are more inclined to succeed at a behavior if they are not beset by aversive anxiety. Fear-provoking thoughts about their incapabilities cause people to arouse themselves to high levels of distress that produce the dysfunction they so fear. Treatments that help decrease emotional arousal to subjective threats increase perceived self-efficacy with corresponding improvements in behavior (Bandura, 1986). People are more apt to expect failure when they are in a state of high physiological arousal. However, physiological indicators of efficacy are not limited to autonomic signals. People also read such physical indicators as fatigue or pain as indicators of physical inefficacy.

The self-efficacy theory has received much research attention. Bandura and Adams (1977) tested the self-efficacy theory by completing experimental tests of human desensitization from snake phobias. Extinction of anxiety arousal was achieved through desensitization and self-efficacy. Self-efficacy was found to be a highly accurate predictor of behavior change following desensitization. The desensitization treatment involved vicarious experience

(modelling), enactive attainment (performance mastery), verbal persuasion and reducing individual's anxiety levels. The strengths,magnitude and generality of self-efficacy were also tested in this experiment.

Taylor, Bandura, Ewart, Miller and DeBusk (1985) used the clinical symptoms of peak heart rate (physiological state), experienced during a treadmill test, to raise men's self-efficacy following a myocardial infarction. The men's wives also participated in the experiment. Thirty men and their wives were randomly assigned to one of three groups: (a) no involvement (wife did not observed or participate in her husband's treadmill test, (b) observation (the wife observed her husband's performance on the test, and (c) performance of the test (the wife actually experienced the treadmill test). The three groups of patients were rated equivalent in cardiac status prior to the experiment. During a counselling session following each treadmill test, couples were informed of the patient's physical capability to perform various physical activities based on the results of the treadmill test. The patient's cardiac self-efficacy prior to the treadmill test predicted their performance on the treadmill test. Performances on subsequent treadmill tests were predicted by the patient's cardiac self-efficacy measured following the counselling session. Only the wives who had actually experienced the treadmill test showed an

increase in judgement of their husband's cardiac and physical efficacy. This study provides evidence that enactive attainment (mastery experiences) and physiological state (heart rate during treadmill tests) can help cardiac patients and their wives develop efficacy in the patient's cardiac and physical activities.

Other intervention studies have also found that self-efficacy can be enhanced. Kaplan, Atkins and Reinsch (1984) found that patients with chronic obstructive pulmonary disease increased their walking activity and perceived self-efficacy for walking through a walking program (enactive attainment). Weinberg, Hughes, Critelle, England and Jackson (1984) used a random sample to study the effects of self-efficacy on weight loss, utilizing self-control techniques. Subjects were classified as either high self-efficacy (60-100% sure that they could lose the required weight) or low self-efficacy (less than 60% sure of losing the required weight). Subjects were randomly selected from each group to be in either the manipulated self-efficacy group (experiment) or the nonmanipulated self-efficacy group (control). All subjects followed a standardized weight control program. However, the manipulated self-efficacy group received weekly reinforcement that they had been selected because of their capability for success in the weight control program. Subjects in the manipulated self-

efficacy group showed significant increase in weight control self-efficacy and a greater reduction in weight than did the nonmanipulated group.

Self-efficacy has been found to be predictive of health behaviors such as smoking cessation (Diclemente, Prochaska, & Gibertini, 1985; Godding & Glasgow, 1985; Wojcik, 1988), alcohol abstinence (Diclemente, 1986; Rist & Watzi, 1983), weight reduction (Clark, Abrams, Niaura, Eaton, & Rossi, 1991; Weinberg, et al., 1984), exercise (Kaplan, et al.,1984; McAuley, Courneya, & Lettunich, 1991), cardiac rehabilitation (Ewart, Taylor, Reese, & DeBusk, 1984) and diabetes management (Crabtree, 1986; Hurley & Shea, 1992).

The self-efficacy theory has application for health care, especially in the area of self-care. Experimental studies have shown that self-efficacy can be enhanced and that self-efficacy influences behavior (Strecher et. al, 1986). Changing health behaviors in the positive direction are thought to improve health and reduce health care costs. Diabetes is a disease which often requires significant behavior changes to maintain glycemic control.

Application of the Self-Efficacy Theory to Diabetes Mellitus.

The self-efficacy theory is very applicable to the management of diabetes mellitus. Maintaining control over

one's diabetes requires that specific self-care behaviors be accurately and consistently carried out throughout the day. This requires that the person be goal directed and persistent. According to the self-efficacy theory, an individual's perceived self-efficacy determines the behaviors they attempt as well as the persistence and effort that they will expend to achieve their goals. The stronger an individual's perceived self-efficacy, the more vigorous and persistent his/her efforts (Bandura, 1977; 1986). Thus, the connection between self-efficacy and diabetes management is evident.

Bandura (1977) described the role of self-efficacy in the paradigm of a person engaging in a behavior with a consequent outcome. The model (Figure 1) has been adapted for application to diabetes management. According to this model, behavior change and maintenance are a function of one's self-efficacy.

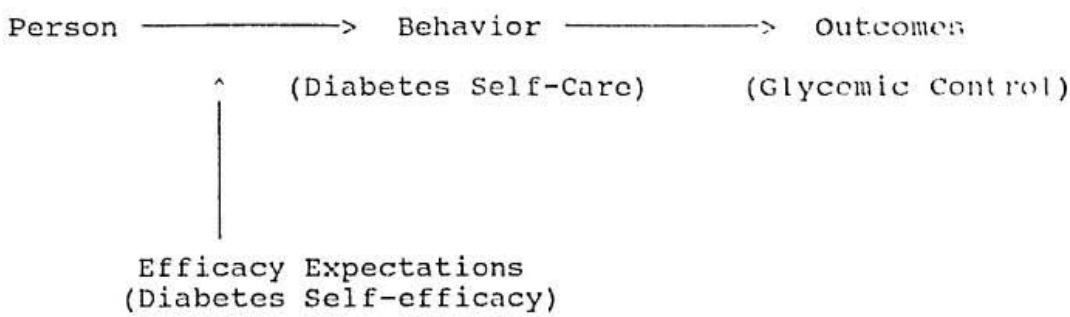


Figure 1. From "Self-Efficacy: Towards a Unifying Theory of Behavior Change" by A. Bandura, 1977, Psychological Review, 84, p. 193. Copyright 1977 by American Psychological Association. Adapted by A. Ludlow with permission.

In diabetes management, efficacy expectations are one's belief in one's own capabilities to carry out the necessary self-care behaviors (such as diet, exercise, insulin/ medication management and blood glucose monitoring). If a person feels capable of performing the necessary self-care behaviors to manage his/her diabetes then he/she is likely to do so in hopes of achieving glycemic control.

Summary

This chapter has presented a review of the literature related to diabetes self-care, diabetes self-efficacy and glycemic control - the variables under investigation in this study. The self-efficacy theory and its application to diabetes management have also been discussed. The research design and methods of the study will follow in chapter III.

Chapter III

Design and Methods

This chapter will present the research design, sample selection, the setting, human subjects protection and the procedure for data collection of the study. The instruments used to measure self-care and self-efficacy and the planned data analysis will also be discussed.

Research Design

A descriptive correlation design was used to investigate the relationships among diabetes self-care, diabetes self-efficacy and glycemic control in a sample of individuals with a diagnoses of NIDDM. Data were collected at one point in time. Thus, this study is classified as a cross-sectional.

Setting

Participants were recruited from an outpatient medical clinic and a diabetes education clinic of the General Hospital, St. John's, Newfoundland, Canada. Data were collected during a six week period, from the end of January to mid-March.

Sample and Selection Criteria

A convenience sample of one hundred and thirty-six adults with a diagnosis of NIDDM were selected for the study. A sample size of thirty is generally considered acceptable for correlational research (Borg & Gall, 1989). However, Borg and Gall (1989) also noted that "a general rule is to use the largest sample possible...larger samples ensure more confidence in results" (p. 233). Multiple regression statistics were used to answer research questions four and five. Prescott (1987) noted that a rule of thumb for minimal sample size in multivariate analysis is 10 subjects per variable entered into the analysis plus 50 additional subjects. Research questions four and five have six variables each, thus requiring a minimal sample size of 110.

Participants were selected from both a diabetes education clinic and an outpatient medical clinic to ensure that participants were from different settings. Patients who attend diabetes education clinics may have a different level of motivation to self manage their diabetes than do those from a nonspecialty clinic.

Inclusion criteria for subject selection were that participants should: (a) be diagnosed as having noninsulin dependent diabetes for a minimum of 6 months to allow time for the individual to have had an opportunity to experience

the disease; (b) be free of the following conditions known to influence the HbA1c level: anemias, renal disease and haemoglobinopathies; (c) not be pregnant- as pregnancy may result in false negative HgA1c levels; (d) have sufficient reading and cognitive abilities to respond to the questionnaires and (e) be responsible for self managing their diabetes.

Human Subjects Protection

The study was approved by both the Human Investigation Committee of the Health Science Center and the General Hospital's ethics committee. Subjects who agreed to participate in the study signed an informed consent form (see Appendix A). The informed consent described the purpose, procedures and risks/benefits of the study. The subjects were also informed that specific subject responses would not be discussed with health care professionals, or others. To maintain anonymity, a number was assigned to each completed set of questionnaires. The completed questionnaires and signed consent forms were kept on file and accessible only by the researcher.

The study did not involve the administration or withholding of treatment. There were no individual or group rewards for participating in the study. Subjects were informed that they could withdraw from the study at anytime

and their refusal to participate would not affect their treatment and follow up care.

Procedures

Permission to contact potential participants and access their HgA1c level was obtained from the participants' physicians and the General Hospital Administration.

Participants were briefly informed of the study by the clerk who registered patients for the outpatient medical clinic. Patients attending the diabetes education clinic were approached by the diabetes education nurse. The researcher was available, in a teaching room of the clinic, to provide further information on the research study, if necessary. After the consent form was signed, the participants completed at their own rate: (a) the modified Insulin Management Diabetes Self-Efficacy Scale (see Appendix B), (b) the modified Insulin Management Diabetes Self-Care Scale (see Appendix C) and (c) the Demographic Questionnaire (see Appendix D). The researcher remained with the participants while they completed the questionnaires and offered clarification as necessary. A HbA1C level for that clinic visit was obtained at a later date from the hospital's computer.

Research Instruments

The Insulin Management Diabetes Self-Efficacy Scale (IMDSES) and the Insulin Management Diabetes Self-Care Scale (IMDSCS) developed and used by Hurley (1989) were modified with permission (see Appendix E) and used to measure self-efficacy and self-care in this study. The IMDSCS is an item to item corollary of the IMDSES. Each scale consists of 28 items with three subscales: (a) general management which consisted of items 1, 2, 3, 4, 27 and 28; (b) diet management (items 5 through 11) and (c) insulin management (items 16 through 26). The latter subscale was further divided into glucose monitoring (items 16 through 18), insulin administration (items 19 through 22) and preventing, detecting and/or treating high or low blood glucose (items 23 through 26). The two exercise items (12 & 13) and the two foot care items (14 & 15) were not used as subscales by Hurley (1989), but contributed to the total score.

The response selection for the items is a Likert scale ranging from 1 (strongly agree) to 6 (strongly disagree). A "not applicable" category is also provided. All items of the IMDSCS are positively worded, while the IMDSES contains ten negatively worded items (3, 4, 8, 9, 13, 16, 20, 22, 25, & 26). The positively worded items are reversed-scored for both scales, thus, a higher score means that the individual has a higher level of self-efficacy or self-care. Hurley

(1989, 1990) reported on the psychometric properties of both the IMDSES and the IMDSCS.

Psychometric Properties of the IMDSES.

According to Hurley (1989), the internal consistency Cronbach's alphas for the subscales were: .68 for the general management, .78 for the diet management, .62 for insulin management and .82 for the total management scale. Hurley (1989) further noted that the low alpha coefficients for the insulin management subscale could be explained by the range and complexity of the behaviors comprising that subscale. This may also hold true for the general management subscale, as it contains items that deal with all diabetes self-care behaviors.

Retest stability was determined by readministering the instrument to a sample of individuals diagnosed with IDDM (n = 38). There was a mean duration of 22 days between the test and retest. Given that diabetes self-efficacy is a dynamic and complexed concept, the Pearson's correlation of .58, ($p<.002$) together with the scale's unchanged means from test to retest were considered evidence of the scale's stability. Content validity was assured by three diabetes educator nurses, who served as diabetes content experts and five patients, who served as experts on clarity and applicability of the statements from the subject's

perspective. The revised IMDSES was next rated for its relevance to the concept of self-efficacy by six experts in the area of self-efficacy. A content validated index was used for this rating. Level of agreement ($p<.05$) gave evidence of content validity.

Evidence to support convergent validity was given by the following Pearson correlations: (a) self-efficacy/past self-care ($r = +.376$, $n = 122$, $p = .0000$); (b) past self-care/glycosylated hemoglobin levels ($r = -.1738$, $n = 113$, $p = .03$); (c) glycosylated hemoglobin levels/perception of past glycemic control ($r = +.2708$, $n = 116$, $p = .002$); (d) perception of past glycemic control/past self-care ($r = -.4388$, $n = 123$, $p = .001$) and (e) expectations for future glycemic control/self-efficacy ($r = +.1687$, $n = 121$, $p = .032$). The association between past self-care and glycosylated hemoglobin levels, and the association between past self-care and self-efficacy were given as support for the construct validity of the self-efficacy scale. The positive association between perceptions of past glycemic control and glycosylated hemoglobin levels and that both were negatively related to past self-care were interpreted as support for the accuracy of the subjects' self-reporting. The positive association between expectation for future glycemic control and self-efficacy indicated that individuals with a high diabetes self-efficacy expected

their diabetes to be in good control. Hurley (1990) recognized that these associations were small but stated that collectively they provided evidence of construct validity. Construct validity was further supported when factor analysis disclosed factors which explained 68% of the scale's variance. These factors were labelled: "(a) confidence to follow diet, (b) insecurity, (c) make insulin decisions, (d) general capability, (e) incorporate diabetes into life style, (f) exercise and (g) recognize low blood sugar" (Hurley, 1989, p. 118). Hurley (1989) also noted that these seven factors both agree with the properties of self-efficacy and reflect the daily management of diabetes. Twenty of the twenty six items loaded cleanly on one of the seven factors. The remaining six items were retained to assure content validity of the scale. The two items (19 & 20) which were excluded from factor analysis because almost all of the subjects answered strongly agree were added to produce the 28 item Insulin Management Diabetes Self-Efficacy Scale.

Psychometric Properties of the IMDSCS.

Internal consistency Cronbach's alphas for the subscales were .91 for general management, .93 for diet management, .88 for insulin management and .96 for the total scale.

Retest stability was determined by a high correlation ($r = .86$, $n = 27$, $p < .001$) and unchanged mean scores between test and retest scores 22 days later.

Content validity was determined by a panel of three judges representing experts in diabetes care. Construct validity was determined when factor analysis disclosed eight factors which explain 79.7% of the scale's variance. These factors were labelled: "(a) carry out diabetes care plan, (b) discipline, (c) make treatment decisions, (d) fit diabetes activities of daily living into lifestyle, (e) take care of problems, (g) follow routines, (h) exercise regularly, and (j) recognize low blood sugar." (Hurley, 1989, p. 125). Two items (19 & 20) of the scale,answered as strongly agree by almost all of the subjects were not included in the factor analysis. Of the 26 remaining items, 22 loaded cleanly, 3 loaded on two factors and one did not meet the factor loading criteria because of a large number of subjects choosing the not applicable (NA) option. All of the items were retained to ensure the content validity of the 28 item Insulin Management Diabetes Self-Care Scale.

Instrument Modifications.

Both the IMDSES and the IMDSCS were developed for adults with insulin dependent diabetes. This present study used a sample of individuals with NIDDM, therefore it was

necessary to modify the instruments to make them more applicable for this sample. Since exercise is viewed as an important aspect of the treatment regimen for individuals with NIDDM (Canadian Diabetes Association, 1992), the exercise items were treated as a subscale in this study. Also, individuals with NIDDM may be treated with medication (hypoglycemic agents) and/or insulin, therefore the word medication was added to the questions dealing with insulin administration (questions 19 & 20) of the insulin subscale on each respective instrument. The insulin subscale was renamed insulin/medication to reflect these changes.

Demographic Questionnaire.

A demographic questionnaire (see Appendix D) prepared by the researcher was used to obtain demographic information on the participants. According to current literature these data were thought to have some influence on diabetes management. They included: gender, age, duration of diabetes, whether or not the participants had attended diabetes education classes and the participants' treatment regimens (insulin, oral hypoglycemic agents or diet controlled).

Glycemic Control.

Glycemic control was measured by the participants'

glycosylated hemoglobin (HbA1c) level taken at the same time as the questionnaires were completed. This blood test was routinely performed on all individuals with diabetes who attended either the diabetes education or the outpatient medical clinic. The Canadian Diabetes Association (1992) recommended that all people with diabetes have their glycosylated hemoglobin levels assessed three or four times a year. According to Fischbach (1992),the nondiabetic reference range of this measure is reported as .04 to .07 and abnormal values are those greater than .070. HbA1c levels below .09 are considered good glycemic control for individuals with diabetes.

Data Analysis

The insulin/medication management subscales of both the modified IMDSES and the modified IMDSCS were analyzed according to the participants' treatment regimen. This was necessary because of the variations in self-care behaviors of persons on the different treatment regimens (insulin, oral hypoglycemic agents and diet). Individuals who were not on insulin were not involved with insulin adjustment. Likewise, the many questions dealing with medication or insulin management did not apply to those participants whose diabetes was controlled by diet. Thus, for data analysis the sample was separated into three groups: (a) the insulin

group (individuals who required insulin to manage their diabetes), (b) the oral agent group (individuals who required oral hypoglycemic agents to manage their diabetes) and (c) the diet group (individuals who did not use either insulin or oral agents to control their diabetes). Thus, two items (21 & 22) pertaining to insulin adjustment were not included in data analysis of the oral agent group. For the latter group the insulin/medication subscale was referred to as the medication management. To analyze the data of both the insulin/medication self-efficacy and self-care subscales for the insulin group all items of each respective subscale were used and the subscale was referred to as the insulin management. In the same way, the insulin/medication management subscale was not used to compute either the self-care or self-efficacy for the diet group or the total sample. The general, diet and exercise subscales of each respective instrument contributed to the total scale for that instrument.

Three items (14, 15 & 26) were deleted in the analysis of both self-care and self-efficacy. These three items were deleted because a large percentage of the participants chose the not applicable (NA) response for these statements. Items 14 and 15 dealt with foot care. Some subjects stated that they had not experienced problems with their feet, while others stated they had not been instructed to apply lotion

to their feet. Thus, they chose the not applicable (NA) response. Also, foot care does not have a direct effect on glycemic control and glycemic control was an outcome variable being measured in this study. Item 26 dealt with adjustment of diabetes self treatments when experiencing a cold or flu. This item also received a large number of not applicable (NA) responses. Several subjects stated that they rarely experienced colds or flues severe enough to warrant treatment adjustments. This may be due to the fact that some of the subjects received an annual flu immunization.

These modifications to the instruments were not expected to affect the psychometric properties. The deleted items made the instruments more applicable to this study's sample. The reliabilities of the modified instruments for this study were considered to be adequate and are described in chapter IV, where the results of the study are discussed.

The data were analyzed using the Statistical Package for the Social Sciences, revised edition (SPSSX, Statistical Package for the Social Sciences, Inc., 1988). Descriptive statistics were used to describe the sample. Research questions one, two, and three were answered using Pearson's product-moment correlation coefficient (Pearson's r). Pearson's r is recommended when investigating linear relationships between variables that have been measured on an interval or ratio scale (Polit & Hungler, 1991).

Pearson's correlation coefficient is reported as r, whose values range from -1.0 to +1.0. The higher the absolute value of r the stronger the relationship (Borg & Gall, 1989; Polit & Hungler, 1991). Variables of a social or psychological nature are usually in the range of r = .10 to r = .40 (Polit & Hungler, 1991). Multiple regression was used to answer research questions four and five. Multiple regression is used to determined the correlation between a criterion variable and two or more predictor variables. For all data analysis the results were considered significant when p values were equal or less than .05.

Summary

This chapter has presented the methods used to conduct the study. The psychometric properties of the original instruments have been reported. Modifications to the instruments to measure diabetes self-care and diabetes self-efficacy in this study have been discussed. The demographic questionnaire and the measurement of glycemic control were presented and the data analysis has been described.

Chapter IV presents the reliabilities of the modified Insulin Management Diabetes Self-Efficacy Scale, that of the modified Insulin Management Diabetes Self-Care Scale, as well as the findings of the study.

Chapter IV

Results

This chapter presents the results of the study. Descriptive statistics were used to describe the sample. Pearson's product-moment correlation and multiple regression were used to investigate the relationships among the variables self-care, self-efficacy and glycemic control.

Sample Characteristics

The sample consisted of 136 adults with a diagnosis of NIDDM. Seventy-one were selected from an internal medical clinic and sixty-five from a diabetes education clinic.

There were 69 males (50.7%) and 67 females (49.3%). Most of the sample were married/living common law (73.3%), 8.1% were single, 11.9% were widowed and 6.7% were divorced. Their ages ranged from 29 to 75 years, with 51.5% of the sample being sixty years and over.

Duration of diabetes varied from less than 1 year but greater than six months (6.6%) to more than 20 years (5.1%), with the majority in the categories of 1-5 years and 6-10 years (40.4% and 30.1% respectively). Table I provides more information about the sample.

Table 1

Characteristics of the Sample (N=136)

Characteristic	Frequency	%
Gender		
Male	69	50.7
Female	67	49.3
Marital Status		
Married/common law	99	73.3
Single	11	8.1
Widowed	16	11.9
Divorced	9	6.7
Missing Data	1	
Age		
25-29	1	.7
30-34	2	1.5
35-39	3	2.2
40-44	11	8.1
45-49	12	8.8
50-54	16	11.8
55-59	21	15.4
60 +	70	51.5
Attended Diabetes Education Classes	97	71.3

The sample consisted of more males than females. The frequency of diabetes increased with age, where 51.5% of the participants were over age sixty. The majority of the sample (71.3%) reported that they had attended diabetes education classes. Those who had not attended diabetes education classes (28.7%) were part of the sample taken from the medical clinic. Participants also reported that diabetes classes had helped them the most in learning to care for their diabetes (52.7%), followed by their doctor (20.4%), the nurse (14%), reading material (6.5%) and other (6.5%). The other category included family members, friends and the Canadian Diabetes Association. Data from the 31.6% of the sample that chose more than one option were not used to answer this question. Thus, valid percents rather than actual percents are reported.

Information on the treatment regimen (insulin, oral agent or controlled by diet) is presented in Table 2. Individuals using insulin to manage their diabetes constituted the largest percentage of the sample. None of the participants reported combination therapy with an oral agent and insulin.

Table 2

Treatment Regimen of the Sample (N=136)

Characteristic	Frequency	%
Insulin Management	54	39.7
Oral Hypoglycemic Agent Management	42	30.9
Diet Management	40	29.4
Total	113	100.0

Since the Insulin Management Diabetes Self-Efficacy Scale (IMDSES) and the Insulin Management Diabetes Self-Care Scale (IMDSCS) have been modified for the Newfoundland sample, their reliabilities are reported in the next section.

Reliabilities of the Modified IMDSES and the Modified IMDSCS

The internal reliabilities of the modified IMDSES are reported in Table 3.

Table 3

Internal Reliabilities of the Modified IMDSES ($p \leq .05$)

Scale	n	Alphas
Management		
General	34	.86
Diet	124	.82
Insulin	46	.58
Medication	78	.73
Exercise	134	.66
Total Efficacy (15)	122	.89

The total efficacy scale (15) included the general, diet and exercise subscales. Alphas of .60 or .70 are generally considered sufficient (Polit & Hungler, 1991). However, to ensure good internal consistency it is generally considered advisable to aim for alpha's of .75 or greater. Hurley (1990) reported an alpha of .62 for the insulin self-efficacy subscale and stated that the low alpha may be due to the range and complexity of the behaviors depicted by the scale. This may also hold true for the medication self-efficacy subscale. The lower alpha for the exercise self-

efficacy subscale in this study may be explained by the fact that data were collected during the winter. Many participants indicated that their form of exercise, walking, was not possible during the winter months because of weather conditions and slippery roads. Other participants indicated that they could not perform exercise because of other health problems such as cardiac disease and arthritis.

The internal reliabilities of the modified IMDSCS found in this study are presented in Table 4.

Table 4

Internal Reliabilities of the Modified IMDSCS ($p \leq .05$)

Scale	n	Alphas
Management		
General	130	.89
Diet	119	.84
Insulin	44	.73
Medication	74	.76
Exercise	135	.82
Total self-care (15)	114	.90

The total self-care (15) was the sum of the general,

diet and exercise subscales. The alphas for each subscale and the total scale were adequate. The lowest coefficients were for the insulin and medication self-care subscales. Again, this may have resulted from the range and complexity of behaviors depicted by these subscales.

The levels of self-efficacy, self-care and glycemic control reported by the sample were used to answer the research questions.

Diabetes Self-Efficacy and Diabetes Self-Care Levels Reported by the Sample

Only those subjects who answered all the items in each subscale were included for the data analysis of that subscale. The not applicable (NA) responses were coded as missing data. Positively worded items were reverse scored, resulting in high scores meaning a high level of self-efficacy or self-care respectively. The mean scores for both the self-efficacy and self-care subscales and total are presented in Tables 5 and 6.

The lowest average self-efficacy level was reported for the exercise (4.15) and the medication management (4.45) items. The highest average self-efficacy level was obtained on the general self-efficacy subscale.

The lowest average level of self-care reported was for the exercise items (3.56).

Levels of Glycemic Control Reported by the Sample

The HbA1c levels reported for the sample (n = 120) ranged from .036 to .107. The mean was .065 with a SD of .02. There were sixteen individuals for which the HbA1c levels were not available, because either they did not want to have the test done or it was not ordered by the physician.

Table 5

Diabetes Self-Efficacy Levels Reported by the Sample

Scale	Mean	SD	Total Possible Score	n
Management				
General	4.90	1.04	6	124
Insulin	4.89	.6	6	45
Medication	4.45	1.16	6	30
Exercise	4.15	1.75	6	124
Total	4.76	.98	6	122

Table 6

Diabetes Self-Care Levels Reported by the Sample

Scale	Mean	SD	Total Possible Score	n
Management				
General	4.70	.99	6	130
Diet	4.13	1.17	6	119
Insulin	4.65	.79	6	4
Medication	4.10	1.34	6	25
Exercise	3.56	1.98	6	135
Total (15)	4.39	1.03	6	11

Data from the 136 participants were analyzed to answer the research questions.

Research Questions

1. Is there a relationship between individuals' diabetes self-efficacy beliefs and their diabetes self-care behaviors?

All subscale scores and the total score of the modified IMDSES were positively correlated at a significant level

($p<.01$) with their corresponding subscale and total score of the modified IMDSCS. Higher levels of self-efficacy were associated with higher levels of self-care. The correlation coefficients are presented in Table 7.

2. Is there a relationship between diabetes self-care behaviors and glycemic control?

Correlations between diabetes self-care behaviors and glycemic control are presented in Table 8. For the total sample a significant ($p<.01$) negative relationship was found between glycemic control and each self-care subscale (general, diet, and exercise) and the total care score. This means that higher levels of self-care were associated with lower HbA1c levels. The relationships between insulin self-care and glycemic control and between medication self-care and glycemic control were also in the negative direction but did not reach significance. This indicates that a significant relationship may not exist between insulin self-care and glycemic control and between medication self-care and glycemic control. Other factors that may have contributed to these nonsignificant relationships are presented in the discussion chapter of the thesis.

Table 7

Correlations Between Diabetes Self-Efficacy and Diabetes Self-Care

	Self-Efficacy					
	General	Diet	Insulin	Medication	Exercise	Total
Self-Care						
General	.83** n=129					
Diet		.78** n=114				
Insulin			.77** n=41			
Medication				.89** n=30		
Exercise					.83** n=134	
Total (15)						.83** n=108

**p<.01.

Table 8

Correlations Between Diabetes Self-Care and Glycemic Control

	Self-Care						
	General	Diet	Exercise	Insulin	Medication	Total	
							Groups
Glycemic Control	-.38** n=114	-.29** n=105	-.21** n=119			-.37** n=100	Total Sample
Glycemic Control				-.29 n=36 not sig.			Insulin
Glycemic Control					-.33 n=22 not sig.		Oral Agent

**p<.01.

3. Is there a relationship between diabetes self-efficacy beliefs and glycemic control?

Correlations between diabetes self-efficacy beliefs and glycemic control are reported in Table 9.

For the total sample a significant negative correlation was found between glycemic control and general self-efficacy ($p<.01$) and between glycemic control and diet self-efficacy ($p<.05$). Thus, higher levels of general and diet self-efficacy were associated with lower HbA1c levels. Exercise and total self-efficacy were correlated with glycemic control in the negative direction, but these did not reach significance. For the insulin group, insulin self-efficacy correlated with glycemic control in the negative direction, but did not reach significance. Likewise, for the oral agent group, medication self-efficacy correlated negatively with glycemic control, but these also did not reach significance. A discussion of possible factors that may be responsible for these nonsignificant findings will be presented in the discussion chapter.

Table 9

Correlations Between Diabetes Self-Efficacy and Glycemic Control

	Self-Efficacy						
	General	Diet	Exercise	Insulin	Medication	Total	
Glycemic Control	-.26** n=118	-.19* n=109	-.10 n=118 not sig.			-.21 n=107 not sig.	**Groups** Total Sample
Glycemic Control				-.08 n=38 not sig.			Insulin
Glycemic Control					-.27 n=26 not sig.		Oral Agent

*p<.05. **p<.01.

4. Which of the variables (gender, age, diabetes education, duration of diabetes, diabetes self-efficacy beliefs) are the best predictors of diabetes self-care behaviors?

Examination of predictors of the various areas of diabetes self-care (general, diet, exercise, insulin and medication management), revealed that diabetes self-efficacy beliefs were consistently the best predictor of each self-care area. General self-efficacy, duration of diabetes and gender together contributed significantly to the prediction of general self-care, ($F(5,130) = 60.80$, $p<.0001$). The contribution of general self-efficacy was stronger (Beta = .81) than that of the duration of diabetes (Beta = .13) or gender (Beta = .09). This was not surprising, as previous studies also found a high correlation between self-efficacy and self-care. The standardized beta weights are presented in Table 10. General self-efficacy, duration of diabetes and gender together accounted for 70% of the variance in general self-care.

Table 10

Predictors of General Self-Care

Predictor Variables	Beta	P
General Self-Efficacy	.81	.0000
Duration of Diabetes	-.13	.0088
Gender	.09	.0510
Diabetes Education	.03	.5289
Age	.03	.5614

Diet self-efficacy and gender contributed significantly to the prediction of diet self-care, ($F(5, 130) = 26.44$, $p<.0001$). The contribution of diet self-efficacy was stronger (Beta =.68) than that of gender (Beta = .16) as shown in Table 11. Diet self-efficacy and gender together accounted for 50% of the variance in diet self-care.

Table 11

Predictors of Diet Self-Care

Predictor Variables	Beta	P
Diet Self-Efficacy	.68	.0000
Gender	.16	.0106
Duration of Diabetes	-.07	.2497
Age	.07	.2866
Diabetes Education	.03	.6357

Only exercise self-efficacy was a significant predictor of exercise self-care (F (5, 130) = 54.93, $p<.0001$). Exercise self-efficacy accounted for 68% of the variance in exercise self-care. The standardized beta weights for the predictors of exercise self-care are presented in Table 12.

Table 1

Predictors of Exercise Self-Care

Predictor Variables	Beta	p
Exercise Self-Efficacy	.81	.0000
Diabetes Education	.04	.4552
Gender	.04	.4629
Duration of Diabetes	-.04	.4928
Age	.02	.6415

Insulin self-efficacy, gender and duration of diabetes contributed significantly to the prediction of insulin self-care ($F(5,130) = 39.14$, $p<.0001$), accounting for 60% of the variance. The contribution of insulin self-efficacy was stronger (Beta = .76), followed by gender (Beta = .14) and duration of diabetes (Beta = -.12) (see Table 13).

Table 13

Predictors of Insulin Self-Care

Predictor Variables	Beta	P
Insulin Self-Efficacy	.76	.0000
Gender	.14	.0152
Duration of Diabetes	-.12	.0465
Age	-.04	.4847
Diabetes	-.01	.8105

Medication self-efficacy was the only significant predictor of medication self-care ($F(5,130) = 38.82$, $p<.001$), accounting for 60% of the variance. The standardized beta weights are presented in Table 14.

The variables of total self-efficacy, gender, age, diabetes education and duration of diabetes were entered in a regression equation to determine the best predictors of total self-care. Total self-efficacy and gender contributed significantly to the prediction of total self-care (F (5, 130) = 31.74, $p<.0001$),accounting for 55% of the variance. The contribution of total self-efficacy was stronger (Beta = .72) than that of gender (Beta =.12). Table 15 presents more information.

Table 14

Predictors of Medication Self-Care

Predictor Variables	Beta	P
Medication Self-Efficacy	.76	.0000
Gender	.08	.1635
Age	-.06	.3311
Diabetes Education	-.05	.3500
Duration of Diabetes	-.04	.5285

Table 15

Predictors of Total Self-Care

Predictor Variables	Beta	P
Total Self-Ffficacy (15)	.72	.0000
Gender	.12	.0417
Duration of Diabetes	-.09	.1633
Age	.04	.5236
Diabetes Education	.02	.6997

To further quantify the relationship between diabetes self-efficacy and diabetes self-care a second multiple regression was conducted. The independent variables of exercise self-efficacy, diet self-efficacy, general self-efficacy, gender, age, diabetes education and duration of diabetes were entered in a regression equation with total self-care being the dependent variable. Medication and insulin self-efficacy were not included in the equation because these did not apply to the total sample. The three efficacy variables (general, diet and exercise) together with gender accounted for 63% of the variance in total self-care ($F(7, 128) = 31.18$, $p<.0001$). General efficacy (Beta =.53) was the strongest contributor to total self-care, followed by diet self-efficacy (Beta =.22), exercise self-efficacy (Beta = .15) and gender (Beta = .14). Additional information is provided in Table 16.

These results indicated that diabetes self-efficacy, gender and duration of diabetes were significant predictors of diabetes self-care with diabetes self-efficacy being the best predictor.

Table 16

Predictors of Total Self-Care (Further Analysis)

Predictor Variables	Beta	P
General Self-Efficacy	.53	.0000
Diet Self-Efficacy	.22	.0055
Exercise Self Efficacy	.15	.0129
Gender	.13	.0129
Duration of Diabetes	-.06	.2745
Age	.03	.5752
Diabetes Education	.02	.7805

Discussion related to the fifth research question will next be presented.

5. Which of the variables (gender, age, diabetes education, diabetes duration, diabetes self-care behaviors, diabetes self-efficacy beliefs) are the best predictors of glycemic control?

Six independent variables (gender, age, diabetes education, diabetes duration, total self-care and total self-efficacy) entered in a regression equation to predict glycemic control. Only total self-care and gender contributed significantly to the prediction of glycemic

control, ($F(6, 129 = 3.66)$, $p<.002$) and these together accounted for 15% of the variance. As shown in Table 17, the contribution of total self-care was slightly more (Beta = -.30) than that of gender (Beta = -.22).

Table 17

Predictors of Glycemic Control

Predictor Variables	Beta	P
Total Self-Care (15)	-.30	.0157
Gender	-.22	.0094
Duration of Diabetes	.10	.2569
Age	.03	.7023
Diabetes Education	.04	.6385
Total Self-Efficacy	2	.8477

A second regression equation was created to further explore the predictive power of diabetes self-efficacy and diabetes self-care in glycemic control. Each of the self-efficacy and self-care subscale scores as well as the demographic and diabetes related variables were entered in the equation as predictor variables. None of the self-efficacy or self-care variables were significant predictors

of glycemic control.

Summary of Results

The majority of the individuals in the sample were over age sixty. Most of them reported that they were married or living common law. Duration of diabetes was between one and ten years for the majority of the sample. Over 70% of the subjects reported that they had attended formal diabetes education classes. When asked to select from five options, 52.7% of the sample reported that diabetes education classes had helped them the most to learn the care of their diabetes. Of the three treatment regimens (insulin management, oral hypoglycemic agent management and diet management), the largest number of subjects were on insulin management (39.7%).

The lowest levels of self-efficacy and self-care were reported for the exercise subscales. The level of self-efficacy correlated significantly in a positive direction with self-care for all subscale and total self-care scores. Diabetes self-care behaviors (general, diet, exercise and the total score) correlated negatively with glycemic control. Significant negative correlations were also found between diabetes self-efficacy (general and diet management) and glycemic control. Each self-efficacy subscale score and the total self-efficacy score of the modified IMDSES emerged

as the strongest predictor of their respective counterparts of the modified IMDSCS. Total self-care and gender emerged as significant predictors of glycemic control.

These results will be discussed with reference to other research and the study's theoretical framework in chapter V.

Chapter V

Discussion

This chapter will discuss the study's findings. The highlights of the sample's characteristics and findings for each of the research questions will be discussed and compared to current research. The results will be examined in relation to the theoretical framework of the study. The limitations of the study will also be addressed.

Characteristics of the Sample

The sample of this study consisted of 1.4% more males than females. Worrall, et al., (1991) in a minimal prevalence study of diagnosed diabetes in Newfoundland and Labrador found the reverse. Their sample consisted of 3.03% more females than males for diagnosed NIDDM. However, the prevalence of diagnosed diabetes (NIDDM and IDDM) was 3.4% for females and 3.7% for males. The prevalence rates of diabetes for Canada are not known (Statistics Canada, personal communication, September, 1992; Worrall, et al., 1991).

The frequency of diabetes mellitus increased with age in this sample. This is consistent with other research findings (Huse et al, 1989; Wingard et al., 1990). Worrall et al. (1991) reported that the prevalence of diabetes

increased with age in Newfoundland and Labrador. The increased prevalence of diabetes with age can be attributed to: (a) the current trends of aging, Statistics Canada (1992) reported that the elderly represent an increasingly larger proportion of Canada's and Newfoundland's population, (b) glucose tolerance decreases after age 50 (Canadian Diabetes Association, 1992), thus, resulting in an increased incidence of diabetes in the aged, (c) the elderly often have several chronic diseases which require medications. These medications may reduce glucose tolerance (Canadian Diabetes Association, 1992).

The majority of the sample were married/living common law (73.3%), over age sixty years (51.5%) and had attended diabetes education classes (71.3%). The lowest level of self-efficacy and self-care were reported for the exercise items. This may be due to the fact that the study was conducted during the winter. Many participants whose form of exercise was walking stated that they could not walk during the winter because of the weather and slippery road conditions. Other participants stated that they could not exercise because of other problems (cardiac disease, arthritis etc.).

The mean HbA1c level (.065) reported for the sample was at the upper range of the normal nondiabetic range (.04 to

.07). This indicates that most of the participants had good glycemic control.

Next, the five research questions will be discussed and compared to the findings of current related research.

Relationships between Diabetes Self-Efficacy and Diabetes Self-Care

This study found a significant positive relationship between diabetes self-efficacy beliefs and diabetes self-care behaviors. Each subscale and total scale of the modified IMDSES correlated highly with its corresponding subscale and total scale of the modified IMDSCS (see Table 7). The correlation coefficients, (Pearson's r), ranged from .77 for insulin management to .89 for medication management. These results indicate that higher diabetes self-efficacy scores were associated with positive self-care behaviors.

The results of this study have application for nursing practice in the area of diabetes education. Implementing strategies to increase the diabetes self-efficacy of individuals with diabetes may help them engage in more positive self-care behaviors. Such strategies may include enactive attainment, modelling, verbal persuasion and focusing on blood glucose levels representing good glycemic control as speculated by Bandura (1986).

Other studies that have investigated the relationship between diabetes self-efficacy and diabetes self-care have also reported that higher diabetes self-efficacy scores were associated with positive diabetes self-care (Crabtree, 1986; Rubin, et al., 1989). Hurley and Shea (1992) used the IMDSES and the IMDSCS to measure self-efficacy and self-care in an American sample of individuals with IDDM. A significant positive correlation was found between each of the self-efficacy subscales (general, diet and insulin) and their corresponding self-care subscales. The level of total self-efficacy also correlated with the level of total self-care. The correlational coefficients (Pearson's r) found in this study are much higher than those found by Hurley and Shea (1992). Table 18 presents a comparison of the correlations found by Hurley and Shea (1992) and those found in this study.

Table 18

Comparison of Correlation Coefficients of Hurley and Shea (1992) and this Present Study.

	Hurley & Shea (1992)		Present Study	
General Management	r=.398***	n=142	r=.83**	n=129
Diet Management	r=.37***	n=142	r=.78**	n=114
Insulin Management	r=.67***	n=142	r=.77**	n= 41
Total Efficacy	r=.578***	n=142	r=.83**	n=108

**p<.01. ***p<.001.

The Newfoundland sample showed a stronger relationship between diabetes self-efficacy and diabetes self-care than was the case in the American sample. This may be attributed to the timeframe of the questionnaire administration. This study measured diabetes self-care immediately following the measurement of diabetes self-efficacy. Also, the item-to-item correspondence in content and the same response format between the diabetes self-efficacy and diabetes self-care scales have very likely contributed to the strong relationships between these two variables. Hurley and Shea (1992) measured diabetes

self-care approximately one month after the measurement of diabetes self-efficacy. The higher r values found in this study may also be attributed to the fact that this study investigated a sample of individuals with NIDDM, while Hurley and Shea (1992) studied a sample of individuals with IDDM. IDDM is known to be a more brittle form of diabetes mellitus, requiring more complex treatment regimens. Thus, it may be more difficult to determine relationships between diabetes self-efficacy and diabetes self-care in individuals with IDDM. The cultural differences between the two samples may also have played a part in such large differences in the correlational coefficients.

In 1991, Padgett studied a sample of individuals with NIDDM from Yugoslavia and found that total self-efficacy correlated with total self-care ($r = .40$, $p<.01$). The total efficacy scores included items dealing with general, diet and exercise management. The adherence questionnaire included items dealing with diet, exercise, glucose monitoring, foot care and oral medication. Thus, more adherence behaviors than efficacy beliefs were measured. This, as well as the cultural differences between the two samples, may be the reason for the lower r values.

The second research question will next be discussed.

Relationships between Diabetes Self-Care and Glycemic Control.

This study found a significant negative correlation between diabetes self-care behaviors (general, diet, exercise and total) and glycemic control (see Table 8). These significant negative correlations indicate that higher levels of self-care were associated with lower HbA1c levels for each respective self-care area.

A significant relationship was not found between insulin self-care and glycemic control or between medication self-care and glycemic control. The r values for these relationships were in the negative direction but did not reach significance ($p \leq .05$). A possible reason for these nonsignificant relationships may be that the sample size was small: $n = 36$ for the insulin subscale and $n = 22$ for the medication subscale. The complexity of the behaviors depicted by the insulin and medication self-care subscales may also have contributed to the nonsignificant correlations with glycemic control.

Current diabetes research that has investigated the relationship between diabetes self-care behaviors and glycemic control has reported mixed findings. While some studies have found significant relationships between self-care and glycemic control, other studies have not found such significant relationships.

Diet adherence has been found to be negatively correlated with glycemic control (Rost, et al., 1990; Schafer, et al., 1983). Brownlee-Duffeck et al.(1987) and Littlefield et al. (1992) reported negative correlations between adherence composite scores and glycosylated hemoglobin levels. Schafer et al. (1983) found diet adherence, care in measuring insulin doses and glucose monitoring to correlate negatively with glycosylated hemoglobin levels. However, exercise was not significantly correlated with glycosylated hemoglobin levels. Other studies have not found diabetes self-care to correlate significantly with glycemic control (Cox, et al., 1984; Glasgow, et al., 1989; Polly, 1992).

A discussion of the third research question will follow.

Relationships between Diabetes Self-Efficacy and Glycemic Control

Negative significant correlations between diabetes self-efficacy and glycemic control were found for only general and diet self-efficacy (see Table 9). The strength of these relationships were low to moderate, as signified by r coefficients of .-26 to .-19 respectively. Thus, higher levels of general and diet efficacy were associated with lower HbA1c levels.

Exercise, medication, insulin and total self-efficacy did not correlate with glycemic control at a significant level ($p \leq .05$). However, these were in the expected negative direction. The small sample sizes may have contributed to these findings for both insulin (n = 38) and medication (n = 26) self-efficacy. The difficulty encountered by some participants in exercising during the winter, which has been discussed previously, may also have contributed to the findings.

Diabetes research that has investigated the association between diabetes self-efficacy and glycemic control is limited. Padgett (1991) did not find an association between diabetes self-efficacy and glycemic control. The lack of association between the two variables in Padgett's study may be attributed to methodological weakness. Padgett did not report the reliability of the Diabetes Self-Efficacy Scale used in the study. Also, the only information reported on the HbA1c levels was that they were obtained from a chart review. The timeframe when the HbA1c levels were measured is a very important factor because the HbA1c level gives an indication of glycemic control for only the previous two to three month period. Grossman et al. (1987), however, found a significant positive relationship between diabetes self-efficacy and glycemic control. In the latter study, glycemic control was rated by four indices with a higher rating

indicating better glycemic control. Thus, a higher level of self-efficacy was associated with better glycemic control.

Discussion related to the fourth research question will follow.

Prediction of Self-Care

General self-efficacy was the strongest predictor of general self-care (Beta = .81). Thus, individuals who possessed a higher level of general self-efficacy engaged more desirable general self-care behaviors. Duration of diabetes and gender were also significant but weaker predictor variables: diabetes duration (Beta = -.13) and gender (Beta = .09) (see Table 10). Thus, the level of general self-care decreased with the duration of diabetes and females reported higher levels of general self-care than did males.

Diet self-efficacy was the strongest predictor of diet self-care behaviors (Beta = .68). Individuals who possessed greater self-efficacy in diet management engaged in more diet self-care behaviors. Gender also entered the regression equation as a significant, but weaker predictor variable (Beta = .16) (see Table 11). Thus, female participants reported higher levels of diet self-care than did males.

Exercise self-efficacy was the only significant predictor of exercise self-care (see Table 12). Individuals

who possessed greater self-efficacy in exercise engaged in more exercise self-care behaviors.

Although gender, duration of diabetes and insulin management each contributed to the prediction of insulin self-care, insulin self-efficacy was the best predictor (Beta = .76). Insulin self-care decreased with the duration of diabetes (Beta = -.12) and was higher for females than for males (Beta = .14 for gender) (see Table 13).

Medication self-efficacy was the only variable to contribute significantly to the prediction of medication self-care. Higher levels of medication self-efficacy were associated with higher levels of medication self-care (Beta = .76) (see Table 14).

Total self-efficacy and gender emerged as significant predictors of total self-care when entered in a regression equation with the demographic and diabetes related variables. Individuals who reported higher levels of total self-efficacy also reported higher levels of total self-care (Beta = .72). Females reported higher levels of total self-care than did males (Beta = .12 for gender) (see Table 15).

In further analysis, when each of the self-efficacy subscales scores were entered in a regression equation with the demographic and diabetes related variables, general, diet, and exercise efficacy together with gender contributed significantly to the prediction of total self-care. Higher

general, diet and exercise self-efficacy scores contributed to higher levels of total self-care. As in the previous regression equation, females reported higher levels of total self-care than did males. The contribution of general self-efficacy to the prediction of total self-care was stronger (Beta = .53) than that of the other variables. The contribution of diet efficacy (Beta = .22), exercise efficacy (Beta = .15) and gender(Beta = .13) differed only slightly (see Table 16).

These findings are consistent with current research which has found that diabetes self-efficacy variables were the strongest predictors for diabetes self-care (Crabtree, 1986; Hurley, 1989). Hurley (1989) found that general, diet, insulin and total self-efficacy each emerged as the best predictor of self-care when entered in a regression equation with demographic, disease related and the health belief model variables. Crabtree (1986) constructed four models: (a) general, (b) diet, (c) exercise and (d) medication taking to examine the predictive capability of self-efficacy. The other variables entered in the models were demographic, diabetes related and social support. General, diet, and exercise self-efficacy were the best predictors of self-care for those behaviors. However, medication taking self-efficacy did not contribute significantly to the prediction of medication taking self-care behaviors.

Instead, age and the number of diabetes complications contributed significantly to the prediction of medication behaviors. Both the findings of Hurley (1989) and Crabtree (1986) were similar to those of this study. In contrast, medication self-efficacy was the only predictor of medication self-care in this study, whereas Crabtree (1986) reported that medication self-efficacy had not contributed significantly to the prediction of medication self-care.

In this study gender emerged as a significant predictor for several self-care areas (general, diet, insulin and total), with females reporting higher levels of self-care than did males. Duration of diabetes was also a significant predictor (in the negative direction) for two self-care areas (general and insulin). Self-care in these areas decreased with the duration of diabetes. These findings are similar to those of other research. Glasgow et al. (1987) found in their sample of individuals with IDDM that females reported better adherence to their diet regimen than did males and that subjects' adherence to their diet regimen decreased with the duration of diabetes. Wilson et al. (1986) also found that sex and duration of diabetes were significant predictors of diabetes self-care for a sample of individuals with NIDDM.

The findings of this study that females engaged in more diabetes self-care behaviors than did males may be explained

by the fact that females are the primary caregivers in society and are socialized into this role. Wright and Leahey (1987) noted that throughout history females have been the primary caregivers and this remains evident today. This may mean that females are more committed to maintaining health and well being. Whetstone and Reid (1991) further noted that females valued health more highly than did males.

Cramer and Spilker (1991) commented on why self-care may decrease with the duration of a chronic illness. They noted the following: (a) people often become negligent with managing their illness with time, (b) individuals become discouraged when their best efforts at compliance with the treatment regimen do not bring about the desired outcomes such as good glycemic control and (c) the impact of compliance on the quality of life such as the sacrifice of preferred foods may lead to reduced long-term compliance.

Other researchers have not found gender or duration of diabetes to be significant predictors of diabetes self-care (Crabtree, 1986; Hurley, 1989).

Age did not emerge as a significant predictor of self-care in this study. However, Crabtree (1986) found age to be a significant predictor of general, diet and medication self-care.

A discussion on the variables that contributed to the prediction of glycemic control will follow.

Prediction of Glycemic Control

The medication and insulin self-efficacy and self-care variables were not entered in the regression equations as possible predictors of glycemic control because these did not apply to the total sample. When the demographic, diabetes related, total self-care and total self-efficacy variables were entered in a regression equation only total self-care and gender emerged as significant predicators of glycemic control. A standardized beta weight of -.30 indicated that individuals who engaged in a higher level of diabetes self-care behaviors experienced lower HbA1c levels which is desirable in controlling diabetes mellitus. Gender (Beta = -.22) contributed slightly less to the prediction of glycemic control than did total diabetes self-care behaviors. The standardized beta weight of -.22 for gender indicated that females had lower HbA1c levels than did males (see Table 17).

None of the diabetes self-care or diabetes self-efficacy subscale scores contributed significantly to the prediction of glycemic control when entered in a regression equation with the demographic and diabetes related variables. Thus, for this sample, diabetes self-care subscales (general, diet and exercise) and diabetes self-efficacy subscales (general, diet,and exercise) did not predict glycemic control.

A point worth noting is that HbA1c levels were not available for 16 of the participants. Two of these individuals admitted that they did not plan to have their blood drawn for HbA1c levels because they had not been carrying out therapeutic self-care behaviors over the past few months.

The results of this study agree with other research. Schafer et al. (1983) found that a combination of adherence measures significantly predicted approximately 40% of the variance in glycemic control. However, some studies have not found the same results (Glasgow, et al., 1989; Polly, 1992). When diabetes self-efficacy was examined as a predictor of glycemic control mixed findings were also reported. Padgett (1991) found that diabetes self-efficacy was not associated with glycemic control. As previously discussed, methodological weakness may be a reason for the lack of association between diabetes self-efficacy and glycemic control in this study. However, Grossman et al. (1987) found that diabetes self-efficacy predicted glycemic control for females but not for males.

The results of this study agree with those of Wilson et al. (1986) who found that diabetes self-care predicted more of the variance in glycemic control than demographic or diabetes related variables.

It is interesting that diabetes education was not a significant predictor of diabetes self-care or glycemic control. This may be attributed to the fact that participants who had attended diabetes education classes were of various diabetes education programs throughout the province of Newfoundland and Labrador. Furthermore, participants who had not attended diabetes education had received information on managing their diabetes from other sources (physician, dietician, nurse, reading material, etc.). As well, the length of time since attending the program may have played a part in these findings.

In summary, the strong associations between diabetes self-care behaviors and diabetes self-efficacy beliefs found in this study are positive. Diabetes self-efficacy was clearly the strongest predictor of diabetes self-care. However, a large percent of the variance in glycemic control was not predicted by diabetes self-care, diabetes self-efficacy, demographic or diabetes related variables. This study found that total diabetes self-care behaviors and gender together contributed to only 15% of the variance in glycemic control.

These results indicated that some of the variance in glycemic control may be influenced by unknown factors in addition to those included in this study. Other researchers have also supported the thesis that glycemic control is

affected by factors other than self-care behaviors (Brownlee-Duffeck, et al., 1987; Polly, 1992) and self-efficacy (Padgett, 1991; Glasgow, et al., 1989).

A factor which plays a major role in glycemic control is that of the appropriateness of the treatment regimen (Canadian Diabetes Association, 1992). Other factors (psychological, social and physiological),in combination with diabetes self-care behaviors and diabetes self-efficacy, very likely play a role in glycemic control. Thus, diabetes management is likely a balance between psychological, social and physiological functioning (Dufton, 1992; Kurtz, 1990). A positive light is that diabetes self-efficacy was predictive of diabetes self-care and total diabetes self-care was the best predictor of glycemic control. These findings are important given the complexity of diabetes glycemic control, diabetes self-care behaviors and diabetes self-efficacy beliefs.

The findings of this study will be discussed in relation to the study's theoretical framework, the self-efficacy theory, in the section which follows.

'pplication of the Results to the Theoretical Framework

The correlation among diabetes self- efficacy, diabetes self-care and glycemic control can be viewed within the self-efficacy theory.

The self-efficacy theory postulates that self-efficacy plays a role in human behavior. People tend to avoid tasks that they do not feel capable of and undertake activities they judge themselves capable of managing (Bandura, 1977).

This study found a strong positive association between diabetes self- efficacy and diabetes self-care. Diabetes self-efficacy predicated most of the variance in three diabetes self-care areas (general, diet and exercise). Thus, individuals who reported higher levels of diabetes self-efficacy for management of their diabetes also reported that they performed the corresponding self-care behaviors. Self-care behaviors were negatively correlated with glycemic control. Individuals who reported higher levels of self-care behaviors had lower HbA1c levels, which is a goal of diabetes management.

These results support the self-efficacy theory. The self-efficacy theory postulates that self-efficacy can lead to the person carrying out the recommended self-care behaviors and that carrying out the self-care behaviors can lead to a greater self-efficacy (Bandura, 1986).

Thus, while one can not infer causality, there does seem to be a meaningful association between diabetes self-efficacy, diabetes self-care and glycemic control.

High levels of diabetes self-efficacy are associated with higher levels of diabetes self-care, which are in turn associated with lower HgA1c levels.

In this study, the demographic and diabetes related variables (gender, age, duration of diabetes and whether or not the person had attended a diabetes education program) were contributors to self-care and glycemic control. However, only gender and duration of diabetes were significant predictors of diabetes self-care, while only gender was a significant predictor of glycemic control. More research is needed to further study the role of these variables in self-efficacy and self-care before they can be incorporated into the diabetes self-efficacy model.

Limitations

There were a number of limitations in this study:

1. A convenience sample was obtained from a large Newfoundland urban hospital. Thus, this sample may not be representative of the NIDDM population of Newfoundland and Labrador.
2. Since this study used a correlation design, one cannot conclude a cause and effect relationship between the variables.
3. There were some missing data because some of the items on the questionnaires were not applicable to some of

the participants. Also, HbA1c levels were not available for sixteen of the participants.

4. In the presence of health professionals, the participants may have reported self-efficacy and self-care levels that they deemed desirable.

Summary

This chapter has discussed the findings of the study and their relationships to other research and the self-efficacy theory. A number of limitations of the study were also noted.

Chapter VI will provide a summary of the study, the implications for nursing practice and some recommendations for future research.

Chapter VI

Summary, Implications and Recommendations

This chapter presents a summary of the study and its implications for nursing practice and nursing research.

Summary

The study evolved from nursing practice, where a need to increase an understanding of the relationship between self-care behaviors and glycemic control in people with NIDDM was identified. Desirable diabetes self-care behaviors have been advocated as a means of achieving glycemic control, which are believed to facilitate prevention, early detection and effective management of diabetes complications. However, as Dufton (1992) noted, approaches that enhance desirable diabetes self-care are in their infancy. The concept of self-efficacy had been identified as an important variable in promoting therapeutic diabetes self-care behaviors (Glasgow, et al., 1989; Hurley & Shea, 1992). However, the concept of self-efficacy had not been adequately researched in people with NIDDM.

The purpose of this study was to investigate the relationships among diabetes self-efficacy, diabetes self-

care and glycemic control in a sample of individuals with NIDDM. The theoretical framework for this study was the self- efficacy theory (Bandura, 1977). The research design was descriptive correlational. A convenience sample of 136 individuals with NIDDM participated in the study. Data were collected using the modified IMDSES and the modified IMDSCS. A demographic data form, developed by the investigator was used to collect pertinent demographic information. Glycemic control was assessed by the participants' HbA1c level at the time of data collection.

The findings of the study demonstrated the following relationships: (a) a significant positive correlation between diabetes self-efficacy and diabetes self-care (general, diet, exercise, insulin, medication and total management); (b) a significant negative correlation between diabetes self-care (general, diet, exercise and total management) and glycemic control; (c) a significant negative correlation between diabetes self-efficacy (general and diet management) and glycemic control; (d) diabetes self-efficacy (general, diet, gender, exercise, insulin, medication and total management) were the best predictors of their corresponding diabetes self-care behaviors and (e) total self-care management and gender were the only two variables that contributed significantly to the prediction of glycemic

control. These together accounted for 15% of the variance in glycemic control.

The results of the study were examined in relation to the self-efficacy model. Diabetes self-efficacy emerged as a strong significant predictor of self-care ($p<.05$), and self-care was related to glycemic control ($p<.05$).

The research questions posed in this study were answered. However, in research it also necessary to consider the impact of the results on nursing practice and future research.

Implications for Nursing Practice

The identification of self-care as an important factor in the management of diabetes has resulted in the need for health care providers to help people with diabetes mellitus perform the recommended diabetes self-care behaviors. It is documented that knowledge about diabetes and its management and diabetes skills are necessary, but insufficient conditions for effective diabetes management (Dufton, 1992; Kurtz, 1990). Effective management of diabetes requires that individuals exercise increased control over their diabetes and become independent and confident in its management. It follows that nurses must use strategies to enhance patients' confidence and independence in their diabetes self-care. Diabetes self-efficacy can lead to effective self-care.

Diabetes self-efficacy will give individuals with diabetes a sense that they can manage their diabetes, thus they will be more likely to engage in effective diabetes self-care behaviors.

Diabetes self-efficacy is a concept that is associated with diabetes self-care, thus interventions that enhance diabetes self-efficacy may also enhance diabetes self-care. Diabetes self-efficacy was thought to be enhanced by enactive attainment, vicarious experience, verbal persuasion and physiological states (Bandura, 1986).

Enactive attainment (past mastery) can be used to help clients focus on their successes in diabetes management. Helping clients set short term goals that they can achieve and concentrate on the success of attaining these goals can help foster diabetes self-efficacy in the client. These successes can help raise the client's diabetes self-efficacy. Vicarious experience (modelling), the use of individuals who are successful self managers in group sessions, may help enhance the diabetes self-efficacy of other members in the group. Verbal persuasion may be used by health care providers to persuade the individual with diabetes to adopt the self-care behaviors necessary to manage their diabetes. The physiological state of blood glucose may also be use to help raise self-efficacy. Blood glucose levels that are considered to represent good

glycemic control may be emphasized to help foster diabetes self-efficacy.

Thus, using interventions that enhance diabetes self-efficacy has the potential to improve diabetes management. However, intervention studies are needed to determine the effectiveness of these strategies in promoting desirable self-care behaviors.

Implications for Nursing Research

There are a number of recommendations for future research that have emerged from this study:

1. Replicate the study using a larger, probability sample.
2. Replicate the study in a variety of urban and rural settings.
3. Replicate the study using a Newfoundland sample of individuals with IDDM.
4. Replicate the study, allowing for an increased number of subjects on each of the treatment regimens (insulin management, oral hypoglycemic agent, combination therapy and diet controlled).
5. Measure outcome expectations (the belief that diabetes self-care behaviors will lead to desirable outcomes) as well as self-efficacy to further test the application of the self-efficacy theory to diabetes self-care.

6. Include measures of self-report such as daily diaries as well as a questionnaire to measure self-care behaviors.
7. Measure self-care one or two months after the self-efficacy measurement, to determine if self-efficacy predicts future self-care in a Newfoundland sample.
8. Design an intervention, longitudinal study using strategies to enhance diabetes self-efficacy and measure the effect on both short term and long term self-care and glycemic control.

Conclusion

This study has demonstrated a significant relationship between diabetes self-efficacy and diabetes self-care and between diabetes self-care and glycemic control. The findings of this study indicate a need to use and promote the concept of self-efficacy in nursing practice and future research.

References

Aikens, J., Wallander, J., Bell, D., & Cole, J. (1992). Daily stress variability, learned resourcefulness, regimen adherence and metabolic control in type 1 diabetes mellitus: Evaluation of a path model. Journal of Consulting and Clinical Psychology, 60, 113-118.

American Association of Diabetes Educators. (1992). The scope of practice for diabetes educators and the standards of practice for diabetes educators. The Diabetes Educator, 18, 52-56.

American Diabetes Association. (1990). Exercise and NIDDM. Diabetes Care, 13, 785-789.

Armstrong, N. (1987). Coping with diabetes a full-time job. Nursing Clinics of North America, 22, 559-568.

Ary, D., Toobert, D., Wilson, W., & Glasgow, W. (1986). Patient perspective on factors contributing to nonadherence to diabetes regimen. Diabetes Care, 9, 168-172.

Bandura, A. (1977). Self-efficacy: Towards a unifying theory of behavior change. Psychological Review, 84, 191-215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37, 122-147.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A., & Adams, N. (1977). Analysis of self-efficacy theory of behavioral change. Cognitive Theory and Research, 4, 287-310.

Barofsky, I (1979). Compliance, adherence and the therapeutic alliance: Steps in the development of self-care. Social Science and Medicine, 12, 369-376.

Becker, M., & Janz, N. (1985). The health belief model applied to understanding diabetes regimen compliance. The Diabetes Educator, 19, 41-47.

Beeney, L., & Dunn, S. (1990). Knowledge improvement and metabolic control in diabetes education: Approaching the limits. Patient Education and Counselling, 16, 217-229.

Bransome, E. (1992). Financing the care of diabetes mellitus in the U.S: Background, problems and challenges. Diabetes Care, 15 (1), 1-5.

Bodor, G., Little, R., Garrettn N., Brown, W., Goldstein, D., & Nahan, M. (1992). Standardization of glycohemoglobin determinations in the clinical laboratory: Three years of experience. Clinical Chemistry, 38, (12), 2414-24-18..

Borg, W., & Gall, M. (1989). Educational research: An introduction. (5th ed.). New York: Longman.

Brown, S. (1990). Studies of education interventions and outcomes in diabetic adults: A meta-analysis revisited. Patient Education and Counselling, 16, 189-215.

Brownlee-Duffeck, M., Peterson, L., Simonds, J., Goldstein, D., Kilo, C., & Hoette, S. (1987). The role of health beliefs in the regimen adherence and metabolic control of adolescents and adults with diabetes mellitus. Journal of Consulting and Clinical Psychology, 55, 139-144.

Brunner, L., & Suddarth, D. (1992). Textbook of medical-surgical nursing (7th ed.). Philadelphia: J. B. Lippincott.

Bunn, F. (1981). Evaluation of glycosylated haemoglobin in diabetic patients. Diabetes, 30, 613-617.

Canadian Diabetes Association (1992). Primer: Canadian diabetes association handbook on diabetes mellitus. Canadian Diabetes, 4, (5), 3-23.

Carter Center of Emory University (1985). Closing the Gap: The problem of diabetes mellitus in the United States. Diabetes Care, 8, 391-406.

Clark, M., Abrams, D., Niaura, R., Eaton, C., & Rossi, J. (1991). Self-efficacy in weight management. Journal of Consulting and Clinical Psychology. 59, 739-744.

Clarke, C., Mulmed, L., & Whitehouse, F. (1991). Type II diabetes: Managing risks and realities. Patient Care, 25, 10-32.

Connell, C. (1991). Psychosocial contexts of diabetes and older adulthood: Reciprocal effects. The Diabetes Educator, 17, 364-371.

Cox, D., Taylor, A., Nowacek, G., Holley-Wilcox, P., Pahl, S., & Guthrow, E. (1984). The relationship between psychological stress and insulin-dependent diabetic blood glucose control: Preliminary investigations. Health Psychology, 3, 63-75.

Crabtree, M. (1986). Self-efficacy and social support as predictors of diabetic self-care. Dissertation Abstracts International, 47, 2369B.

Cramer, J. & Spilker, B. (1991). Patient compliance in medical practice and clinical trials. New York: Raven Press.

Diclemente, C.(1986). Self-efficacy and the addictive behaviors. Journal of Social and Clinical Psychology, 4, 302-315.

Diclemente, C., Prochaska, J., & Gibertini, M. (1985). Self-efficacy and the stages of self-change of smoking. Cognitive Theory and Research, 9, 181-200.

Dunn, S., Beeney, L. Hoskin, P., & Turtle, J. (1990). Knowledge and attitude change as predictors of metabolic improvement in diabetes education. Social Science and Medicine, 31, 1115-1139.

Dufton, B. (1992). Barriers to diabetes self-care. Beta Release, 16, 119-125.

Ewart, C., Taylor, C., Reese, L., & Debusk, R. (1984). Effects of early postmyocardial infarction exercise testing on self-perception and subsequent physical activity. American Journal of Cardiology, 51, 1076-1080.

Fischbach, F. (1992). A manual of laboratory & diagnostic tests (4th ed.). Philadelphia: J. B. Lippincott.

Gantz, S. (1990). Self-care: Perspectives from six disciplines. Holistic Nursing Practice, 4 (2), 1-12.

Glasgow, R., McCaul, K., & Schaffer, L. (1987). Self-care behaviors and glycemic control in type 1 diabetes. Journal of Chronic Disease, 40, 399-412.

Glasgow, R., Toobert, D., Hampson, S., Brown, J., Lewinsohn, P., & Donnelly, J. (1992). Improving self-care among older patients with type 11 diabetes: The "sixty something..." study. Patient and Counselling, 19, 61-74.

Glasgow, R., Toobert, D., Riddle, M.,Donnelly, J., Mitchell, D., & Calder, D. (1989). Diabetes-specific social learning variables and self-care behaviors among persons with type 11 diabetes. Health Psychology, 8, 285-303.

Glasgow, R., Wilson, W., & McCaul, K. (1985). Regimen adherence: A problematic construct in diabetes research. Diabetes Care, 8, 300-301.

Godding, P., & Glasgow, R. (1985). Self- efficacy and outcome expectations as predictors of controlled smoking status. Cognitive Therapy and Research, 9, 583-590.

Grossman, H., Brink, S, & Hauser, S. (1987). Self-efficacy in adolescent girls and boys with insulin-dependent diabetes mellitus. Diabetes Care, 10, 324-329.

Hanestad, B. R., & Albrektsen, C. (1991). Quality of life, perceived difficulties in adherence to a diabetes regimen, and blood glucose control. Diabetes Medicine, 8, 759-764.

Harris, M., Klein, R., Welborn, T., & Knuiman, M. (1992). Onset of NIDDM occurs at least 4-7 yr before clinical diagnosis. Diabetes Care, 15, 815-819.

Hernandez, C.(1989). The pathophysiology of diabetes mellitus: An update. The Diabetes Educator, 15, 163-169.

Hilbert, G. (1985). Accuracy of self-reported measures of compliance. Nursing Research, 34, 319-320.

Hood, G., & Dincher, J. (1992). Total patient care: Foundations and practice of adult health nursing. St. Louis: Mosby-Year Book.

Hurley, A. (1989). Diabetes health beliefs and self care of individuals who require insulin. Dissertation Abstracts International, 50, 124B.

Hurley, A. (1990). Measuring self-care ability in patients with diabetes: Insulin management diabetes self-efficacy scale. In O. Strickland & C. Waltz (Eds.), Measurement of Nursing Outcomes: Measuring Client Self-Care and Coping Skills (pp.28-44). New York: Springer.

Hurley, A., & Shea, C. (1992). Self-efficacy: Strategy for enhancing diabetes self-care. The Diabetes Educator, 18, 146-150.

Huse, D., Oster,G., Killen, A., Lacey, M., & Colditz, G. (1989). The economic costs of non-insulin-dependent diabetes mellitus. Journal of American Medical Association, 262, 2708-2713.

Jacobs, J., Sena, M., & Fox., N. (1990). The cost of hospitalization for the late complications of diabetes in the United States. Diabetes Medicine, 8, 523-29.

Jacobson, A. (1986). Current status of psychosocial research in diabetes. Diabetes Care, 9, 546-548.

Jovanovic, L., & Peterson, C. (1981). The clinical utility of glycosylated hemoglobin. The American Journal of Medicine, 70, 331-335.

Kaplan, R., Atkins, C., & Reinsch, (1984). Specific efficacy expectations mediates exercise compliance in patients with COPD. Health Psychology, 3, 223-242.

Kaplan, R., Chadwick, M., & Shimmel, L. (1985). Social learning intervention to promote metabolic control in type 1 diabetes mellitus: Pilot experiment results. Diabetes Care, 8, 152-155.

King, H., & Rewers, M. (1991). Diabetes in adults is now a third world problem. Bulletin of the World Health Organization, 69, 643-648.

Kingery, P., & Glasgow, R. (1989). Self-efficacy and outcome expectations in the self-regulation of non-insulin dependent diabetes mellitus. Health Education, 20, 13-19.

Krall, L. (1986). Wide, wide world of diabetes mellitus. The Diabetes Educator, 12, 379-383.

Krall, L., & Beaser, R. (1989). Joslin diabetes manual. Philadelphia: Leg & Febiger.

Kurtz, S. (1990). Adherence to diabetes regimens: Empirical status and clinical applications. The Diabetes Educator, 16, 50-55.

Larsen, M., Petersen, P., Horder, M., & Mogensen, E. (1990). Discrepancies in assessment of metabolic regulation in insulin-dependent diabetes mellitus: Can we do without measurements of glycosylated haemoglobin? Diabetes Research, 14, 75-78.

Littlefield, C., Craven, J., Radin, G., Daneman, D., Murray, M., & Rydall, A. (1992). Relationships of self-efficacy and bingeing to adherence to diabetes regimen among adolescents. Diabetes Care, 15, 90-93.

Mazze, R. (1984). Diabetes patient education: A health care provider perspective. The Diabetes Educator, 12, 126-129.

Mazzuca, S., Moorman, N., Wheeler, M., Norton, J., Fineberg, N., Vinicor, F., Chen, S., & Clark, C. (1986). The diabetes education study: A controlled trial of the effects of diabetes patient education. Diabetes Care, 9 (1), 1-10.

McAuley, E., Courneya, K., & Lettunich, J. (1991). Effects of acute and long term exercise on self-efficacy responses in sedentary, middle aged males and females. The Gerontologist, 31, 534-542.

Morsiana, M. (1989). Epidemiology and screening of diabetes. Boca Raton, Fl: CRC Press.

Nagasawa, M., Smith, M., Barnes, J., & Flincham, J. (1990). Meta-analysis of correlations of diabetes patients' compliance with prescribed medications. The Diabetes Educator, 16, 192-200.

National Diabetes Data Group. (1984). Special announcement. National standards for diabetes education programs. Diabetes Care, 7, 29-35.

National Diabetes Task Force (1985). The status of diabetes in Canada. Ottawa: Health and welfare Canada.

Newfoundland Department of Health, & Department of National Health and Welfare. (1990) Newfoundland heart and health survey 1988-1989. St. John's, Nf: Government of Newfoundland.

O'Leary, A. (1985). Self-efficacy and health. Behavior Research Therapy, 23, 437-451.

Orem, D. (1991). Nursing concepts of practice (4th ed.). St. Louis: Mosby Year Book.

Padgett, D., Mumford, E., Hynes, M., & Carter, R. (1988). Meta-analysis of the effects of educational and psychosocial interventions on management of diabetes mellitus. Journal of Clinical Epidemiology, 41, 1007-1030.

Padgett, D. (1991). Correlates of self-efficacy beliefs among patients with non-insulin dependent diabetes mellitus in Zagreb, Yugoslavia. Patient Education and Counselling, 18, 139-147.

Palernostro-Bayles, M., Wing, R., & Robertson, R. (1989). Effects of life-style activity of varying duration on glycemic control in Type II diabetic women. Diabetes Care, 12, 34-37.

Polit, D., & Hungler, B. (1991) Nursing research: Principles and methods (4th ed.). New York: J.B. Lippincott.

Polly, R. K. (1992). Diabetes health beliefs, self-care behaviors and glycemic control among older adults with non-insulin-dependent diabetes mellitus. The Diabetes Educator, 18, 321-327.

Prescott, P. (1987). Multiple regression analysis: Cautions and suggestions. Nursing Research, 36, 130-133.

Redekar, N. (1988). Health beliefs and adherence in chronic illness: IMAGE. Journal of Nursing Scholarship, 20, 31-34.

Rist, F., & Watzi, H. (1983). Self assessment of relapse risk and assertiveness in relation to treatment outcome of female alcoholics. Addictive Behaviors, 18, 121-127.

Rosenstock, I. (1985). Understanding and enhancing patient compliance with diabetic regimens. Diabetes Care, 8, 610-615.

Rost, K., Flavin, K., Schmidt, L., & McGill, J. (1990). Self- care predictors of metabolic control in NIDDM patients. Diabetes Care, 13, 1111-1113.

Rubin, R., Peyrot, M., & Saudet, C. (1989). Effects of diabetes education on self-care, metabolic control and emotional well-being. Diabetes Care, 12, 673-679.

Schafer, L., Glasgow, R., McCaul, K., & Dreher, M. (1983). Adherence to IDDM regimens: Relationship to psychosocial variables and metabolic control. Diabetes Care, 6, 493- 498.

Schafer, L., McCaul, K., & Glasgow, R. (1986). Supportive and nonsupportive family behaviors: Relationships to adherence and metabolic control in persons with type I diabetes. Diabetes Care, 9, 179-185.

Schlenk, E., & Hart, L. (1984). Relationship between health locus of control, health value and social support and compliance of persons with diabetes mellitus. Diabetes Care, 7, 566-573.

Schunk, D. (1984). Enhancing self-efficacy and achievement through rewards and goals: Motivation and informational effects. Journal of Educational Research, 78, 29-34.

SPSSX Inc. (1988). Statistical package for the social sciences (revised). New York: McGraw-Hill.

Statistics Canada. (1992). Profile of census divisions and subdivisions in Newfoundland - part a. Ottawa: Government of Canada

Strecher, V., DeVellis, B., Becker, M., & Rosenstock, I. (1986). The role of self-efficacy in achieving health behavior change. Health Education Quarterly, 13, 73-91.

Strowig, S., & Raskin, P. (1992). Glycemic control and diabetes complications. Diabetes Care, 15, 1126-1137.

Tan, M., & Wornell, C. (1991). Diabetes mellitus in Canada. Diabetes Research and Clinical Practice, 14, 53-58.

Taylor, C., Bandura, A., Ewart, C., Miller, N., & DeBusk, R. (1985). Excise testing to enhance wives confidence in their husbands' cardiac capability soon after clinically uncomplicated acute myocardial infarction. American Journal of Cardiology, 55, 635-638.

Uzoma, C., & Feldman, R. (1989). Psychosocial factors influencing inner city black diabetic patients' adherence with insulin. Health Education, 20, 29-32.

Watkins, P., Drury, P. & Taylor, K. (1990). Diabetes and its management (4th ed). Edinburgh: Blackwell Scientific.

Weinberg, R., Hughes, H., Critelle, J., England, R., & Jackman, A. (1984). Effects of preexisting and manipulated self-efficacy on weight loss in a self control program. Journal of Research in Personality, 18, 352-358.

Whetstone, W. & Reid, J. (1991). Health promotion of older adults: Perceived barriers. Journal of Advance Nursing, 16 1343-1349.

Wilson, W., Ary, D., Biglan, R., Glasgow, D., Toobert, M., & Campbell, D. (1986). Psychosocial predictors of self-care behaviors (compliance) and glycemic control in non-insulin dependent diabetes mellitus. Diabetes Care, 9, 614-622.

Wing, R., Epstein, L., Nowalk, M., Scott, N., & Koeske, R. (1985). Compliance to self- monitoring of blood glucose: A marked item technique compared with self-report. Diabetes Care, 8, 456-460.

Wingard, D., Sinsheimer, P., Barrett-Connor, E., & McPhillips, J. (1990). Community- based study of prevalence of NIDD in older adults. Diabetes Care, 13, 3-8.

Wojeik,J. (1988). Social learning predictors of the avoidance of smoking relapse. Addictive-Behaviors, 13, 177-180.

World Health Organization. (1985). Diabetes mellitus (Tech. Rep. No. 727). Geneva: Author.

Worrall, G., Fodor, G., & Butt, M. (1991). A minimal prevalence study of diagnosed diabetes in Newfoundland and Labrador. Canadian Journal of Public Health, 82, 104-108.

Wright, M., & Leahey, M. (1987) Families and chronic illness. Springhouse, PA: Springhouse Corp.

Appendix A

Informed Consent

Title: Self-Efficacy, Self-Care and Glycemic Control in Individuals with Noninsulin Dependent Diabetes Mellitus.

Researcher: Anita Ludlow, Graduate Student, School of Nursing, Memorial University of Newfoundland.

You have been asked to participate in a research study. Your participation in this study is completely voluntary and you may withdraw from the study at anytime. If you do not participate in the study or if you withdraw from the study, the health care services you receive will not be affected in any way.

The responses you give will not be connected to your name or medical record. The researcher will be available during the study should you have any problems or questions about the study.

The purpose of this study is to explore the relationships among individuals' beliefs about their abilities to manage their diabetes, their self-care behaviors and their blood sugar levels.

Following the signing of this consent form you will be asked to complete three short and simple questionnaires which will take approximately forty minutes. The researcher

will also obtain your most recent blood sugar level from your medical record.

This study does not involve any risks to you. It is hoped that the results of this study will assist health care workers to help individuals with diabetes to better manage their disease.

CONSENT FORM

Title: Self-Efficacy, Self-Care and Glycemic Control in Individuals with Noninsulin Dependent Diabetes Mellitus.

Researcher: Anita Ludlow, Graduate Student, School of Nursing, Memorial University of Newfoundland.

I _____, agree to participate in this research study. I understand my involvement in the study and all of my questions have been answered. I realize that participation is voluntary. I acknowledge that I have been offered a copy of the consent form.

_____ _____

Signature of Participant Date

Researcher

I have explained to the above named subject the purpose and procedures of this research study, I have requested questions from the participant and have answered all questions to the best of my ability.

_____ _____

Signature of Researcher Date

Phone Number:_____

Appendix B

MODIFIED INSULIN MANAGEMENT DIABETES SELF-EFFICACY SCALE

I.D. ____

The following statements describe what some people believe about their ability to take care of their diabetes. Please take the next few minutes to tell me what you believe about your ability to manage your diabetes. After reading each statement, circle the number that best expresses your beliefs. There are twenty eight (28) statements, please answer each one. There are no right or wrong answers.

Circle 1 if you strongly agree with the statement,

2 if you moderately agree with the statement,

3 if you slightly agree with the statement,

4 if you slightly disagree with the statement,

5 if you moderately disagree with the statement,

6 if you strongly disagree with the statement, or

NA if the statement does not apply to you.

Example	Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Does Not Apply
I can test my urine for sugar before meals when I am away from home.	1	2	3	4	5	6	NA

Answer.

If you are confident in your ability to test your urine before meals when you eat out, you should circle 1 because that statement best expresses your belief. If you do not test urine, you should circle NA.

MODIFIED INSULIN MANAGEMENT DIABETES SELF-EFFICACY SCALE

I.D.____

		Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	N/A
1.	I can carry out practically all of the self care activities in my daily diabetes routine.	1	2	3	4	5	6	NA
2.	I am confident in my ability to manage my diabetes.	1	2	3	4	5	6	NA
3.	I feel unsure about having to use what I know about diabetes self treatment every day.	1	2	3	4	5	6	NA
4.	I don't think I can follow my diabetes routines every single day.	1	2	3	4	5	6	NA
5.	I can eat my meals at the same time every day.	1	2	3	4	5	6	NA
6.	I can stay on my diabetic diet when I eat in familiar places away from home (such as at a friend's house)	1	2	3	4	5	6	NA
7.	I can stay on my diabetic diet when I eat in unfamiliar places.	1	2	3	4	5	6	NA
8.	I'm not sure I'll be able to stay on my diabetic diet when the people around me don't know that I have diabetes.	1	2	3	4	5	6	NA
9.	I'm not sure I'll be able to follow my diabetic diet every day.	1	2	3	4	5	6	NA
10.	I can correctly exchange one food for another in the same food group.	1	2	3	4	5	6	NA
11.	When I go to parties, I can follow my diet plan.	1	2	3	4	5	6	NA
12.	I can exercise several times a week.	1	2	3	4	5	6	NA

MODIFIED INSULIN MANAGEMENT
DIABETES SELF-EFFICACY SCALE

I.D.___

		Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Does Not Apply
13.	I can't exercise unless I feel like exercising	1	2	3	4	5	6	NA
14	I can figure out when to call my doctor about problems with my feet.	1	2	3	4	5	6	NA
15.	I can routinely apply the recommended lotion to my feet.	1	2	3	4	5	6	NA
16.	I cannot test my blood or urine when I am away from home.	1	2	3	4	5	6	NA
17.	I can recognize when my blood sugar is too high.	1	2	3	4	5	6	NA
18.	When I feel sick I can test my blood or urine more than I routinely do	1	2	3	4	5	6	NA
19.	I can take my insulin/medication using the recommended procedure.	1	2	3	4	5	6	NA
20.	I may have difficulty taking my insulin/medication when away from home.	1	2	3	4	5	6	NA
21.	I can adjust my insulin dose based on the results of my urine or blood tests.	1	2	3	4	5	6	NA
22	I'm not sure I can figure out what to do about my insulin dose when changes occur in my usual routine.	1	2	3	4	5	6	NA
23.	I can do what was recommended to prevent low blood sugar reactions when I exercise.	1	2	3	4	5	6	NA

MODIFIED INSULIN MANAGEMENT DIABETES SELF-EFFICACY SCALE

I.D.___

	Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Does Not Apply
24. I can figure out what self treatment to administer when my blood sugar gets higher than it should be.	1	2	3	4	5	6	NA
25. I'm not sure I can recognize when my blood sugar is low.	1	2	3	4	5	6	NA
26. I'm not sure I can adjust my diabetes self treatments if I get a cold or the flu.	1	2	3	4	5	6	NA
27. I can fit my diabetes self treatment routine into my usual life style.	1	2	3	4	5	6	NA
28. I think I'll be able to follow my diabetes plan even when my daily routine changes.	1	2	3	4	5	6	NA

Do you have any comments you wish to add about confidence in your ability to self manage diabetes?

Thank You

Appendix C

MODIFIED INSULIN MANAGEMENT DIABETES SELF-CARE SCALE

I.D. ____

The following statements describe what some people do to take care of their diabetes. Please take the next few minutes to tell me what you have been doing to manage your diabetes. After reading each statement, circle the number that best expresses your beliefs. There are twenty eight (28) statements, please answer each one. There are no right or wrong answers.

Circle 1 if you strongly agree with the statement,

2 if you moderately agree with the statement,

3 if you slightly agree with the statement,

4 if you slightly disagree with the statement,

5 if you moderately disagree with the statement,

6 if you strongly disagree with the statement, or

NA if the statement does not apply to you.

Example	Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Does Not Apply
I tested my urine for sugar before meals when I am away from home. Answer.	1	2	3	4	5	6	NA

If you almost always tested your urine before meals when you ate out, you should circle 1 because that statement best expresses how you managed your diabetes. If you never tested when you ate out, you should circle 6. If you do not test urine, you should circle NA.

MODIFIED INSULIN MANAGEMENT DIABETES SELF-CARE SCALE

		Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Does Not Apply
1.	I carried out practically all of the activities in my daily self care diabetes routine.	1	2	3	4	5	6	NA
2.	I managed my diabetes very well.	1	2	3	4	5	6	NA
3.	I was able to use what I know about my diabetes self treatment every day.	1	2	3	4	5	6	NA
4.	I followed my diabetes self care routines every single day.	1	2	3	4	5	6	NA
5.	I ate my meals at the same time every day.	1	2	3	4	5	6	NA
6.	I stayed on my diabetic diet when I ate in familiar places away from home (such as at a friend's house).	1	2	3	4	5	6	NA
7.	I stayed on my diabetic diet when I ate in unfamiliar places.	1	2	3	4	5	6	NA
8.	I stayed on my diabetic diet when the people around me did not know that I have diabetes.	1	2	3	4	5	6	NA
9.	I followed my diabetic diet every day.	1	2	3	4	5	6	NA
10.	I correctly exchanged one food for another in the same food group.	1	2	3	4	5	6	NA
11.	When I went to parties, I followed my diet plan.	1	2	3	4	5	6	NA
12.	I exercised several times a week.	1	2	3	4	5	6	NA

MODIFIED INSULIN MANAGEMENT
DIABETES SELF-CARE SCALE

I.D.____

		Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Does Not Apply
13	I exercised even when I did not feel like exercising.	1	2	3	4	5	6	NA
14.	I figured out when to call my doctor about problems with my feet.	1	2	3	4	5	6	NA
15.	I routinely applied the recommended lotion to my feet.	1	2	3	4	5	6	NA
16	I tested my blood or urine when I was away from home.	1	2	3	4	5	6	NA
17	I recognized when my blood sugar was too high.	1	2	3	4	5	6	NA
18.	When I felt sick I tested my blood or urine more often than I routinely do.	1	2	3	4	5	6	NA
19.	I self administered my insulin/medication using the recommended procedure.	1	2	3	4	5	6	NA
20.	I took my insulin/ medication when away from home.	1	2	3	4	5	6	NA
21.	I adjusted my insulin dose based on the results of my urine or blood tests.	1	2	3	4	5	6	NA
22.	I figured out what to do about my insulin dose when changes occurred in my usual routine.	1	2	3	4	5	6	NA
23.	I did what was recommended to prevent low blood sugar reactions when I exercised.	1	2	3	4	5	6	NA
24.	I figured out what self treatment to administer when my blood sugar was higher than it should be.	1	2	3	4	5	6	NA

MODIFIED INSULIN MANAGEMENT DIABETES SELF-CARE SCALE

I.D.___

	Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree	Does Not Apply
25. I recognized when my blood sugar was low.	1	2	3	4	5	6	NA
26. I adjusted my diabetes self treatments when I got a cold or the flu.	1	2	3	4	5	6	NA
27. I fit my diabetes self treatment routine into my usual life style.	1	2	3	4	5	6	NA
28. I followed my diabetes plan even when my daily routine changed.	1	2	3	4	5	6	NA

Do you have any comments you wish to add about self managing diabetes?

Thank You

Appendix D

Demographic Questionnaire

1. Subject's ID number

2. Sex (1) Male (2) Female

3. Present marital status
   (1) Married/Common Law
   (2) Single
   (3) Widowed
   (4) Divorced

4. What is your age to the near year?
   (1) 24 or under (4) 35-39 (7) 50-54
   (2) 25-29 (5) 40-44 (8) 55-59
   (3) 30-34 (6) 45-49 (9) 60-

5. How long have you been diagnosed with diabetes?
   (1) Less than 1 Year (4) 11-15 Years
   (2) 1-5 Years (5) 16-20 Years
   (3) 6-10 Years (6) More than 20 Years

6. Have you attended diabetes education classes?
   (1) No (2) Yes

   If yes, please specify when

7. Which of the following helped you the most to learn the care of your diabetes?

   _____ (1) Diabetes education classes
   _____ (2) Your doctor
   _____ (3) The nurse
   _____ (4) Reading material
   _____ (5) Other, please specify
   _____

8. Do you take medication to control your diabetes?
   (1) Yes (2) No

9. What kind of medication do you take to control your diabetes?
   (1) Insulin When started
   (2) Oral agent When started

Appendix E

Permission from Dr. A. Hurley

Anita Ludlow
20 Waterloo
Mount Pearl, Nf
Canada
A1N 3X3

Dear Ms. Ludlow:

In response to your letter dated December 10, 1992 you may make the necessary changes to the Insulin Management Diabetes Self-Efficacy Scale and the Insulin Management Diabetes Self-Care Scale to render them more applicable to your sample.

Ann C Hurley

ANN HURLEY

Appendix F

Permission from the American Psychological Association

I, _____, being the copyright holder of the material described below:

Bandura (1977) Self-efficacy: Towards a unifying theory of behavior change. Psychological Review, 84, 191-215.

do hereby permit the inclusion of the described material in the thesis entitled: Self-Efficacy, Self-Care and Glycemic Control in Individuals with Noninsulin Dependent Diabetes Mellitus written by Anita J. Ludlow and submitted in partial fulfillment of the requirements for the degree of Master of Nursing at Memorial University of Newfoundland.

I further permit the National Library of Canada to microfilm this thesis, including the material to which I retain copyright, and to lend or sell copies of the film.

DATE: _____

SIGNATURE: _____

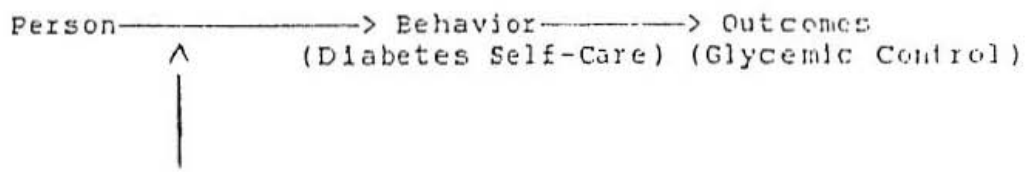
Appendix G

Permission from Dr. Bandura

I request permission to adapt the Self-Efficacy Model for use in a masters thesis entitled: Self-Efficacy, Self-Care and Glycemic Control in Individuals with Noninsulin Dependent Diabetes Mellitus.

The Self-Efficacy Model

(Person————————> Behavior————————> Outcome) will be adapted as follows:



Address of Investigator

Anita Ludlow

20 Waterloo Cres
Mount Pearl, Nf.
Canada, A1N 3X3

Signature

July 19/93
Date

Permission is hereby granted to adapt the Self-Efficacy Model for the research project described above.

Dr. Albert Bandura

7/12/93
Date