The Effects of Diabetes Education on Self-Efficacy and Self-Care of Adults with Type 2 Diabetes

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A Thesis

Submitted to the Faculty of Graduate Studies

in Partial Fulfilment of the Requirements

for the Degree of

Master of Nursing

University of Manitoba

Faculty of Nursing

Winnipeg, Manitoba

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

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Acknowledgements

The completion of this thesis would not have been possible without the support of a number of very special people. First, I am thankful to my Thesis Chair, Dr. Judith Scanlan for her direction and guidance over the past four years. She often had more faith in me than I had in myself. For the wisdom and encouragement offered by my committee members, Dr. Dean Care, Dr. Daniel Bailis, and Dr. Sora Ludwig, I am also thankful. I am grateful for the individuals who participated in this study and for the staff at Youville Centre for their cooperation.

I would like to thank those friends who supported and encouraged me during this time. Your kindness will always be remembered. To Dr. Tom Harrigan, thank you for helping me make sense of statistics. I extend my heartfelt thanks to my husband Damir, my daughter Katarina, and my mother Nada for their unfailing love, patience, and support over the past 4 years. Words cannot express the depth of gratitude that I have for the sacrifices they have made to get me to this point. I am truly blessed to have such wonderful people in my life.

I would like to dedicate this work to my late father, Karlo Renic who inspired me to do this in the first place.

Table of Contents

Abstract

Diabetes is a chronic health condition which requires ongoing control and management. Diabetes education programs have the difficult task of preparing adults with Type 2 diabetes with the skills they need to manage their disease and prevent long-term complications associated with it. Research has shown that the concept of self-efficacy is becoming increasingly important in the design of diabetes education programs. Self-efficacy is the belief in one's ability to perform specific behaviours needed to control one's diabetes. Using Social Cognitive Theory as a conceptual framework, the purpose of this quasi-experimental study was to examine the effects of a diabetes education program on the self-efficacy and self-care behaviours of adults with Type 2 diabetes. Home visits were conducted to collect data from 28 individuals attending a diabetes education program at an urban community clinic. Modified versions of the Diabetes Self-Efficacy Scale (DSES) and the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire were used to collect data on self-efficacy and self-care. Questionnaires were administered on three occasions: pre-program, post-program and one month follow-up time periods. Analysis of the data revealed that there was a significant ($p<.001$) overall increase in self-care over the course of the study. Self-efficacy increased significantly ($p<.001$) from pre-program to post-program data collection periods and was maintained thereafter. Data findings at the outset of the study indicated that self-efficacy and self-care were positively correlated ($r=0.63$, $p<.001$). The findings of this study provide information to diabetes educators and program planners about the benefits of incorporating the concept of self-efficacy into diabetes education programs.

CHAPTER ONE:

INTRODUCTION

Background to the Study

There has never been a more challenging and exciting time to do research in diabetes care and education. The current health care environment's focus on clinical outcomes prompts those involved in diabetes to base their activities on scientific and research-based literature. The Diabetes Control and Complications Trial (DCCT) (1993) and the United Kingdom Prospective Diabetes Study (UKPDS) (1998) have clearly shown the importance of tight glycemic control in reducing the risk for long-term complications of diabetes. Literature demonstrates that diabetes education is an essential component of managing diabetes, maintaining good glycemic control, minimizing the risk for long-term complications and improving the overall health status of individuals with diabetes (Brown, 1988; 1990; 1992; Campbell, Redman, Moffitt, & Sanson-Fisher, 1996; Fain, Nettles, Funnell, & Charron Prochownik, 1999; Padgett, Mumford, Hynes, & Carter, 1988; Peyrot & Rubin, 1994; Rubin, Peyrot, & Saudek, 1993; 1991).

The success of diabetes self-management is dependent on the client's own health behaviour. However, research has shown that knowledge alone of the importance of good health behaviour is not enough to maintain a level of diabetes self-care necessary to achieve good glycemic control (Clement, 1995; Hurley & Shea, 1992; Ludlow & Gein, 1995). Researchers have advocated the inclusion of behavioural and cognitive theories into diabetes education programs (Clement, 1995; Glasgow, 1999; Ludlow & Gein, 1995; Padgett et al., 1988). The concept of self-efficacy has gained increasing importance in the

design of diabetes education programs as self-efficacy has been found to be correlated with diabetes self-care (Corbett, 1999; Hurley & Shea, 1992; Kingery & Glasgow, 1989; Skelly, Marshall, Haughey, Davis, & Dunford, 1995). Despite the growing popularity of self-efficacy, few studies have actually studied the effects of diabetes education on self-efficacy and self-care. A discussion of the impact of diabetes, the importance of diabetes education, and an introduction of the importance of self-efficacy in diabetes education programs will provide background information for the purpose of the study, research questions, operational definitions, and the conceptual framework.

The Impact of Diabetes

Prevalence and Incidence

The statistics related to the rising incidence and prevalence of diabetes, its severity, complications, risks, and costs, are staggering. In 1994, the World Health Organization (WHO) estimated that 100 million people in the world had diabetes; 90% of whom had Type 2 diabetes (Manitoba Health, 1998). Current national survey data from Health Canada (1999) indicate that there are 1.2 to 1.4 million Canadians with diabetes while it is estimated that only 800,000 of these are diagnosed cases. Furthermore, there are approximately 60,000 new cases of diabetes diagnosed each year. In Manitoba, there are currently 55,000 people living with diabetes and 27,500 are estimated to have diabetes, but are not aware of their diagnosis. Every year, more than 4,000 Manitobans are diagnosed with diabetes. It is projected that by the year 2005, the number of Manitobans diagnosed with diabetes will increase to more than 70,000 (Manitoba Health, 1998). National statistics indicate that the prevalence of diabetes increases with age such

that the rate in those 65 and older is three times as high as the rate in those aged 35-64 (10.4% vs. 3.2%) and is slightly more common in men (3.5%) than in women (2.9%) (Health Canada, 1999). People of Aboriginal and African heritage have a higher prevalence of diabetes and prevalence of diabetes is at least three to five times higher for Aboriginals than the rest of Canada's population (Health Canada, 1999).

Morbidity & Mortality

The severity of diabetes becomes more meaningful when one has an awareness of the associated complications. Approximately 40% of people with diabetes will develop complications at some point in their lives. Complications include heart disease and stroke, kidney disease, amputation and blindness. The hospitalization rate for cardiovascular disease and stroke is five times higher than average among people with diabetes. Kidney disease strikes people with diabetes ten times more often than those without diabetes, making up 35% of cases requiring dialysis. Approximately 57% of lower limb amputations occur among people with diabetes. Diabetes is also the leading cause of blindness in Canada (CDA, 1999).

Health Canada (1999), has identified diabetes as the seventh leading cause of death in Canada. In 1996, there were 5,447 deaths for which diabetes was certified as the underlying cause of death. It is estimated that the number of deaths for which diabetes was a contributing factor is actually five times higher. The reason for this is that people with diabetes usually die from a late complication of diabetes, such as ischemic heart disease, or kidney failure, in which case these conditions are coded as the underlying cause of death (Health Canada, 1999).

Burden of Cost

In Canada, it is estimated that at least $9 billion is spent annually on treating people with diabetes and its complications, including both direct health care costs and indirect costs such as lost productivity due to diabetes related illness and premature death (Health Canada, 1999). The Diabetes Costing Project, a joint initiative of Health Canada and both the Diabetes and Chronic Diseases Unit and Epidemiology Unit of the Public Health Branch of Manitoba Health has estimated the direct and excess costs of diabetes by taking into account inpatient hospital and day surgeries, professional medical services, personal care home services, and outpatient dialysis services. The project estimates that the cost of diabetes services for adults in Manitoba is $193 million per year or $530, 000 per day (Manitoba Health, 1998). It is estimated that approximately 1 in 7 health care dollars is consumed by diabetes and its management (Meltzer, Leiter, Daneman, Gerstein, Lau, Ludwig, Yale, Zinman, & Lillie, 1998).

Definition of Diabetes

In order to gain a better appreciation for the need for diabetes education, it is important to define diabetes. According to the 1998 Clinical Practice Guidelines for the Management of Diabetes in Canada, diabetes mellitus is defined as "a metabolic disorder characterized by the presence of hyperglycemia due to defective insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes mellitus is associated with significant long term sequelae, particularly damage, dysfunction and failure of various organs; especially the kidney, eye, nerves, heart and blood vessels" (Meltzer et al., 1998, S4).

The 1998 Clinical Practice Guidelines for the Management of Diabetes in Canada marked a change in classification of diabetes (Meltzer et al., 1998). The new classification proposed the elimination of the terms "insulin-dependent diabetes mellitus" (IDDM) and "non-insulin-dependent diabetes mellitus" (NIDDM), but retained "Type 1" and "Type 2" diabetes designations using Arabic numerals rather than Roman numerals. The former classification of IDDM/NIDDM was based on treatment rather than pathogenesis. This caused some confusion, since clients with any form of diabetes may have required insulin treatment at any stage of their disease. This change in classification creates a challenge in grouping and comparing the literature as studies prior to 1998 utilized the former classifications of NIDDM and IDDM, whereas newer literature has only begun to incorporate the new classification system. Type 1 diabetes refers to diabetes which primarily results from pancreatic beta-cell destruction and which is prone to ketoacidosis (previously known as juvenile diabetes or IDDM). Type 2 diabetes encompasses clients from predominant insulin resistance with relative insulin deficiency, to predominant secretory defect with insulin resistance (previously known as adult onset diabetes or NIDDM).

Innovations and Advances in Diabetes

There have been numerous advances in the field of diabetes in recent years which advocate the importance of diabetes education and the need for continued research in this field. These innovations have not only affected diabetes care, education and research, but also modify the context of the diabetes literature. The Diabetes Control and Complications Trial (1993) and the United Kingdom Prospective Diabetes Study (1998)

are two recent studies which are worthy of mention.

The Diabetes Control and Complications Trial (DCCT) has been cited in the diabetes literature as a landmark study which demonstrates the benefits of tight glycemic control in reducing the risk for long-term complications of diabetes (DCCT Research Group, 1993). The 1441 clients with insulin dependent diabetes mellitus (IDDM) who participated in this clinical trial were randomly assigned to either a) an intensive therapy regimen designed to achieve blood glucose values as close to the normal range as possible with the use of an external pump or by three or more daily insulin injections guided by frequent blood glucose monitoring, or b) a conventional therapy regimen consisting of one or two insulin injections. The participants were followed for a mean of 6.5 years to determine the progression of long-term complications. Results from the study indicated that intensive therapy of patients with IDDM delays the onset of complications related to diabetes. Recommendations for closely monitored intensive regimens, with a goal of maintaining blood sugar levels as close to normal as possible are advocated. The authors also extended the findings of this study to clients with non-insulin-dependent diabetes mellitus (NIDDM). Even though this group was not studied, the authors stated that it is hyperglycemia which is associated with the presence of complications in NIDDM, as in IDDM.

A subsequent clinical trial studied the effects of glycemic control on long-term complications of people with Type 2 diabetes. The United Kingdom Prospective Diabetes Study (UKPDS) (UK Prospective Diabetes Study Group, 1998) was a randomized clinical trial involving 3867 newly diagnosed clients with Type 2 diabetes

who were followed for an average of 10 years. The purpose of the study was to compare the effects of an intensive treatment regimen on the cardiovascular and microvascular complications of clients with Type 2 diabetes. The central question was whether maintaining blood glucose levels as close to normal as possible was beneficial. Findings of the study indicated that the risk of developing microvascular complications, particularly retinopathy and nephropathy decreased overall. The UKPDS results regarding macrovascular complications were statistically insignificant, although they did support the importance of blood pressure control in reducing the risk for complications. A strength of both the DCCT and UKPDS study is the longitudinal design, and large sample sizes. This adds weight to their conclusions and increases generalizability of the findings.

Management of Diabetes

The 1998 Clinical Practice Guidelines for the Management of Diabetes in Canada which are based on The Diabetes Control and Complications Trial Research Group (1993) recommend that diabetes can best be managed by maintaining blood glucose levels at close to normal ranges (Meltzer et al., 1998). This minimizes the risk and frequency of both macrovascular (coronary artery disease, cerebrovascular disease, and peripheral vascular disease), and microvascular (retinopathy, nephropathy, neuropathy, and foot problems) complications. Evidence-based research of the reduction in risk for long-term complications as a result of good glycemic control offers incentive to clients with diabetes to maintain diabetes self-care behaviours such as diet, exercise, medication management, and blood glucose monitoring.

Diabetes education

Diabetes education is fundamental to diabetes self-management. Landmark research studies such as the UKPDS (1998) and the DCCT (1993) and new clinical practice guidelines provide a growing appreciation among diabetes educators of the need to educate clients with diabetes to maintain tight glycemic control by performing the necessary self-care behaviours to manage their diabetes. Clients are taught about the importance of diet, exercise, self blood glucose monitoring, and medication management to maintain their blood sugars at optimal levels. They are also educated about smoking, stress, foot care, and other lifestyle factors which may increase the risk for complications associated with diabetes.

Approximately 30% of people with Type 1 diabetes and 70% of people with Type 2 diabetes never receive appropriate diabetes and self-care education (Canadian Diabetes Association (CDA) Statistics, 1999). Statistics for the number of clients receiving diabetes education in Canada or Manitoba are lacking (Health Canada, 1999). Despite this, there has been considerable research conducted to determine optimal methods of diabetes education delivery. The literature supports the idea that diabetes education improves overall health outcomes of people with diabetes (Brown, 1988; 1990; 1992; Campbell et al., 1996; Charron-Prochownik, 1999; Fain, et al., 1999; Padgett, Mumford, Hynes, & Carter, 1988; Peyrot & Rubin, 1994; Rubin et al., 1991; 1993). However, it has been established that acquiring knowledge alone is not sufficient for adults to manage their diabetes (Reyrot & Rubin, 1994).

Definition of Terms

The variables used in this study are defined in terms of constructs, concepts, and operational definitions. The constructs are congruent with Bandura's Social Cognitive Theory (Bandura, 1986). The concepts and operational definitions demonstrate how Social Cognitive Theory provides an effective framework for understanding self-efficacy and self-care practices of adults with Type 2 diabetes. Bandura (1986, 1977) describes the role of self-efficacy in the model of a person engaging in a behaviour with a consequent outcome. Definitions for the following terms: a) individual with diabetes, b) diabetes self-efficacy, c) diabetes group education session, and d) diabetes self-care, as identified in the research questions appear in a table in Appendix A.

Conceptual Framework

Bandura's Social Cognitive Theory (1986), from which the concept of self-efficacy originates, has been frequently used as a framework for understanding the relationship between self-efficacy and self-care. The theory attempts to predict and explain how people acquire and maintain certain behaviours and provides a basis for intervention strategies. Bandura posits that behaviour is a dynamic interaction among the characteristics of the person, the behaviour of that person, and the environment in which the behaviour is performed. This interaction is referred to as reciprocal determinism (Baranowski, Perry, & Parcel, 1997; Parcel & Baranowski, 1981).

Several key concepts including incentives, outcome expectations, and self-efficacy expectations are incorporated into the theory, although the concept of self-

efficacy is of particular relevance to diabetes education and has assumed an increasingly important role in health education and research, independent of its original theoretical construct (Maibach & Murphy, 1995; Strecher, DeVellis, Becker, & Rosenstock, 1986). According to Social Cognitive Theory people act if they believe that certain behaviour will lead to desirable results (outcome expectations) and if they believe that they can successfully engage in the behaviour (self-efficacy). In the realm of self-care, self-efficacy links knowledge with action, because the belief in one's ability to assume self-care has to occur before self-care can be attempted.

Self-efficacy is defined as the belief about one's ability of performing a specific behaviour in a particular situation (Bandura, 1986). It is not concerned with the skills one has, rather with the judgements of what one can do with the skills one possesses. Furthermore, self-efficacy does not refer to a personality characteristic, or a global trait that operates independently of contextual factors. For an individual living with diabetes, self-efficacy refers to one's beliefs in one's capability to monitor, plan, and carry out the specific behaviours required to manage one's diabetes.

Self-efficacy is based on four principal sources of information: performance accomplishments, vicarious experiences of observing the performances of others; verbal persuasion and allied types of social influences that one possesses certain capabilities; and physiological states from which people partly judge their capableness, strength, and vulnerability (Bandura, 1986). Performance accomplishments refer to the learning gained from previously mastered experiences. Previous successes can raise efficacy expectations while repeated failures can lower them. Performance accomplishments are the most

potent source of self-efficacy. Vicarious experience refers to learning that occurs through observing others. Individuals persuade themselves that if others can do it, they should be able to meet with some degree of success as well. Verbal persuasion involves talking individuals into believing that they possess capabilities that will enable them to achieve their goals. This method is most widely used by health educators, who continually urge clients to persist in their efforts to change health behaviours. The final source of self-efficacy is physiological state. Individuals rely on information from the physiological state to judge their capabilities. For example, people who experience sweaty palms, high anxiety, and a racing heartbeat prior to undertaking a task may find that their self-efficacy diminishes. Diabetes educators need to be knowledgeable about the sources of self-efficacy and develop techniques and interventions to enhance the sources of self-efficacy for their clients.

Bandura's Social Cognitive Theory is an appropriate theoretical framework for this study. The variables of person, self-efficacy, and self-care fit conceptually within the theory and its adaptation to diabetes management. Because the variables to be investigated in this study are only a part of what the theory describes, and will not include outcome expectations and outcomes, the conclusions arising from the study will be somewhat limited

The concept of self-efficacy has been frequently used in diabetes education as a framework for understanding and predicting adherence to self-care behaviours in a diabetes regimen. Increasing self-efficacy is an essential part of most behavioural objectives in client teaching (Moore, 1990). There have been a number of studies which

have investigated the use of self-efficacy in diabetes care and education (Anderson, Funnell, Fitzgerald, & Marrero, 2000; Via & Salyer, 1999; Bernal, Woolley, Schensul, & Dickinson, 2000; Corbett,1999; Grossman, Brink, & Hauser, 1987; Hurley & Shea, 1992; Johnson, 1996; Kingery & Glasgow, 1989; Ludlow & Gein, 1995; Padgett, 1991; Rubin et al., 1993; Skelly et al., 1995). Several of these research studies have reported a positive correlation between diabetes self-efficacy and diabetes self-care (Corbett, 1999; Hurley & Shea, 1992; Kingery & Glasgow, 1989; Padgett, 1991; Skelly et al., 1995).

Having established that there is a correlation between diabetes education and improved client outcomes (e.g., self-care or glycemic control) and that self-efficacy improves self-care, it is appropriate to examine self-efficacy as a possible mechanism of the effects of diabetes education on self-care. One study has validated the impact of a diabetes education program on self-efficacy by reporting that self-efficacy improves as a result of diabetes education. Rubin and colleagues (1993) measured the effect of a diabetes education program focussing on coping skills training on emotional well-being and diabetes self-efficacy and reported that post-intervention well-being and self-efficacy scores improved from the baseline pre-intervention scores. Subjects participated in an intensive five day program and self-efficacy (in addition to self-esteem, anxiety, depression, and knowledge) was measured at 6 months and 12 months after the programs. Self-efficacy results at the 6 and 12 month intervals were improved over baseline scores ($p<.01$) and 12 month scores improved over 6 month scores.

Purpose of the Study

The purpose of this quasi-experimental study was to examine the effects of a

diabetes group education session on self-efficacy and self-care of adults with Type 2 diabetes. The intent of the study was to identify whether an introductory group diabetes education session fosters diabetes self-efficacy of adults with Type 2 diabetes, and in turn, their ability to perform the self-care behaviours needed to maintain glycemic control.

Research Questions

The research questions which will guide this study are:

1. What is the effect of a group diabetes education session on self-efficacy (SE) and self-care (SC) in adults with Type 2 diabetes?
2. Is there a relationship between self-efficacy (SE) and self-care (SC) in adults with Type 2 diabetes?
3. Are demographic variables (gender, age, marital status, education, race, socioeconomic status) correlated with diabetes self-efficacy or diabetes self-care?

Summary of Chapter

Recent statistics indicate that Type 2 diabetes is a growing problem among the adult population and that successful self-management of the disease is key to maintaining good glycemic control and minimizing one's risk for long-term complications. Diabetes education is fundamental in teaching clients how to manage their lifestyles with respect to diet, exercise, medication management and self-blood glucose monitoring. Experts have discovered that clients with high self-efficacy are better able to perform these self-care tasks and that diabetes education improves overall health outcomes of individuals with

Type 2 diabetes. Literature pertaining to the relationship between diabetes education and self-efficacy is available, but has not addressed the issue comprehensively. Furthermore, findings about the relationship between self-efficacy and self-care resulting from diabetes education are limited. Research specifically related to the effect of a group diabetes education session on self-efficacy and self-care also is lacking.

The issue of how the concept of self-efficacy could best be applied in diabetes education needs further examination. Diabetes educators and practitioners would benefit from the knowledge gained by examining the effect of a group education session on self-efficacy and self-care. Clients reporting low self-efficacy could be detected early and appropriate teaching methods could be directed to those clients at risk. Similarly, clients reporting high self-efficacy could benefit from an enhanced educational program tailored to their needs. If self-efficacy and self-care are not found to be significant variables in diabetes education, other variables need to be examined.

CHAPTER TWO:

REVIEW OF LITERATURE

A review of the literature was conducted to gain an understanding of the accumulated state of knowledge of the use of self-efficacy in diabetes education. Included in this review is classical literature in health education and diabetes education as well as research studies which have been conducted in the field of diabetes education. Literature and research from the disciplines of nursing, education, medicine and psychology are included to provide support for the study. Relevant concepts, themes, research studies and research recommendations were examined.

Bandura's Social Cognitive Theory (1986), which has been chosen as a theoretical framework for this study, will also guide the literature review. According to this theory, people act if they believe that certain behaviour will lead to desirable results and if they believe that they can successfully engage in the behaviour. This belief is referred to as self-efficacy. Self-efficacy is defined as the belief about one's ability to perform a specific behaviour in a particular situation (Bandura, 1986).

Bandura describes the role of self-efficacy in the model of a person engaging in a behaviour with a consequent outcome. Ludlow and Gein (1995) have adapted this model for application to diabetes management (Figure 1). Diabetes behaviour changes and maintenance of diabetes self-care behaviours are a function of one's self-efficacy. Thus, the stronger one's self-efficacy is, the more persistent one's efforts to change and maintain one's behaviour will be.

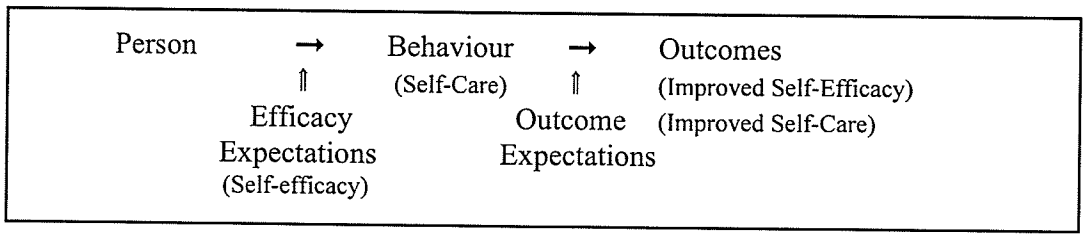

Figure 1.

The review of the literature is divided into three main areas: person, behaviour, and outcomes, based on Ludlow and Gein's (1995) adaptation of the social cognitive theory model to diabetes management. Self-efficacy is discussed with reference to the person diagnosed with diabetes. An introduction into diabetes education will precede the discussion.

The Importance of Diabetes Education

It is well documented in the literature that education plays a key role in the management of diabetes (Brown, 1988; 1990; 1992; Campbell et al., 1996; Fain, et al., 1999; Padgett et al., 1988; Peyrot & Rubin, 1994; Rubin et al., 1991; 1993). A review of several meta-analyses combining results from a number of studies supports the idea that diabetes education improves overall health outcomes of people with diabetes (Brown, 1988; 1990; 1992; Fain et al., 1999; Padgett et al., 1988). They provide support for the contention that diabetes education improves knowledge, self-care, glycemic control, and psychosocial outcomes such as self-efficacy. Four studies which illustrate the effectiveness of diabetes education in improving diabetes outcomes will be discussed (Campbell et al., 1996; Corbett, 1999; Peyrot & Rubin, 1994; Rubin et al., 1991).

Rubin, Peyrot, and Saudek (1991) implemented a week long diabetes education

program to determine whether improvements in self-regulation behaviours such as blood glucose monitoring and insulin administration are more effective at maintaining normal glycemic levels than lifestyle behaviours. Measures for diabetes self-care and symptom patterns as well as HbA_{1c} levels were taken prior to the program as well as at 6 and 12 months following the program. The researchers reported that diabetes education is effective in promoting self-regulation behaviours such as blood glucose monitoring and insulin administration. Less of an effect was evident on lifestyle behaviours such as diet and activity which are required for diabetes management. They recommended the need for more extensive long-term programs to address these diabetes lifestyle changes which are often deeply entrenched.

Peyrot and Rubin (1994) disaggregated the effects of various elements of an educational program to find out which changes in self-care behaviour are most strongly related to blood glucose control. The research protocol for the 82 adults with diabetes included a glycosylated hemoglobin assay and a self-report of insulin administration, self-monitoring of blood glucose, and exercise at the start of the program and at 6 and 12 month follow-ups. The authors reported that diabetes education caused marked improvements in insulin administration, self-monitoring of blood glucose, and exercise which subsequently improved glycemic control. Improved insulin administration was singled out as being the most dramatic indicator of glycemic control. This study suggests that improvement in glycemic control was present even in the absence of improvements in these areas, thereby providing support for the efficacy of the educational component. This study offers guidance to diabetes educators to target behaviours (such as monitoring

blood glucose and insulin administration) which have a significant impact on glycemic control. These findings also provide support to the idea that diabetes education produces changes in self-care and subsequently, glycemic control.

Campbell et al. (1996), in their randomized trial, tested four different methods of delivering diabetes education. They reported that all methods resulted in improved glycemic control (reductions in HbA_{1c} levels), with no significant differences between the programs, thus supporting the overall efficacy of diabetes education programs. They concluded that programs which are more intensive in terms of patient time and resources will not necessarily produce better outcomes than less intensive programs.

Corbett (1999) conducted a study to assess diabetes self-efficacy in 115 insulin-requiring adults before and after a home health visit by a nurse, and to compare efficacy enhancing nursing interventions with patient outcomes. In this study, self-efficacy was measured using the Insulin Management Diabetes Self-Efficacy Scale (IMDSES) which has well established validity and reliability ($\propto$ =0.77). Self-efficacy results improved significantly after home care visits as compared to before.

Thus, there is evidence in the literature that diabetes education improves overall diabetes outcomes. A weakness of the comparison between studies is the lack of consistency in the various types and duration of diabetes education programs among the various studies. Although the objectives of the studies varied substantially and used different designs, samples and measures, they all supported the efficacy of diabetes education programs for improving diabetes outcomes.

Diabetes Education Delivery

Although the literature provides strong support for the overall efficacy of diabetes education programs, many also argue that a disparity exists in how diabetes education should be delivered. Early educational efforts have emphasized general knowledge about diabetes (Peyrot & Rubin, 1994). Traditionally, diabetes education programs have been content-based and focused on the transfer of knowledge to the client. These programs were effective in increasing knowledge, but had little effect on glycemic control (Campbell et al., 1996). Experts today criticize didactic methods of teaching diabetes knowledge and skills alone as being ineffective for diabetes self-management (Clement, 1995; Hurley & Shea, 1992; Ludlow & Gein, 1995).

Researchers argue that interventions employing a combination of behavioural interventions, skills training, and social learning theory produce better outcomes with respect to self-care and glycemic control than do programs which focus on the acquisition of knowledge alone (Boehm, Schlenk, Funnell, Powers, & Ronis, 1997; Cameron, 1996; Charron-Prochownik, Becker, Brown, Liang, & Bennett, 1993; Day, 1995; Kurtz, 1990; MacLean, & Lo, 1998; Wilson, Ary, Biglan, Glasgow, Toobert, & Hampson, 1996). Many have suggested the need to incorporate more behavioural components into diabetes education programs to supplement the traditional didactic instruction on the pathophysiology and medical treatment of diabetes (Clement, 1995; Glasgow, 1999; Ludlow & Gein, 1995; Padgett et al., 1988).

Rubin, Peyrot, and Saudek (1993) conducted a descriptive correlational study of 91 adults with diabetes participating in a diabetes education program focusing on coping

skills training on emotional well-being and diabetes self-efficacy. The participants attended an intensive five-day diabetes education program and completed measures for global emotional well-being (self-esteem, anxiety and depression), and measures for diabetes-specific competence (diabetes knowledge and self-efficacy), 6 months and 12 months following the program. They reported improved post-intervention well-being and self-efficacy scores at 6 months and 12 months from the baseline pre-intervention scores ($p<.01$). Furthermore, they maintained that scores at the 12 month interval were an improvement over 6-month self-efficacy scores. The researchers recommended the incorporation of behavioural efforts designed to improve emotional status and diabetes self-efficacy into diabetes education curricula. Although the authors measure self-efficacy, little is written about the concept and reference to a particular theoretical framework is not made.

Trends in the literature point to the evolution of diabetes education and it is believed that current methods are an improvement over methods used in the past. However, a common criticism of many authors is that specific diabetes interventions or parts of diabetes education programs have not been assessed (Padgett, et al., 1988; Peyrot and Rubin, 1994). Four studies were located which address this issue (Campbell et al., 1996; Glasgow, Toobert, & Hampson, 1996; Rickheim, Weaver, Flader, and Kendall, 2002; Walker, 1999).

Campbell et al. (1996) compare the effectiveness of four different diabetes education programs. The 238 participants with non-insulin dependent diabetes in this randomized trial were allocated to one of four programs 1) a minimal instruction

program, 2) an education program of individual visits, 3) and educational program incorporating a group education course, or 4) a behavioural program. The minimal instruction program involved two hour-long visits. The individual education program consisted of two sessions conducted in the first two weeks, then monthly for 12 months. The group education program consisted of two individual sessions and a 3-day small group course, followed by two-hour group follow ups at 3 and 9 months after the initial course. The behavioural program applied cognitive-behavioural strategies and was delivered individually. Outcome measures which were assessed at baseline, 3, 6 and 12 months included blood glucose (glycosylated hemoglobin), diabetes treatment, BMI (body mass index), blood lipids, blood pressure, smoking, diabetes knowledge, and patient satisfaction. All strategies produced reductions in HbA_1 and BMI, with no significant differences between the programs. It was interesting to note that the behavioural program produced a greater reduction in diastolic blood pressure over 12 months than the education programs and a greater reduction in cholesterol risk ratio over 3 months. The clients in the behavioural program were also more likely to have visited a podiatrist after 6 months and reported higher satisfaction. The authors of this study recommended further investigation of programs based on behavioural strategies.

Rickheim, Weaver, Flader, and Kendall (2002) conducted a randomized control trial examining differences in knowledge, self-management behaviours, weight, BMI, HbA_{1c}, quality of life, attitudes, and patient regimen between participants attending a group versus individual diabetes education sessions. Data were collected at baseline, 2 week, 3 month, and 6 month intervals. The authors reported that group diabetes

education was equally effective in providing key educational components and equivalent or slightly greater improvements in glycemic control.

Walker (1999) conducted a review of adult learner characteristics. In her review, she located two additional research studies which compared group learning versus individual learning contexts. Heller et al. (1988, as cited by Walker, 1999), reported improved glycemic control and decreased weight for the group education class. Similarly, Arseneau et al. (1994, as cited by Walker, 1999) reported a decrease in HbA_{1c} values in the group class. From these studies, as well as findings reported by Campbell et al.(1996) and Rickheim et al., 2002) , it appears that there may be benefits beyond the potential program cost savings with group diabetes education.

Glasgow, Toobert, and Hampson (1996), evaluated the effectiveness of a brief office-based behavioural intervention designed to facilitate diabetes dietary self-management. Social Cognitive Theory provided the theoretical basis for this study. A sample of 206 adults with diabetes were randomly assigned to either usual care or a brief intervention consisting of a touchscreen computer-assisted assessment which provided immediate feedback on goal setting, barriers to self-management, and problem solving. Detailed explanations of the interventions were included in the report. Effects of the interventions were compared and evaluated on physiologic (cholesterol and glycosylated hemoglobin) and quality of life outcomes. Results of the study were a decrease in overall serum cholesterol levels but no reductions in glycosylated hemoglobin and no improvements in quality of life for the intervention group. The researchers stated that the failure to find congruence between self-care behaviour change and glycemic control

outcomes is not unusual as it may have been mediated by a variety of other lifestyle factors.

Person

The second area of this review will include discussions pertaining to the person diagnosed with diabetes, related theoretical perspectives, and the concept of self-efficacy. The successful management of diabetes requires the individual to manage diet, exercise, medications, and self-blood glucose monitoring, among other tasks. Literature has established that the period of adjustment to these lifestyle changes constitutes a difficult period for the person with diabetes. Researchers have investigated the application of numerous theoretical frameworks in an effort to understand and predict health care behaviours for individuals with diabetes. The results range from eclectic approaches to focussed applications of a particular model.

MacLean and Lo (1998) used concepts taken from seven models of health behaviour including the Health Belief Model, Lazarus' Stress and Coping Model, Theory of Reasoned Action, Rosenberg's Self-Esteem Inventory, and Bandura's Social Cognitive Theory to create a theoretical framework which would help them to identify and understand factors related to adherence to diabetes regimens. The Health Belief Model has been frequently used as a theoretical framework for understanding diabetes self-care behaviours (Boehm et al., 1997; Cameron, 1996; Charron-Prochownik et al., 1993). The concept of self-efficacy has been applied as a construct in the Health Belief Model (Charron-Prochownik et al., 1993; Kurtz, 1990) as well as in the Transtheoretical Model of Change (Sullivan & Joseph, 1998). The concept of self-efficacy, derived from

Bandura's Social Cognitive Theory is perhaps the most notable in recent diabetes and health education literature.

Social Cognitive Theory and the Concept of Self-Efficacy

Bandura's Social Cognitive Theory and the concept of self-efficacy have received much attention in the diabetes and health education literature as a framework for understanding and predicting a person's adherence to self-care behaviours in diabetes self-management. The theory is based on the principle assumption that psychological procedures serve as a means of creating and strengthening expectations of personal efficacy (Bandura, 1977).

Learning theories of the 20th century can be classified into two broad categories: behavioural and cognitive. Behavioural learning theory involves reinforcing behaviours while cognitive theory posits that learning is the development of insights that guide behaviour. Bandura's social cognitive theory is largely a cognitive theory which incorporates principles of behaviourism (Redman, 1993).

Social cognitive theory proposes that behaviour is the result of cognitive processes which develop through the social acquisition of knowledge. The concept of self-efficacy is assigned a central role in understanding, predicting, and mediating behaviour change. Self-efficacy reflects a person's perceived, rather than actual capabilities, and it is these perceptions and not one's true abilities that influence behaviour (Strecher, DeVellis, Becker, & Rosenstock, 1986). In diabetes, self-efficacy refers to one's belief in one's ability to monitor, plan, and carry out the self-care behaviours necessary to control one's diabetes.

Self-Efficacy Research

A considerable amount of research on self-efficacy has been conducted. Early research focussed on general health practice areas such as smoking cessation, weight control, contraceptive behaviour, alcohol abuse, and exercise (Strecher et al., 1986). Other health practices areas related to adherence to medical regimens and dietary changes unrelated to weight control only emerged in the mid to late 1980s as Social Cognitive Theory and the concept of self-efficacy gained increasing attention and credibility.

Several research studies have been conducted on self-efficacy in areas other than diabetes (Boehm, Coleman-Burns, Schlenk, Funnell, Parzuchowski, & Powell, 1995; Galavotti, Cabral, Lansky, Grimley, Riley, & Prochaska, 1995; Grimley, Prochaska, Prochaska, Velicer, Galavotti, Cabral, & Lansky, 1996; Grimley, Prochaska, Velicer, & Prochaska, 1995; Pellino, Tluczek, Collins, Trimborn, Norwick, Engelke, & Broad, 1998; Wilson, Sisk, & Baldwin, 1997). In some of these studies, the concept of self-efficacy has been incorporated as a construct into other theories of health behaviour such as the Health Belief Model and the Transtheoretical Model of Behaviour Change (Galavotti et al., 1995; Grimley et al., 1995; Grimley et al., 1996; Wilson et al., 1997). The findings from the majority of these studies concur that self-efficacy is positively related to improved self-care outcomes.

The concept of self-efficacy has been frequently used in diabetes education as a framework for understanding and predicting adherence to self-care behaviours in a diabetes regimen. Numerous studies have investigated the use of self-efficacy for the self-management of diabetes or the use of self-efficacy in diabetes education programs

(Anderson et al., 2000; Anderson, Funnell, Butler, Arnold, Fitzgerald, & Feste, 1995; Via & Salyer, 1999; Bernal et al., 2000; Corbett, 1999; Grossman et al., 1987; Hurley & Shea, 1992; Johnson, 1996; Kingery & Glasgow, 1989; Ludlow & Gein, 1995; Padgett, 1991; Rubin et al., 1993; Skelly et al., 1995). Most of the studies found were descriptive, correlational studies which examined the relationship between diabetes self-efficacy and adherence to a diabetes regimen, diabetes self-care, or a variety of physiological (e.g., glycosylated hemoglobin) or psychosocial outcomes. Instruments used to measure self-efficacy varied across studies, therefore making comparisons between studies difficult. Convenience samples were predominantly used, thus making the task of generalizing findings to other populations challenging. The following studies illustrate this (Bernal et al., 2000; Via and Salyer, 1999).

Bernal, Woolley, Schensul, and Dickinson (2000) conducted a cross-sectional study using a convenience sample of 97 insulin dependent Hispanic adults with diabetes to examine factors associated with increased diabetes self-efficacy. Hurley's Insulin Management Diabetes Self-Efficacy Scale (IMDSES), was translated into Spanish and administered with a demographic questionnaire to participants. Self-efficacy ratings were low to average regarding diabetes management behaviours and general self-efficacy ratings were lower than those reported by respondents in another study using the same scale (Hurley & Shea, 1992). Problem solving behaviours received the lowest self-efficacy scores. The authors found that those individuals with improved English skills, and who received formal diabetes education or home nursing visits reported higher self-efficacy scores. Glycosylated hemoglobin was not measured in this study, thus making

comparisons with other diabetes self-efficacy studies difficult. Additionally, convenience sampling and self-report of behaviours limits the generalizability of study findings. Learning gained from this study includes the importance of using language and vocabulary which is understood by participants in order to develop self-efficacy.

Via and Salyer (1999) described perceived psychosocial self-efficacy, diabetes attitudes, glucose levels, and demographic characteristics of 90 veterans with type 2 diabetes attending a diabetes education program. The program was a full-day multidisciplinary class providing information on diet, exercise, medications, prevention of complications, monitoring, and management, behavioural change strategies, goal setting, and risk factor reduction. It was particularly interesting to note that glucose control (as indicated by glycosylated hemoglobin values [HbA_{1c}]) did not correlate with measures of self-efficacy. The authors hypothesized that this may be due to a lack of previous diabetes education or skill building. Limitations of this study include the sample of male veterans which limit the generalizability of findings to other populations.

Self-efficacy as a predictor of self-care.

The relationship between self-efficacy and self-care has received considerable attention in diabetes research. Several studies support the hypothesis that self-efficacy is a predictor of self-care (Chen, 1999; Chen, Yeh , & Lin, 1998; Crabtree, 1986; Hurley & Shea, 1992; Kingery & Glasgow, 1989; Ludlow & Gein, 1995; Skelly et al., 1995). The following studies illustrate good examples of the relationship between self-efficacy and self-care (Hurley & Shea, 1992; Kingery & Glasgow, 1989; Ludlow & Gein, 1995; Skelly et al., 1995). These studies were chosen for several reasons. First, all studies were

successful in establishing positive correlation between self-efficacy and self-care and they all used descriptive, correlational methodologies to test their hypotheses. The studies were frequently cited in the diabetes literature, and were therefore deemed important. Finally, the studies are all relatively recent, with Kingery and Glasgow (1989) being the oldest. It was important to include this study, however, because of its comprehensive application of Social Cognitive Theory and the frequent reference to this article by other researchers. Above all, these studies all established a positive correlation between self-efficacy and self-care.

Crabtree (1986) developed a Diabetes Self-Efficacy Scale (DSES) to measure the self-efficacy of 143 adults who managed their diabetes with diet or the addition of oral hypoglycemics or insulin. Results of the study indicated that diabetes self-efficacy subscales which represent specific behaviours were successful predictors of related self-care activities. Details about the DSES will be discussed later on in the chapter.

Hurley and Shea (1992) conducted a descriptive correlational study to examine the relationship between self-efficacy and self-care of adults with diabetes (n=142). The researchers used the Insulin Management Diabetes Self-Efficacy Scale (IMDSES), and Diabetes Self-Care Scale (DSC) to measure the relationship between self-efficacy and self-care. Clients who could not maintain adequate metabolic control were scheduled to receive five days of intensive inpatient diabetes care. Self-efficacy was measured prior to discharge from the five day program, while self-care was measured approximately 30 days following discharge from the program. Self-efficacy prior to discharge was relatively high and a strong correlation was found between self-efficacy and self-care

($r=+0.67$, $p<.001$). Neither demographic nor diabetes variables were predictors of self-care, thus supporting the hypothesis that it is self-efficacy that predicts diabetes self-care. Limitations to this study include a homogeneous convenience sample with high socioeconomic status and lack of ethnic mix.

Kingery and Glasgow (1989) examined the utility of self-efficacy as a prospective and concurrent predictor of self-care (diet, exercise, and self-blood glucose monitoring), and whether outcome expectancies add to the predictive ability of self-efficacy with respect to diabetes self-care in adults with NIDDM ($n=127$). Key findings from this study are that self-efficacy and outcome expectations are strong predictors of self-care with regard to exercise, but weaker predictors of self-care with respect to diet management and blood glucose monitoring (Correlation ranged from a high of $r=0.58$, $p<0.05$ for exercise to a low of $r=0.35$, $p<0.05$ for glucose testing). The authors accounted for the difference in predictive capacity for the exercise regimen by the use of a more stable measure for the exercise variable as compared to measures used for diet and blood glucose monitoring. The authors recommend measuring self-efficacy before self-care over intervals of varying lengths of time to determine whether one interval length of time is preferred over another.

Skelly and colleagues (1995) investigated the relationship between perceptions of self-efficacy and diabetes self-care behaviours, and the relationship between outcome expectancies and participation in diabetes self-care behaviours. They measured self-care and outcome expectancies in a convenience sample of 118 African-American Women with NIDDM on two occasions separated by a 4 month period. They concluded that self-efficacy was an important variable in relation to adherence to specific diabetes self-care

behaviours at certain points of time. Results indicated that self-efficacy accounted for 18% of the variance in glucose testing, 24% of the variance in diet, and 53% of the variance in exercise at Time 1. At Time 2, self-efficacy remained consistent in explaining 18% of variance in glucose testing, 0% of variance in diet, and 29% of variance in exercise. The authors account for the weak correlation between self-efficacy and specific self-care behaviours in Time 2 by proposing that perhaps the combination of self-efficacy as a composite variable with confidence in outcomes could have influenced the results as confidence in outcomes was weakly correlated to self-efficacy in Time 2 as opposed to Time 1. The researchers suggest that although self-efficacy may be a predictor of specific self-care behaviours in one point in time, it may not have the same predictive capability at a later period, thus implying the notion of a ceiling effect with regard to self-efficacy.

Three additional studies are worthy of mention (Chen, 1999; Chen, Yeh, & Lin, 1998; Ludlow & Gein, 1995). Chen et al. (1998) investigated self-efficacy, social support, self-care behaviours, and other variables associated with self-care practices. Only the abstract of this article was available in English as the rest of the article was written in Chinese. Results of the study indicated that self-efficacy and self-care scores were highest in areas of glucose testing and taking medication, while diet control and regular exercise received the lowest self-efficacy scores. In addition, specific items in self-efficacy were significantly related to the corresponding items in self-care behaviours. Findings of this study are consistent with other research related to self-efficacy as well as Bandura's Social Cognitive Theory which proposes that people avoid behaviours which

they believe exceed their capabilities, but attempt activities they perceive themselves capable of handling.

Chen (1999) examined the relationships between health locus of control, self-efficacy, and self-care behaviour in a convenience sample of 120 older adults with hypertension. Self-efficacy and self-care were measured by scales which demonstrated good reliability (Cronbach's $\propto$ were 0.76 and 0.86, respectively). Results of this study indicated a significant correlation between self-efficacy and self-care ($r=0.58$, $p<0.001$).

Ludlow and Gein (1995), whose research will be discussed in the ensuing section have also identified a positive relationship between self-efficacy and self-care in adults with diabetes, backed by a significant Pearson's product moment correlation coefficient ($r=0.83$, $N=108$, $p<0.01$). These results are consistent with findings from other studies (Chen et al., 1998; Crabtree, 1986; Hurley & Shea, 1992; Kingery & Glasgow, 1998; Skelly et al., 1995) which identify a positive correlation between self-efficacy and self-care.

Most of the studies described above used descriptive correlational methods to test their hypotheses. Though sample sizes and measurements varied across studies, all reported similar findings; that is, a positive correlation between self-efficacy and self-care. Correlation coefficient values ranged from $r=0.35$ to $r=0.83$. Findings indicate that individuals with increased self-efficacy were more likely to carry out the corresponding diabetes self-care behaviours. Conversely, those with decreased self-efficacy were less likely to carry out self-care behaviours. There is no consensus among researchers whether a certain level of self-efficacy is required to carry out diabetes self-care. Corbett

(1999) and Skelly et al. (1995) allude to the possibility of a ceiling effect, although no proven self-efficacy value in relation to this proposed ceiling effect exists.

Self-efficacy, self-care and HbA_{1c}

A number of studies have examined the relationship between diabetes self-efficacy, self-care, and glycemic control using glycosylated hemoglobin (HbA_{1c}) levels (Grossman et al., 1987; Ludlow & Gein, 1995; Padgett, 1991). A study by Grossman and colleagues (1987) investigated the relationship between self-efficacy and glycemic control in 68 adolescent girls and boys with insulin-dependent diabetes mellitus. An instrument with good reliability was used to measure self-efficacy (Kuder-Richardson coefficient $\propto$=0.90). A positive correlation between self-efficacy and glycemic control was confirmed in girls but not in boys. The investigators were unable to determine the causal relationship between the two variables. The authors recommended that further studies be conducted to address this concern.

Ludlow and Gein (1995) conducted a descriptive correlational study to examine the relationships between diabetes self-care, diabetes self-efficacy and HbA_{1c} levels. A convenience sample of 136 individuals with non-insulin dependent diabetes mellitus was selected from a medical clinic and a diabetes education clinic. Instruments used to measure self-efficacy and self-care demonstrated good reliability (Cronbach's$\propto$=0.89 and 0.90, respectively), which were slightly modified for use with individuals with non-insulin-dependent diabetes. The authors stated that the modifications of the two scales did not affect their psychometric properties. Blood work for HbA_{1c} levels was drawn at the clinic after the participants completed the questionnaires. The researchers reported a

statistically significant positive correlation between self-efficacy and self-care (Pearson's r correlation coefficient r=0.83, p<0.01), and a significant negative correlation between self-efficacy and HbA_{1c} levels, and self-care and HbA_{1c} levels (Pearson's r= -0.21 and -0.37, repectively). The positive correlation between self-efficacy and self-care supports the value of this relationship in diabetes management. The authors reported that individuals who reported high self-efficacy had lower HbA_{1c} levels and those reporting higher self-care had lower HbA_{1c} levels.

In an earlier study, Padgett (1991) investigated correlates of self-efficacy in clients (n=169) with non-insulin-dependent diabetes mellitus in Zagreb, Croatia. Self-efficacy was measured by the Diabetes Self-Efficacy Scale (DSES)(Cronbach's$\propto$=0.71). The DSES underwent extensive translation and back-translation from Croatian to English. Adherence levels were completed by both participants and by their physicians. Blood levels for HbA_{1c} were drawn at the clinic. Correlational analyses revealed that self-efficacy and adherence scores were positively correlated to each other (r=0.40, p<0.01), but self-efficacy and adherence behaviours were weakly associated with HbA_{1c} levels (r= -0.14, p<0.01 represents the strongest correlation for these relationships).

The findings of these studies are somewhat conflicting with respect to the relationship between self-efficacy and glycemic control, as only Ludlow and Gein (1995) observed a negative relationship between self-efficacy and glycemic control using self-care as a mediating variable. In their earlier study, Grossman and colleagues (1987) also reported a negative correlation between self-efficacy and glycemic control although they were unable to explain this. Padgett (1991), on the other hand reported a weak

relationship between the two variables. Similar findings were noted by Via and Salyer (1999), who conjectured that this could be associated with a lack of diabetes education and skill building.

Some diabetes education researchers have questioned the importance of using glycosylated hemoglobin as an outcome measure at the exclusion of other important outcomes such as self-care. Findings in the literature concur that there is a positive relationship between self-efficacy and self-care. The three preceding studies showed that self-care and HbA_{1c} values are negatively correlated.

Measures of Self-Care and Self-Efficacy

In the review of the literature, several instruments which measured self-efficacy and self-care were identified. Two self-care instruments which are worthy of review include the Summary of Diabetes Self-Care Activities questionnaire (SDSCA) and the Insulin Management Diabetes Self-Care Scale (IMDSCS). The IMSCS, developed by Hurley, has been used by Hurley and Shea (1992) and an adapted form (used for adults with NIDDM) was used by Ludlow and Gein (1995). Evidence of good reliability as demonstrated by a Cronbach's alpha of 0.96 and good test-retest stability ($r=0.86$, $p<0.001$) makes this scale accurate for use. Its three subscales are composed of 1) six general items, 2) seven diet items, and 3) 11 insulin items. One limitation to this scale is its specific use for people with insulin dependent diabetes mellitus. Researchers Ludlow and Gein (1995) revised the scale for use with individuals with non-insulin-dependent diabetes mellitus, but efforts to locate these researchers to obtain information on the revised scale failed.

The SDSCA used in Toobert et al. (2000) and Kingery & Glasgow (1989) is probably the most widely used self-report instrument for measuring diabetes self-management in adults (Toobert et al., 2000). The brief self-report questionnaire of diabetes self-management consists of 11 core items assessing self-care of general diet, specific diet, exercise, blood-glucose testing, foot care, and smoking. Inter-item correlations are chosen rather than coefficient $\propto$ to measure reliability because of extensive revision and testing of the instrument over the years, and different versions of the tool each contained a different number of items. Means for inter-item correlations for the subscales are detailed in Chapter 3. The internal consistency of the scales, assessed by average of inter-item correlations, was deemed to be acceptable (mean=0.47). Test-retest correlations tended to be moderate (mean r=0.40, r=-0.05 [for medications] to 0.78 [for glucose testing]) although the authors argue that the moderate test-retest reliability correlations may be an underestimate. The SDSCA questionnaire is a brief, yet reliable and valid self-report measure of diabetes self-management that is useful for both research and practice. A strength of the SCSCA is the inclusion of new diabetes self-care behaviours such as blood glucose testing, foot care, and smoking.

There are several instruments which researchers have used to measure diabetes self-efficacy. The most frequently used instruments include the Diabetes Self-Efficacy Scale (DSES), the Insulin Management Diabetes Self-Efficacy Scale (IMDSES), and the Diabetes Empowerment Scale (DES). The 25-item Crabtree DSES used by Padgett (1991) was constructed with advice from Dr. Bandura. The scale has a coefficient alpha of 0.71 when used in a predictive study and test-retest stability of 0.87 ($p<0.001$). The

subscales tap self-efficacy for diet management (8 items), medication taking (7 items), exercise (6 items), and general diabetes self-management (4 items). The scale is brief, easy to administer, and reliable.

The IMDSES, developed by Hurley, was based on Crabtree's DSES, and adapted for use with clients using insulin. The scale has been used by researchers such as Ludlow and Gein (1995) and Bernal and colleagues (2000) and is often quoted in the literature. The scale boasts good reliability (Cronbach's $\propto = 0.82$) and adequate test-retest stability ($r=0.58$, $p<0.002$). It corresponds to the IMDSCS with regard to its subscales (general management, diet, and insulin).

The Diabetes Empowerment Scale (DES) has been used in recent studies to measure self-efficacy (Anderson et al., 2000; Via & Salyer, 1999). The 28-item instrument is a measure of diabetes-related psychosocial self-efficacy with three subscales: 1) managing the psychosocial aspects of diabetes, 2) assessing dissatisfaction and readiness to change, and 3) setting and achieving diabetes goals. Reliability of the scale is good (coefficient $\propto=0.96$) and preliminary evidence of test-retest reliability is provided by a correlation of 0.79. A factor which makes this instrument inappropriate for certain studies is its focus on empowerment and psychosocial self-efficacy.

The self-care and self-efficacy instruments discussed are consistent with regard to nature of subscales and number of items, with few differences. Most scales include subscales of general diabetes management, diet, insulin or medication taking, and exercise, and newer scales have expanded to include items for blood glucose testing, foot care, and smoking cessation. Instruments measuring self-efficacy and self-care discussed

in the preceding paragraphs have established adequate reliability and validity and good test-retest stability, although the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire and the Diabetes Self-Efficacy Scale (DSES) are particularly suited for the proposed study because they are valid, reliable, easy to administer, and accurately describe the variables of self-care and self-efficacy for use in this study.

Behaviour

The second area of study which this literature review will address is behaviour. A central concern of diabetes education is health behaviour. Health behaviour is defined as "those personal attributes such as beliefs, expectations, motives, values, perceptions, and other cognitive elements; personality characteristics, including affective and emotional states an traits; and overt behavioral patterns, actions, and habits that relate to health maintenance, to health restoration, and to health improvement" (Gochman, 1982, as cited by Glanz et al., 1997). This section will include a discussion of the concepts of self-care and self-management.

Diabetes Self-Care

Various terms have been used to describe clients' own practices concerning diabetes treatment. The term self-care has been commonly used when referring to the management of diabetes. One study operationally defines self-care as those daily behaviours of monitoring, planning, and carrying out of the self-care behaviours typically required of persons to manage their diabetes (Hurley & Shea, 1992). According to the 1998 clinical practice guidelines, these behaviours include self blood glucose monitoring, nutrition management, physical activity, medication management, and foot care (Meltzer

et al., 1998). Studies on self-care have established a positive correlation with adherence to diabetes care behaviours; that is, as self-care practices improve, so does adherence to diabetes regimens (Johnson, 1996; Hurley & Shea, 1992; Kingery & Glasgow, 1989; Ludlow & Gein, 1995; Peyrot & Rubin, 1994; Rubin et al., 1993; Skelly et al., 1995). The research also has confirmed a positive correlation between self-care and glycemic control; that is, as self-care practices improve, glycemic control improves (Ludlow & Gein, 1995; Peyrot & Rubin, 1994). The literature has identified certain diabetes self-care behaviours which are more easily performed by individuals with diabetes. Behaviours such as diet and exercise, which require significant lifestyle changes, have been more difficult to incorporate for individuals than behaviours such as blood glucose monitoring or medication management (Chen, 1998; Ruggiero, Glasgow, Dryfoos, Rossi, Prochaska, Orleans, Prokhorov, Rossi, Greene, Reed, Kelly, Chobanian, & Johnson, 1997).

The concept of self-management has gained increasing attention in recent years and is used synonymously with the term "self-care". Writers have deemed diabetes self-management as the cornerstone of the overall management of diabetes (Clement, 1995; Mulcahy, 1999; Ruggiero et al., 1997). It is defined as "the process of providing the person with diabetes with the knowledge and skills needed to perform self-care, manage crises, and make lifestyle changes required to successfully manage this disease" (Clement, 1995, p. 1204.). The goal of the process is to enable the client to become the most knowledgeable and the most active participant in his or her diabetes care. Self-management emphasizes a greater focus on individual self-responsibility in the control

and management of diabetes. According to Clement (1995), diabetes self-management education is associated with reduced hospitalizations for diabetes-related problems and reduced diabetes-related health care costs.

Ruggiero and colleagues (1997) conducted a survey to identify correlates of diabetes self-management in a sample of 2056 individuals with diabetes. The mailed survey included questions regarding participant sociodemographics and health status, psychosocial, behavioural, and environmental characteristics, and information about recommended self-management behaviours, for four areas including diet, exercise, medication use, and blood glucose monitoring. Results of the survey indicated patterns of self-management which were more consistent for medication use and glucose monitoring and less consistent for lifestyle changes of diet and exercise. A benefit of this survey is the large sample and high response rate which compares favourably with other studies in this field using much smaller sample sizes. The large sample size and high response rate increases the generalizability of findings to other populations.

Health education is considered an integral aspect of diabetes self-management. In diabetes self-management, the burden to modify or maintain the necessary daily behaviours to manage diabetes is on the individual. However, the benefits to proper self-management include reduced hospitalizations, reduced health care costs, and subsequently improved health status.

Outcomes

Bandura (1986) describes an outcome as the consequence of an act. Clients implementing diabetes behaviour changes look to outcomes to guide their behaviour. In

Social Cognitive Theory, individuals experience outcome expectations, which are judgements of the likely consequence of their behaviour. Given the emphasis on health funding, financing, and outcomes research, researchers must identify meaningful outcomes in diabetes education. Concentrating on outcomes also allows diabetes educators to target their interventions appropriately with respect to the client receiving care (Fain, 1996). Based on a review of diabetes outcomes, Glasgow (1999) has classified diabetes outcomes into five categories: cognitive, behavioural, physiologic, emotional, and economic outcomes.

Cognitive outcomes measure and find improvements in knowledge. Many researchers argue that knowledge is too frequently used as an outcome at the exclusion of other outcomes (Fain, 1996; Glasgow, 1999; Glasgow & Osteen, 1992) . Glasgow (1999) reports that knowledge does not produce behaviour change, rather, it is conceptualized as a process mechanism rather than an outcome of health education. Furthermore, he asserts that problem-solving or applied knowledge measures are more related to behaviour change than are assessments of abstract knowledge. Glasgow and Osteen (1992) maintain that the shift toward diabetes self-management makes measurements of self-efficacy increasingly important.

Behavioural outcomes are gaining in popularity in diabetes education research. The claim that behavioural outcomes should be incorporated more into diabetes education programs and research is not a recent phenomenon of discussion (Beeney & Dunn, 1990; Kaplan, 1990; Mulcahy, 1999; Glasgow, 1999; Glasgow, 1997). The movement toward behavioural measures was emphasized in the 1960s, however, measures of biological

process were still seen as more pure, reliable, and valid than behavioural indicators (Kaplan, 1990). Therefore, the amount of research and literature in this area is small but significant and growing. It is well known that the ultimate goal of diabetes education is to promote the behaviour changes necessary for optimal health outcomes, psychosocial adaptation, and quality of life. These include self-care behaviours such as nutrition and physical activity patterns. Glasgow (1999) asserts that the magnitude of behavioural change is associated with intensive educational interventions and that it is more pronounced and lasting with medically related behaviours such as self blood glucose monitoring, foot care, and medication management than it is for lifestyle changes such as diet and exercise.

The use of physiologic outcomes in diabetes studies have varied in interpretation, use, and results. Mortality remains one of the major outcome measures in epidemiological and clinical trials (Kaplan, 1990). There have been differential results with regard to various outcomes. Glycosylated hemoglobin (HbA_{1c}) values were the most frequently used physiologic outcome (Fain, 1996; Fain et al., 1999; Grossman et al., 1987; Glasgow, 1999; Ludlow & Gein, 1995; Mulcahy, 1999; Padgett, 1991). A measure of glycosylated hemoglobin represents a three month average of an individual's blood glucose levels. Numerous authors have criticized the use of HbA_{1c} at the exclusion of other, possibly more appropriate outcomes (Fain et al., 1999; Glasgow, 1999). Other studies have incorporated other variables such as weight, body mass index, cholesterol, blood lipids, and blood pressure (Abourizk, O'Connor, Crabtree, & Schnatz, 1994; Campbell et al., 1996; Tilly, Belton, & McLachlan, 1995). Glasgow (1999) argues

that cardiovascular outcomes are equally (or more) important than glycemic and microvascular outcomes, given the results of the UKPDS (1998) which shows that cardiovascular disease complications are responsible for most mortality cases and healthcare costs among persons with diabetes. Based on the UKPDS, it is recommended that more attention be paid to cardiovascular outcomes such as lipids, blood pressure, and smoking status.

Emotional and quality of life outcomes as well as economic outcomes have been measured in a small proportion of diabetes education literature. Glasgow (1999) found that only 17% of studies from 1997-1999 included a quality of life measure. Of those collected, results are variable and can be attributed to a lack of standard measures. Patient satisfaction is the most commonly collected quality of life measure and has been positively impacted. Padgett (1991), measured depression as an outcome in clients with non-insulin-dependent diabetes mellitus using the Zung self-rating depression scale. Collection of mood and depression measures is recommended, given the prevalence of depression in diabetes. Economic outcomes are a relatively understudied outcome variable. So far, the few studies that have included some element of cost-effectiveness have shown promise. Clement (1995) reports that diabetes self-management education is associated with reduced hospitalizations for diabetes-related problems and reduced diabetes-related health care costs. Given the trend toward cost-effective health care, this category outcome assessment will likely become essential for the evaluation and justification of diabetes education programs.

The outcome which will be used in this study is self-care. This outcome was

chosen because it has a direct impact on the successful management of diabetes. Despite the growth of knowledge in this field there are still gaps in the research which need to be filled if this concept is to be used to its full potential.

Summary of Chapter

The need for conducting research in diabetes education is well established. Social Cognitive Theory and the concept of self-efficacy provide a useful conceptual framework for understanding diabetes management and for implementing effective client interventions and research. Literature and research on diabetes self-efficacy was discussed in relation to person, behaviour, and outcomes using Ludlow and Gein's (1995) adaption of Social Cognitive Theory to diabetes management. Findings from the literature maintain the significance of self-efficacy as a predictor of diabetes self-care, but the function of group diabetes education in this regard has not yet been detailed. This supports the need for continued research so that individuals with Type 2 diabetes receiving education maintain effective diabetes self-management.

CHAPTER THREE:

METHOD

The purpose of this quasi-experimental study is to examine the effect of a group education session on diabetes self-efficacy and diabetes self-care for adults with Type 2 diabetes. The intent of the study is to identify whether an introductory group diabetes education session fosters self-efficacy of adults with Type 2 diabetes, and in turn, their ability to perform the self-care behaviours needed to maintain glycemic control. This chapter will provide rationale for the research method selected and detail the study design and ethical considerations.

Selection of Research Method

The study was conducted using a quasi-experimental pretest-posttest time series design. A quasi-experimental design was chosen for several reasons. First, quasi-experimental designs involve the manipulation of an independent variable, that is, the institution of an experimental treatment, but lack either or both randomization or a control group, two properties that are characteristic of true experiments (Polit & Hungler, 1995). In addition, a quasi-experimental design seeks to establish the presence of a cause and effect relationship. This study involved an experimental treatment (a diabetes group education session), but lacked both randomization and a control group. Since the study involved the implementation of an educational session as its intervention, the presence of a cause and effect relationship was sought between an educational intervention and both self-efficacy and self-care.

A strength of the quasi-experimental design is its practicality, feasibility, and

generalizability. Quasi-experimental research plans are able to introduce some element of control over extraneous variables when full experimental control is lacking. Since most nursing research occurs in natural settings, it is often difficult to deliver a particular treatment to half of a group or to randomize clients.

A limitation of quasi-experimental designs is first and foremost, the absence of full control inherent in true experiments. This may result in the presence of rival hypotheses which compete with the experimental manipulation as an explanation for observed or desired results. Another limitation of quasi-experimental designs is their dependence in part on human judgement rather than on objective criteria, whereby the validity of the cause and effect inferences can be challenged (Polit & Hungler, 1995).

One design which offers researchers some protection against the inherent problems of lack of a control group or randomization is the implementation of repeated measures design (or time series design). The premise underlying repeated measures designs is the collection of information over an extended period of time and the introduction of the independent variable during the course of the data collection period (Campbell & Stanley, 1966; Polit & Hungler, 1995). The purpose of repeated measures experiments is to control for extraneous, confounding variables which may present rival hypotheses for experimental interventions. It also confirms the stability of measures such as self-efficacy and self-care which were collected in the study. Data collection on these variables occurred on three different occasions, including a pre-intervention collection period and two post-intervention collection periods.

Population, Sample Criteria and Setting

Population and Sample

The population of this study, from which the convenience sample was selected, was all adults who attended the Introductory Oral Agents Class at Youville Centre Diabetes Education Resource (DER) in Winnipeg, Manitoba. This population consisted of adults diagnosed with Type 2 diabetes who manage their diabetes with oral hypoglycemics (OHA) (in addition to diet and exercise), but who do not take insulin. The sample consisted of those adults currently managing blood glucose levels with the use of oral hypoglycemic agents to maintain continuity and minimize confounding variables. Length of diagnosis was not a limiting factor in recruitment, although time since diagnosis was measured for each participant. Pregnant women with gestational diabetes were excluded from the study. All potential participants were required speak and read English and to be over the age of 18 years. Inclusion criteria is summarized in Appendix H.

For this study, a statistician from the Statistical Advisory Service at the University of Manitoba was consulted to conduct a power analysis for sample size. Based on the power analysis and assuming a level of power of 0.80, Type 1 error (alpha=0.05), and effect size (r=0.70), the sample was anticipated to consist of approximately 26 adults with Type 2 diabetes attending the Introductory Oral Agents Class at Youville Centre (Appendix H). The final sample size after recruitment and data collection consisted of 28 participants.

Youville Centre is an outpatient community nurse resource centre which operates

a DER, the diabetes education program approved by the Province of Manitoba. Clients are referred to the DER by general practitioners, endocrinologists, nurses, and dieticians. The DER provides diabetes education through group classes, individual teaching, and counselling and support services to adults of a wide range of ages. The study included individuals referred to Youville Centre and assessed for eligibility in the Oral Agents Class which is continuously offered approximately every two weeks (Appendix I).

Sampling Procedure

Convenience sampling was used at the Youville Centre because of the practicality of this method. This type of sampling involves the use of the most conveniently available people for use as participants in a study (Polit & Hungler, 1995). Participants were recruited as a convenience sample in an attempt to obtain a reasonable sample size for statistical analysis. Group diabetes education classes are offered at various sites in the city of Winnipeg. Although sampling from a variety of sites could have produced results which could be generalized to a larger population and which would be more representative of the whole population, there are some problems inherent in this method of sampling. One problem involved in sampling from different sites is lack of consistency in the delivery of the diabetes education through different programs and educators, which may have introduced confounding variables. Therefore, Youville Centre diabetes education program was chosen to minimize confounding variables as well as for its reputation as being a well established diabetes education centre.

Recruitment Procedure

Recruitment for the study took place with cooperation from Youville Centre.

Clinic nurses identified adults with Type 2 diabetes who met the sampling criteria and were scheduled to attend the Introductory Oral Agents Class. Once potential recruitment candidates were identified, the receptionist at Youville Centre called scheduled clients and ask them if they would be interested in hearing more about the study as described in "Request for Permission to Release Names of Potential Participants" (Appendix E). The names and phone numbers of interested participants were then forwarded to the researcher by phone, who contacted potential participants at home to explain the study and obtain verbal consent using the "Explanation of the Study to Potential Participants" (Appendix F). Consenting participants were then given the opportunity to read and sign the consent form (Appendix G) in their home prior to participating in the study.

Data Collection Procedures

This study included the collection of data related to demographic characteristics, self-reported diabetes self-efficacy, and self-reported diabetes self-care at various stages prior to and following a group diabetes education session. Demographic information included gender, age, marital status, educational level, race, income, previous diabetes education and diabetes management (Appendix B). Demographic characteristics were analysed to compare participants and to determine whether certain demographic characteristics are associated with certain diabetes self-care practices or diabetes self-efficacy. Data were also collected on diabetes self-efficacy and diabetes self-care using tools designed to measure these constructs. The data collection process was completed independently by the researcher without the use of assistants.

Instruments

The instruments used in this study reflected the selected variables identified by Ludlow and Gein's (1995) adaptation of Bandura's Social Cognitive Theory to diabetes management, as well as the supporting literature. The tools selected were chosen to measure the variables identified in the research questions; that is, self-efficacy, self-care, and demographic variables. They consisted of the revised Diabetes Self-Efficacy Scale (DSES) (Appendix B), the revised Summary of Diabetes Self-Care Activities Questionnaire (SDSCA) (Appendix C), and a personal demographic form (Appendix D).

The Diabetes Self-Efficacy Scale (DSES)

The tool used to measure self-efficacy was a revised version of the Diabetes Self-Efficacy Scale (DSES). A copy of this tool is found in Appendix B. The original DSES is a 25 item Likert-type scale which represents items dealing with self-efficacy regarding diet management, exercise, medication, and general diabetes self-management (Crabtree, 1986). The instrument was designed for use with adults. The mean age of the original sample was 44 years, but it has been used by persons 18-70 years of age. The instrument has been used with both individuals with non-insulin-dependent diabetes and insulin-dependent diabetes who have had diabetes for an average of 15 years (minimum criterion was 6 months). The instrument consists of four subscales: management of diet (8 items), medication-taking (7 items), exercise (6 items), and general self-management of diabetes (4 items). The medication taking subscale is relevant to individuals on insulin or oral agents.

The instrument uses a 7-point Likert-type response scale ("strongly disagree",

"moderately disagree", "slightly disagree", "slightly agree", "moderately agree", "strongly agree", and "not apply") where participants circle the answer which best expresses their belief about the particular statement. The DSES yields a total score and a score for each subscale, although the author recommends the use of the total score as it is more reliable. Scores on the total scale can range from 25-150, with higher scores reflecting increased self-efficacy (Crabtree, 1986).

Testing of the DSES for validity and reliability yielded positive results for content validity test-retest reliability, internal consistency, and construct validity. Content validity of an original 35-item DSES was evaluated by a panel of ten judges representing expertise in diabetes care, instrument development, nursing research and self-efficacy and was found to be adequate. Based on their feedback, 5 items were dropped, two items were added to the general subscale, and several items were reworded for clarity. This resulted in a 32-item version of the instrument which was administered to a pilot sample of 48 adults with NIDDM or IDDM averaging 38 years of age with a mean duration of diabetes of 15 years (Crabtree, 1986).

The test-retest reliability was $r = 0.87$, $p < .001$, $N = 39$ based on a ten day interval. Internal consistency measures (Cronbach's alpha) were 0.79 for the total scale, 0.78 for the diet subscale, 0.76 for the exercise subscale, 0.66 for the medication subscale, and 0.78 for the general self-management subscale. Preliminary evidence of construct validity was achieved by examining the pattern of correlations with two other instruments administered to the same sample. A Pearson correlation coefficient of $r = 0.50$, $p < .001$, $N = 40$ was obtained between the DSES and the Rosenberg Self-esteem Scale, which

indicated that the two constructs were related, but not redundant (Crabtree, 1986). According to Bandura (1986), one may have low self-efficacy for a behaviour without sacrificing self-esteem.

Internal consistency of the final 25-item scale was evaluated with a new sample of 143 adults with IDDM and NIDDM. The internal consistency of the revised scale, based on Cronbach's alpha coefficient was 0.71 for the total scale, 0.77 for diet, 0.6 for exercise, 0.65 for medications, and 0.56 for self-management.

The Diabetes Self-Efficacy Scale was revised upon request by the Youville Clinic staff. The staff suggested the rewording of the items in the diet subscale to eliminate the term "diet" and replace it with the phrase "healthy food choices", to reflect the content being taught in the class. In addition, the staff proposed the elimination of 5 items within the medication subscale which were in conflict with the content being taught in the class. The author of the subscale (Dr. K. Crabtree) was consulted regarding rewording and proposed changes of the items in question. Approval for permission to make the changes was sought and obtained. The revised version of the DSES consisted of 20 items and scores for the revised questionnaire could now range from 20-120. It is important to note that modifications to the original scale may not capture the intended nature of the constructs, and may pose a threat to internal validity.

Summary of Diabetes Self-Care Activities (SDSCA) Measure

Diabetes self-care was measured using the Summary of Diabetes Self-Care Activities (SDSCA) measure, developed by Toobert, Hampson, and Glasgow (2000) (See Appendix C). The SDSCA is a brief self-report questionnaire of diabetes self-

management that includes 11 core items assessing the following aspects of the diabetes regimen: general diet, specific diet, exercise, blood-glucose testing, foot care, and smoking. Respondents report the frequency with which they completed these activities over the preceding 7 days. The SDSCA assesses levels of self-care rather than adherence or compliance to a prescribed regimen as it is difficult, for a given individual, to identify a specific unchanging standard against which behaviour can be compared. The tool has been used typically for older adults with Type 2 diabetes. It is probably the most widely used self-report instrument for measuring diabetes self-management in adults (Toobert et al., 2000).

The version of the SDSCA measure used in this study is a revised version of the scale based on a review of seven studies which tested normative data (means and standard deviation), inter-item and test-retest reliability, correlations between the SDSCA subscales. and a range of criterion measures, and sensitivity to change scores (Toobert et al., 2000). Pearson's correlation coefficients were computed to evaluate the magnitude of association between baseline and post-test (test-retest) and between SDSCA scales and criterion variables (validity coefficients).

The authors have not reported the reliability coefficient for this tool. Inter-item correlations were chosen to assess relationships among items within a scale. Inter-item correlations were chosen rather than coefficient $\propto$ because coefficient $\propto$ is influenced by the number of items in a test as well as the relationship among items, and different versions of the tool each contained a different number of items. Means for inter-item correlations are as follows: general diet (mean=58.6, SD=28.7, n=1409); specific diet

(mean=67.5, SD=16.9, n=973); exercise (mean=34.3, SD=31.9, n=883); blood glucose monitoring (mean=69, SD=34.9, n=685); medication (mean=95, SD=15.4, n=218); foot care (mean=47.1, SD=21, n=407).

The internal consistency of the scales, assessed by average of inter-item correlations, was deemed to be acceptable (mean=0.47). Test-retest correlations tended to be moderate (mean r=0.40, $p<0.05$ [for medications] to 0.78 [for glucose testing]) although the authors argue that the moderate test-retest reliability correlations may be an underestimate. The final measure includes 11 core tested items and an additional 14 items which may be used when a particular question is of interest to researchers.

The authors affirm that the SDSCA is a multidimensional measure of diabetes self-management with adequate internal and test-retest reliability and evidence of validity and sensitivity to change. The instrument shows practical utility as a change measure which is useful both as a brief screening instrument to identify those individuals experiencing difficulty with one or more diabetes self-care areas, and to measure improvements as a result of diabetes education (Toobert & Glasgow, 1994). The SDSCA questionnaire is a brief, yet reliable and valid self-report measure of diabetes self-management that is useful for both research and practice.

One question (#4) from the SDSCA was reworded upon request by the Youville clinic nurses to better reflect the content being taught in the course. This was done upon seeking and gaining approval from the authors of the scale. Total scores for the SDSCA could range from 0-77. Actual pre-program and follow-up scores for the SDSCA ranged from 15-68. Once again, modifications to the SDSCA may pose a threat to internal

validity and may not capture the intended nature of the construct of self-care.

Data Collection Protocol

Data collection took place during three separate time periods as indicated in Table 1.

Table 1. Data Collection Time Periods

Data Collection Time Periods		
Time Period	**Description**	**Tools Administered**
Time 1	Up to one week prior to diabetes education session	1) Diabetes Self-Efficacy Scale (DSES) 2) Summary of Diabetes Self-Care Activities (SDSCA) 3) Demographic Questionnaire
Time 2	Up to one day following diabetes education session	1) Diabetes Self-Efficacy Scale (DSES)
Time 3	Three-four weeks following diabetes education session	1) Diabetes Self-Efficacy Scale (DSES) 2) Summary of Diabetes Self-Care Activities (SDSCA)

Data collection took place in the participants' homes or at a place mutually agreed upon by the participant and researcher up to one week prior to the diabetes education session. For Time 1, the Diabetes Self-Efficacy Scale (DSES), the Summary of Diabetes Self-Care Activities Questionnaire (SDSCA), and the Demographic Questionnaire were administered to obtain baseline data. Prior to the administration of these questionnaires at the first visit, participants had the opportunity to read and sign the Consent Form. The researcher was present to explain the procedure for completing the questionnaires and to answer questions which participants may have. Data collection for Time 2 took place up to one day after the diabetes education session, independent of a visit from the researcher. Participants were called by the researcher to remind them to complete the DSES and to

mail it in a pre-addressed and stamped envelope. During Time 2, the DSES was administered to measure self-efficacy following the education session. Self-care was not measured at Time 2 as it takes several weeks to incorporate self-care behaviour changes and the SDSCA instrument involves questions about self-care behaviours which have taken place over a period of the past seven days. At Time 3, the DSES and the SDSCA were administered in a mutually agreed upon place (i.e., the participant's home) to obtain post-intervention data. This occurred three to four weeks following the group education session. Data collection during this time period provided information about changes in diabetes self-efficacy and diabetes self-care which might have taken place over this time period.

Data Analysis

Statistical Analysis

Statistical analysis of the collected data were completed through the use of the Statistical Package for the Social Sciences (SPSS) computer software program. Data were coded and entered manually by the researcher. A statistician from the University of Manitoba Statistical Advisory Service was consulted to determine appropriate methods of statistical analysis for describing data. Descriptive statistics were used to the describe the sample in terms of demographic characteristics such as age, educational level, racial background, income and length of diagnosis. Statistical tests included frequency and percent distributions on demographic variables and self-efficacy and self-care scores.

Missing Data

During the course of data entry, it was noted that several participants purposely or

inadvertently chose not to answer some questions. In addition, some participants chose the "not applicable" option when answering questions on the Diabetes Self-Efficacy Scale. Out of a total 2324 response items, the number of missing values was 47 (~2%). Of these 47 missing values, 23 items were actual missing responses while the remaining 24 items were entered as "not applicable" responses. Missing values can influence the data analyses in a number of undesirable ways, therefore this issue needed to be dealt with appropriately. George & Mallery (2001) suggest that it is acceptable to replace up to 15% of data by using the mean of the distribution with little damage to the resulting outcomes. Therefore, missing values were replaced with the mean score for that participant's responses across the total scale's items. Since the percentage of missing responses was small (2%), the expectation is that the results would not be affected significantly by this procedure.

Statistical analyses were geared toward answering the study's research questions. To answer question #1, "Do self-care or self-efficacy scores increase as a result of a group diabetes education session?", paired t-tests, repeated-measures analysis of variance (within-subjects) (ANOVA) and a post-hoc Honestly Significant Difference (HSD) Tukey test were used. A matched pairs t-test was used to analyse differences in self-care scores at two points in time; before the educational session (Time 1) and three to four weeks following the session (Time 3). Repeated-measures ANOVA is used when there are three or more measures of the same dependent variable for each subject (as was the case with self-efficacy) (Polit & Hungler, 1995). A post-hoc Honestly Significant Difference (HSD) Tukey test was then used to extend the implications of ANOVA findings to

determine where the changes in self-efficacy occurred.

To answer question #2, "Are self-care and self-efficacy positively correlated in adults with Type 2 diabetes?", a Pearson correlation was performed to determine the significance of the correlation coefficients between the two variables during different time periods. Correlation coefficients are used to quantitatively describe the magnitude and direction of a relationship between two variables (Polit and Hungler, 1995). The most commonly used correlation index is the product-moment correlation coefficient (Pearson's *r*). For most variables of a social and psychological nature, an*r* of 0.70 is high, while most correlations between psychosocial variables typically are in the 0.10-0.40 range (Polit & Hungler, 1995). Correlation coefficients were conducted for the following pairs: pre-program self-efficacy (SE) and pre-program self-care (SC), pre-program self-efficacy (SE) and follow-up self-care (SC), and follow-up self-efficacy and follow-up self-care (SC). To answer the question of whether the program's influence on self-efficacy might have accounted for the observed changes in participants' follow-up self-care scores, a linear regression analysis was done

To answer question #3, "Are demographic variables (e.g., gender, age, marital status, education, race, socioeconomic status) correlated with diabetes self-efficacy or diabetes self-care?", a variety of correlation measures were used to describe the association between self-efficacy and self-care and the various demographic variables.

Ethical Considerations

Ethical approval was sought and obtained from the Ethical Review Board at the University of Manitoba prior to proceeding with the study. Upon ethical approval from

this board, a letter requesting access to participants at Youville Centre was sent to the Executive Director. Once access was obtained, those staff with potential involvement in the study at Youville Centre reviewed the research proposal. Issues relating to the study and staff involvement, such as the design of the study, instruments, participant recruitment, consent, anonymity, and confidentiality were addressed and clarified in several meetings with the research coordinator.

Participants were recruited to the study by Youville Centre staff who screened for potential candidates and obtained permission for the release of names and phone numbers of potential participants (Appendix E). Names of willing participants were confidentially forwarded by the receptionist to the researcher who then contacted potential participants by phone and discussed the purpose of the study as well as issues of voluntary consent, anonymity, confidentiality, and risks and benefits to participants (Appendix F). These issues were also addressed in the Consent Form (Appendix G). Participants were assured that their decision to participate or not participate would not affect the care they received at the clinic.

Code numbers were used instead of given names to correlate responses between instruments. Confidentiality of the names was maintained by assigning each participant an identification number and keeping the corresponding list of numbers on a separate sheet in a locked cabinet. All data collection sheets were stored in a locked cabinet in a separate location. Data was only available to the researcher during the course of the study. The data collection sheets will be kept for a period of seven years. During this time, permanent storage of all study documents will be at the researcher's home in a

locked cabinet. After the proper time, these documents will be destroyed by a paper shredder. The issue of insider status and bias was not a concern as the researcher has no affiliation with the Youville Centre, therefore the element of coercion has been avoided.

The nature of this research study was not invasive and presented minimal risk to potential participants. Individuals were informed of their right to withdraw from the study at any point in time and to refuse to answer questions to which they felt uncomfortable responding.

Summary of Chapter

This chapter provided a review of the research design, sample, population and setting, and recruitment and data collection procedures which will be used in this study. Data analysis procedures and ethical considerations were outlined.

CHAPTER FOUR:

RESULTS

The purpose of this study was to examine the effect of a diabetes education session on self-efficacy and self-care for adults with Type 2 diabetes. Self-efficacy was measured on three occasions; up to one week prior to the diabetes education session (pre-program), up to one day after the education session (post-program), and three to four weeks after the education session (follow-up). Self-care was measured at the pre-program and follow-up data collection times. Demographic information was collected at the outset of the study. The statistical analyses were geared toward answering the study's research questions. The research questions are, 1) "What is the effect of a group diabetes education session on self-efficacy and self-care in adults with Type 2 diabetes?", 2) "Is there a relationship between diabetes self-efficacy and diabetes self-care in adults with Type 2 diabetes?", 3) "Are demographic variables correlated with diabetes self-efficacy or diabetes self-care?". This chapter will present the findings of this study in reference to the research questions.

Description of Sample

Demographic characteristics

Data were collected from 28 participants. The mean age of the participants was 51 years with the range being 26 to 75 years (SD=10.7). Of these 28 participants, 20 were female and 8 were male. In the sample, 18 of the participants were married, 5 were single, 3 were widowed, 1 was divorced, and 1 was separated. A majority of the sample (n=17) were educated at the Grade 12 level or higher, while the remaining 11 participants

had received less than Grade 12 education throughout their lifetime. Out of the 28 participants, 24 identified their racial background as white, 2 were Native or Metis, 1 was Asian, and 1 identified him/herself as "Other". A majority of the participants (n=24) had been diagnosed with diabetes within the past year and a half. Only 3 of the 28 participants had a history of previous diabetes education. Participants reported a mean score of 3.69 out of 7 (SD=1.49) for their perceived level of understanding of diabetes management. In summary, the participants comprising this sample of 28 were, on average, 51 years of age, married, white, and had completed a minimum of Grade 12 education. A majority of the sample had been diagnosed with diabetes within the past two years and had never received formal diabetes education. The demographic characteristics of the sample are shown in Table 2.

Table 2. Demographic Characteristics of Sample

Demographic Characteristics of Sample	
Gender	male = 8 female = 20
Age	mean = 52 years (SD=10)
Marital Status	single = 5 married = 18 separated = 1 divorced = 1 widowed = 3
Education Level	< grade 12 = 11 ≥grade 12 = 17
Racial Background	White = 24 Native/Metis = 2 Asian = 1 Other = 1

Demographic Characteristics of Sample	
Income	below $10, 000 = 2 $20,000-29,999 = 4 $30,000-39,999 = 2 $40,000-49,999 = 4 $50,000-59,999 = 3 $60,000-69,999 = 3 $70,000-79,999 = 2 $80,000-89,999 = 0 $90,000-99,999 = 1 Above $100,000 = 5 NR = 2
Previous Diabetes Education	yes = 3 no = 25

Demographic Correlations

One of the research questions in this study was, "Are demographic variables correlated with diabetes self-efficacy or diabetes self-care?". It is important to note that no statistically significant correlations were noted between gender, age, marital status, race, or income level, and self-care or self-efficacy. Therefore, these were not confounding variables in the study. It is unlikely that observed changes in self-care or self-efficacy are really a function of the demographic composition of this group. However, education level was found to be moderately correlated with pre-program, $r=0.36$, $p<0.06$, and post-program, $r=0.42$, $p<0.03$ self-efficacy mean scores. Independent of the program, those with higher education reported higher self-efficacy.

Scale Reliability

Reliability analysis for the Diabetes Self-Efficacy Scale (DSES) for pre-program, post-program, and follow-up data collection periods evidenced good total scale reliability

(alpha= 0.72, 0.81, and 0.73 respectively). Internal consistency of the 20-item scale was based on Cronbach's alpha coefficient. The internal consistency of the subscales of the SDSCA assessed by average inter-item correlations was acceptable for both pre-program (r=0.67) and follow-up (r=0.71) data collection periods.

The DSES consists of four subscales: diet, exercise, general diabetes self-management, and medications. The Summary of Diabetes Self-Care Activities Questionnaire (SDSCA) also consists of four subscales: diet, exercise, blood-glucose testing, and foot care. Inter-item correlations were used to assess relationships among items within the various subscales. Reliability estimates for each specific subscale of the DSES and SDSCA are reported in Appendix J.

Changes in Self-Care and Self-Efficacy Over Time

Self-Care and Self-Efficacy Scores

The dependent variables in this study were self-care and self-efficacy. Self-care was determined by total scores from the Summary of Diabetes Self-Care Activities Questionnaire (SDSCA) taken at Time 1 and 3. Self-efficacy was determined by total scores from the revised Diabetes Self-Efficacy Scale (DSES) taken at Time 1, 2, and 3. Mean score results were calculated for each data collection period and are represented in Figure 2. These scores are useful in answering the first research question, "What is the effect of a group diabetes education session on self-efficacy (SE) and self-care (SC) in adults with Type 2 diabetes?".

There was an overall increase in both self-care and self-efficacy scores over the course of the study. To assess changes in self-care over time, a paired t-test revealed a

significant increase from pre-program to follow-up self-care scores, t(27)= - 4.963, p<0.001. Significant increases were also noted for self-efficacy from Time 1 to Time 2 (r=0.787, p<.000), as well as between Time 1 and Time 3 (r=0.725, p<.000). A slight increase in self-efficacy scores from Time 2 to Time 3 was noted, but is not statistically significant (r=0.664, p<0.953).

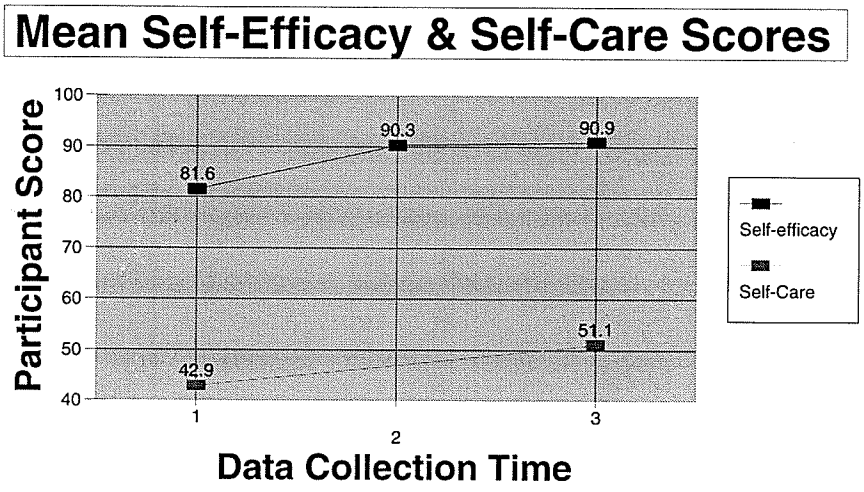

Figure 2.

Self-efficacy scores were obtained on three occasions: no earlier than one week before the program, no later than one day after the program, and three to four weeks after the program. A one-way repeated measures analysis of variance (ANOVA) was used to compare these scores (Polit & Hungler, 1995). A significant effect for time of measurement indicated that reliable differences occurred between self-efficacy at Time 1, Time 2, and Time 3, as demonstrated by the *F* value, $F(1, 27)= 17.636$, p<0.001 (Table 3.).

Table 3. Summary Table from Repeated Measures ANOVA of Self-Efficacy by Time

Summary Table from Repeated Measures ANOVA of Self-Efficacy by Time				
Source	**Sum of Squares (SS)**	**Degrees of Freedom (df)**	**Mean Squares (MS)**	***F***
Time	1207.7	1	1207.7	**17.636 ***
Error (Time)	1848.963	27	68.48	-
Total	4860.699	28	-	-

* denotes $p < 0.001$, which indicates a significant finding

A limitation of using ANOVA is that this test only generates significance values indicating whether there are significant differences within the comparisons being made. It does not indicate where the difference is or what the differences are (George & Mallery, 2001; Spatz, 2001). A post-hoc Tukey's Honestly Significant Difference test can identify which groups differ significantly from each other (George & Mallery, 2001; Spatz, 2001). Therefore, using the within-subject error term from this analysis, a post-hoc Honestly Significant Difference (HSD) Tukey test further revealed that the pre-program self-efficacy score differed significantly from both post-program and follow-up self-efficacy scores, but post-program and follow-up scores did not differ significantly from each other (Figure 3). Thus, self-efficacy increased on average through the program and was maintained thereafter.

Figure 3. Post Hoc Tukey Test for Self-Efficacy

Post Hoc Tukey Test (Honestly Significant Difference) for Self-Efficacy

HSD $= q(\sqrt{MS_W/n}) = 3.53(\sqrt{68.48/28}) =$ **5.52**
Differences in Means:
SE Post-Program - SE Pre-Program = 90.2550-81.6182= **8.6368***
SE Follow-up - SE Pre-Program = 90.9061-81.6182= **9.2879***
Both (*) values are greater than 5.52, therefore both changes are significant, $p<0.001$, but not significantly different from each other.

Relationship Between Self-Care and Self-Efficacy

The final research question was, "Are self-care and self-efficacy positively correlated in adults with Type 2 diabetes?". At the outset of the program, self-care and self-efficacy scores were positively correlated ($r=0.63$, $p<0.001$). That is, participants with higher self-efficacy also engaged in better practices of diabetes self-care. This finding raises the question whether the program's influence on self-efficacy might account for the observed changes in participants' follow-up self-care scores. To answer this question, a multiple regression analysis was done. Multiple regression analysis shows the influence of two or more independent variables on a designated dependent variable (George & Mallery, 2001). This statistical procedure allows one to make predictions about the degree of relationships between variables. Three separate analyses were conducted. For each analysis, follow-up self-care (SC2) was entered as the dependent variable. In each, the effect of pre-program self-care was entered as an independent variable together with one of the following additional independent variables: pre-program self-efficacy (SE1), post-program self-efficacy (SE2), and the difference

between pre-program and post-program self-efficacy (SEDiff). Only pre-program self-care once again emerged as a significant predictor of follow-up self-care.

Multiple regression analysis generates *B* values, which represent the weighted constant for the variable of interest. The greater the *B* value, the greater the influence of the independent variable on the dependent variable (follow-up self-care). Conversely, the smaller the *B* value, the less the influence of the independent variable on the dependent variable (George & Mallery, 2001). The *B* value, however, often cannot be used to compare variables as different variables may be measured on different scales. Therefore, a standardized score called *Beta* (β) allows for direct comparison between variables. The *Beta* (β) value varies between ±1.0 and represents a partial correlation between the two variables in which the influence of all other variables have been partialed out (George & Mallery, 2001). Thus, pre-program and post-program self-efficacy, as well as the difference between the two variables were not significant in predicting follow-up self-care over and above the effects of pre-program self-care, as evidenced by the statistically insignificant *B* and *Beta* (β) values ($p<0.215$, $p<0.416$, $p<0.586$) shown in Table 4.

Table 4. Regression Analysis of Diabetes Self-Care at Follow-up

Regression Analysis of Diabetes Self-Care at Follow-up, as a function of prior self-care and self-efficacy							
Analysis	**DV**	**IV**	**B**	**Standard Error (SE_B)**	**Beta (β)**	***t***	**Sig**
#1	SC2	SC1	.732	.155	.846	4.735	.000
		SE1	-.140	.110	-.227	-1.271	**.215***
		constant	31.199	7.157	--	4.359	.000
#2	SC2	SC1	.662	.139	.766	4.775	.000
		SE2	-9.306E-02	.112	-.113	-.828	**.416***
		constant	31.132	9.074	--	3.431	.002
#3	SC2	SC1	.631	.130	.730	4.851	.000
		SEDiff	8.201E-02	.149	.083	.551	**.586***
		constant	23.356	6.300	--	3.707	.001

Note:
SEDiff=SE2-SE1
"*" denotes values which are **not** significant

Summary

The major findings of this study indicate that there was a significant overall increase in self-care scores over the course of the study. Self-efficacy scores increased significantly from pre-program to post-program data collection periods but only slightly increased from post-program to follow-up data collection periods. Data findings at the outset of the study indicated that self-efficacy and self-care were significantly correlated; that is, participants with higher self-efficacy scores also scored higher on the self-care questionnaire. A multiple regression analysis was conducted to determine whether the

diabetes education program's influence on self-efficacy might account for the changes in follow-up self-care. However, it was found that pre-program or post-program self-efficacy were not significant predictors of self-care. The only significant demographic correlations that emerged from the study were a relationship between education level and pre-program and post-program self-efficacy scores. Reliability estimates for the two scales used in the study were acceptable.

CHAPTER FIVE:

DISCUSSION

This study sought to examine the effects a diabetes education session on self-efficacy and self-care of adults with Type 2 diabetes. The intent of the study was to identify whether an introductory group diabetes education session fosters diabetes self-efficacy of adults with Type 2 diabetes, and in turn, their ability to perform the self-care behaviours needed to maintain glycemic control. The three research questions which guided this study were:

1. What is the effect of a group diabetes education session on self-efficacy (SE) and self-care (SC) in adults with Type 2 diabetes?
2. Is there a relationship between self-efficacy (SE) and self-care (SC) in adults with Type 2 diabetes?
3. Are demographic variables (gender, age, marital status, education, race, socioeconomic status) correlated with diabetes self-efficacy or diabetes self-care?

This chapter will discuss the implications of the study's findings with respect to the research questions posed, existing literature and Social Cognitive Theory. Limitations of the study will be outlined. Implications of the study's findings for diabetes education and research will be discussed.

Sample Representativeness

Although the sample used in this study was small compared to other studies described in the literature, it accurately reflected other populations of adults with Type 2

diabetes (Bernal et al., 2000; Chen, 1999; Ludlow & Gein, 1995; Kingery & Glasgow, 1989; Padgett, 1991; Rickheim et al., 2002; Rubin, Peyrot & Saudek, 1989; Skelly et al., 1995; Via & Salyer, 1999). Authors of some of the studies found on this topic did not report at all, or provided limited information on the demographic characteristics of samples used (Anderson et al., 1995; Corbett, 1999; Hurley & Shea, 1992; Rubin, Peyrot, & Saudek, 1993). Thus, it is difficult to make comparisons between the population in this study and those in the literature.

Relationship between demographic characteristics and self-efficacy and self-care

One of the research questions posed in this study was, "Are demographic variables correlated with diabetes self-efficacy or diabetes self care?' Demographic characteristics such as age, gender, marital status, race, income level, level of education, time since diagnosis, and history of previous diabetes education were examined in the study. No statistically significant correlations were noted between gender, age, marital status, race, or income level, and self-care or self-efficacy. However, education level was found to be moderately correlated with pre-program ($r=0.36$, $p<0.06$), and post-program, ($r=0.42$, $p<0.03$), self-efficacy mean scores. Individuals with Grade 12 level education or higher reported increased levels of self-efficacy while individuals with less than Grade 12 education reported lower levels of self-efficacy. Therefore, independent of the diabetes education program, those individuals with more education reported higher self-efficacy. Padgett (1991), who found that educational level was significantly correlated with self-efficacy, provides support for this finding.

The relationship between level of education and self-efficacy has several practical

implications for diabetes education. Since it has been shown that individuals with higher levels of education report higher self-efficacy, there may be benefit to designing diabetes education programs to specifically meet their needs. Individuals reporting higher levels of self-efficacy may benefit from diabetes education which enhances their current level of self-efficacy, thus increasing overall diabetes self-efficacy. On the other hand, individuals with lower levels of self-efficacy may benefit from a diabetes education program whose goal it is to build self-efficacy for that particular individual by focussing on small performance accomplishments, which has proven to be the most powerful source of self-efficacy (Bandura, 1977).

Educational strategies to enhance self-efficacy may be directed toward one or all of the four sources of self-efficacy. For instance, incorporating sources of self-efficacy such as performance accomplishments, verbal persuasion, vicarious experience, and physiological state within the framework of the diabetes education curriculum may increase levels of self-efficacy, thus increasing the chances of clients being able to perform better diabetes self-care. These practical implications have also been suggested by Hurley and Shea (1992).

The clinic from which this study's sample was taken follows diabetes education guidelines outlined in a manual designed for the province of Manitoba. The construct of self-efficacy appears in the manual as one of several important theoretical concepts for diabetes education, but is not an explicit focus of the curriculum. In this study's particular setting, most diabetes educators incorporate a few or all of the four sources of self-efficacy in their teaching, but may be unaware that they are doing so. It may be

beneficial to provide formal instruction to diabetes educators about the importance of building self-efficacy by using the four sources of information. The four sources of information are easily integrated into diabetes education curricula, and in fact, many educators already incorporate these principles in their instruction. Therefore, by providing information about the usefulness of the self-efficacy construct for diabetes education, educators could make a conscious effort to incorporate the four sources of self-efficacy information into their classes.

Another way to effectively deliver programs to each group of clients may be to measure clients' self-efficacy at the outset of the program and place clients in an education session that would be suited to their reported levels of self-efficacy. The revised Diabetes Self-Efficacy Scale may be administered at various times throughout the diabetes education program, as an aid in determining changes in beliefs about ability to perform specific aspects of diabetes self-care. The Diabetes Self-Efficacy Scale is a brief tool which takes only minutes to complete. It is easy to administer for individuals who can read and write, and it is a reliable instrument which captures the essence of the self-efficacy concept for people with diabetes.

Changes in Self-Care and Self-Efficacy over Time

Another research question which guided the study was "What is the effect of a group diabetes education session on self-efficacy (SE) and self-care (SC) in adults with Type 2 diabetes?"

Self-efficacy over time

The results obtained in this study indicate that self-efficacy improved from pre-

program scores to post-program scores, but was maintained at the same level thereafter. The one-way repeated measures analysis of variance (ANOVA) indicated that reliable differences occurred for time of measurement. These findings indicate that participation in a diabetes education program may improve levels of self-efficacy for self-care behaviours needed to manage diabetes. The findings of this study are consistent with findings reported by other researchers who have examined the effect of diabetes education programs on self-efficacy (Rubin, Peyrot, & Saudek, 1993; Rubin, Peyrot, & Saudek, 1989; Corbett, 1999; Anderson et al., 1995; Kingery & Glasgow, 1989; Hurley & Shea, 1992).

Rubin, Peyrot, & Saudek (1993) reported an improvement in self-efficacy scores at 6 and 12 months following their diabetes education program which focussed on coping skills training on emotional well-being and diabetes self-efficacy. In their study, they stated that the 12 month scores were only slightly improved over the six month scores. Corbett (1999) measured self-efficacy before and after a home visit by a nurse. This researcher found that self-efficacy results improved significantly after the home care visits in groups of participants with low or moderate self-efficacy scores prior to their home care visit, while individuals in the high self-efficacy range only slightly improved with regard to self-efficacy . The results of these two studies allude to the possibility of a ceiling effect for self-efficacy, which may provide an explanation for the marginal increase in self-efficacy from the post-program to the follow-up data collection period found in this study. The findings of this study contribute to the findings regarding the effect of diabetes education on self-efficacy found in the literature. Rubin, Peyrot, and

Saudek (1989) also reported a statistically significant overall increase in self-efficacy from pre-program scores to six month follow-up scores in their sample of 165 participants. In addition, Anderson et al. (1995) reported gains in self-efficacy in their patient empowerment diabetes education program for their intervention group, and overall sustained improvements in all self-efficacy areas.

Furthermore, a study by Kingery & Glasgow (1989) which measured self-efficacy on two occasions separated by a six month period, without an educational intervention did not show significant increases in self-efficacy for diet, exercise, or blood glucose testing. This provides support for the results of this research study, which did indeed show improvements in levels of self-efficacy following an educational intervention.

Anderson et al. (1995) state that improvements in self-efficacy may be underestimates. They assert that pre and post assessments of self-efficacy often do not reflect the magnitude of change brought about by an intervention. This phenomenon occurs when participants overestimate their self-efficacy before a program because they do not fully understand a particular skill or concept. It has been suggested that retrospective pre-post self-assessments of self-efficacy are likely to demonstrate greater change and be more consistent with objective measures of acquired skills. These findings from Anderson et al. (1995) help place the findings of this study in perspective. This may suggest that a retrospective pre and post assessment of self-efficacy may be more effective in determining greater changes in self-efficacy measures as a result of the educational intervention than those which were detected.

Self-Care over Time

The results obtained by the paired t-test analysis in this study indicated that there were significant increases in self-care from pre-program to follow-up self-care scores. These findings may indicate that the influence of the diabetes education session on self-care of clients with Type 2 diabetes is a positive one which results in the ability of patients to improve their self-care activities. Similar results regarding increases in self-care over the course of a diabetes education program have been reported in the literature by a group of investigators (Rubin, Peyrot, & Saudek, 1991; Peyrot & Rubin, 1994; Rubin et al., 1989).

Rubin et al. (1991) found that self-care behaviours, such as blood glucose monitoring and insulin administration, were improved at 6 months and 12 months after a week long diabetes education program. Peyrot and Rubin (1994) found that self-care behaviours such as blood glucose monitoring, exercise, and insulin administration all improved after a diabetes education component. This offers support for the contention that diabetes education produces changes in self-care. Rubin et al. (1989) reported that self-care scores for exercise, blood glucose monitoring, and diet significantly improved from pre-program to six-month follow-up intervals. The findings of this study, therefore, are consistent with past research on the effect of diabetes education on self-care, as significant increases in self-care were noted after the diabetes education session.

The Relationship Between Self-Efficacy and Self-Care in Adults with Type 2 Diabetes

Another research question raised in this study was, "Is there a relationship

between self-efficacy (SE) and self-care (SC) in adults with Type 2 diabetes?" Study results indicated that there was a positive correlation between pre-program self-efficacy and pre-program self-care measures ($r=0.63$, $p<0.001$) only, but no other significant relationships were noted between self-efficacy and self-care for any other time periods. The multiple regression analysis indicated that pre-program self-efficacy only emerged as a predictor of follow-up care at a level which was not significant. Some research studies have reported a positive correlation between diabetes self-efficacy and diabetes self-care (Chen, 1999; Chen, Yeh & Lin, 1998; Crabtree, 1986; Hurley & Shea, 1992; Kingery & Glasgow, 1989; Ludlow & Gein, 1995; Padgett, 1991; Skelly et al., 1995).

The results of this study are consistent with existing research findings which examine the role of self-efficacy in self-care. The findings of this study are relatively similar with respect to the positive relationship between self-efficacy and self-care. A unique characteristic of this study is that it sought to extend the implications of the significant correlation between pre-program self-efficacy and pre-program self-care ($r=0.634$, $p<.001$) from a cross-sectional one to a longitudinal one. This raised the question of whether self-efficacy may act as a mediator of the effects of diabetes education on self-care. The central idea behind mediation is that the effects of a stimuli (education) on behaviour (self-care) are mediated by various internal transformation processes (self-efficacy) (Baron & Kenny, 1986). Mediators explain how external physical events take on internal psychological significance.

The results of the regression analysis indicated that pre-program or post-program self-efficacy did not actually predict post-program self-care once effects of pre-program

self-care were taken into account. The findings of the regression analysis are puzzling, considering that both self-efficacy and self-care increased from their pre-program scores. A possible explanation for this is that there may be a delayed effect of the role of self-efficacy on self-care beyond the time intervals which were established in this study. That is, had self-efficacy and self-care been measured beyond the one month post-intervention data collection period, notable changes in self-care may have occurred. Possible results for this scenario is that self-efficacy and self-care may have been positively correlated at this time and the mediating effects of self-efficacy could have been detected.

The findings of this study are not consistent with results from Crabtree (1986), who found that diabetes self-efficacy was a successful predictor of related self-care activities. Kingery & Glasgow (1989) also examined the utility of self-efficacy as a predictor of self-care and found that self-efficacy is a strong predictor of self-care with regard to exercise, but weaker predictor of self-care with respect to diet management and blood glucose monitoring. In this study, correlations between overall diabetes self-efficacy and diabetes self-care behaviours were assessed. Correlations for specific diabetes self-care behaviours such as diet or exercise were not examined. It would be of benefit to include correlational analyses for specific self-care behaviours in future research efforts.

Skelly et al. (1995) investigated the relationship between perceptions of self-efficacy and diabetes self-care behaviours. They found that self-efficacy was an important variable in relation to adherence to specific diabetes self-care behaviours at certain points in time. For example, self-efficacy accounted tor 18% of the variance in

glucose testing, 24% of the variance in diet, and 53% of the variance in exercise in Time 1, while in Time 2, self-efficacy continued to explain 18% of the variance in glucose testing, but only 0% and 29% of the variance in diet and exercise respectively. This is consistent with the findings of this study in that self-efficacy was significant in explaining variances in self-care at the outset of the program, while it was not a significant predictor of self-care at post-program or follow-up data collection periods.

The findings regarding the positive correlation found between self-efficacy and self-care at the outset of the study are similar to what other researchers have found. Hurley & Shea (1992) examined the relationship between self-efficacy and self-care of 142 adults with diabetes and found a strong correlation between self-efficacy and self-care independent of either demographic or diabetes variables. In their study examining self-efficacy, social, support, and self-care behaviours, Chen, Yeh & Lin (1998) found that self-efficacy items were significantly correlated to corresponding items in self-care behaviours. Ludlow & Gein (1995) identified a significant correlation between self-efficacy and self-care in adults with diabetes. Padgett (1991) also found a significant relationship between self-efficacy and adherence to diabetes self-care behaviours. Chen (1999), who examined relationships between self-efficacy and self-care of older adults with hypertension also found a significant correlation between self-efficacy and self-care.

The findings of this study regarding the positive correlation between diabetes self-efficacy and self-care may be useful to diabetes education practitioners in predicting levels of self-care practices of clients prior to providing diabetes education. Diabetes educators can measure clients' self-efficacy using the Diabetes Self-Efficacy Scale before

initiating diabetes teaching. Based on their findings, they can then cater their teaching to meet their clients learning needs.

Social Cognitive Theory Revisited

Bandura's (1986) Social Cognitive Theory (SCT) was the theoretical framework used to guide this research study. Social Cognitive Theory attempts to predict and explain how people acquire and maintain certain behaviours, and provides a basis for intervention strategies. According to Bandura (1986), people act if they believe that they can successfully engage in a specific behaviour. This belief is referred to as self-efficacy. Self-efficacy is based on four principle sources of information: performance accomplishments, vicarious experiences, verbal persuasion, and physiological state.

Although diabetes educators frequently implement interventions using the four sources of self-efficacy information, many are unaware of the theoretical basis underlying self-efficacy. The use of the four sources of information (performance accomplishments, verbal persuasion, vicarious experiences, and physiological states), though not explicitly outlined in the diabetes education curriculum, were used implicitly by the diabetes educators to enhance self-efficacy for specific diabetes self-care behaviours for individuals in the class. Verbal persuasion was most commonly used as the facilitators encouraged and convinced clients that they could manage their diabetes. With respect to performance accomplishments, the facilitators asked class participants to identify occasions on which clients were successful in managing their diet. Members of the class were encouraged to share their personal experiences related to diabetes self-management with the rest of the class, thus increasing self-efficacy of other participants through

vicarious experiences. Clients' self-efficacy was also increased through identification of physiologic states where clients were able to identify with the experience of a hypoglycemic reaction by recalling physical symptoms associated with this condition. Practitioners could therefore improve educational interventions by consciously incorporating the four sources of self-efficacy into their program curricula, thus increasing their efforts to improve self-efficacy for their clients.

Social Cognitive Theory (1986) also describes the role of self-efficacy in the model of a person engaging in a behaviour with a consequent outcome. According to the theory, people act if they believe that a certain behaviour will lead to desirable results (outcome expectations) and if they believe that they can successfully engage in the behaviour. Although variables such as self-efficacy and improved self-care as the consequent outcomes were examined, this study did not incorporate the outcome expectation construct of the model. Therefore, this study only provides support for the applicability of self-efficacy and self-care as components of Social Cognitive Theory to diabetes education.

The findings of this study are consistent with those found by many researchers who have used Social Cognitive Theory as an organizing framework in diabetes education (Anderson et al., 2000; Anderson, Funnell, Butler, Arnold, Fitzgerald, & Feste, 1995; Via & Salyer, 1999; Bernal et al., 2000; Corbett, 1999; Grossman et al., 1987; Hurley & Shea, 1992; Johnson, 1996; Kingery & Glasgow, 1989; Ludlow & Gein, 1995; Padgett, 1991; Rubin et al., 1993; Skelly et al., 1995). Although the model has been used as a framework for investigating the role of self-efficacy in diabetes education in different

ways than that chosen for this study, it is interesting to note that similar patterns related to self-efficacy as a predictor of self-care and improved diabetes outcomes have emerged in the research. Social Cognitive Theory provided a useful conceptual framework for this study with respect to helping to explain the relationship between self-efficacy and self-care. The applicability of Social Cognitive Theory as a guiding framework for further research related to diabetes self-efficacy and self-care is recommended. Furthermore, its usefulness as a conceptual framework for understanding self-efficacy with relation to other health care behaviours and health care problems is also warranted.

Considerations of the Study

It is important to address design issues and other variables impacting on the results when attempting to place research findings in the proper perspective. The following considerations should be made when interpreting the findings of this study:

1. External validity was limited in this study due to a small sample size and the nature of the convenience sample obtained from the diabetes education clinic accessed in this study. The site accessed is a single community health centre in a western Canadian city. The use of a non-experimental design with no control group warrants a larger sample size to have greater confidence in the results. Additionally, the uniqueness of the diabetes education program at the Clinic limits the ability to generalize findings of this study to other diabetes education programs. Despite the fact that all diabetes education programs throughout the province follow the same Diabetes Education Resource (DER) as a framework for providing diabetes education, variations may exist between the different programs. Examples of variations may include type and length of class offered,

sequencing of information, availability of facilities, and character of facilitators which may have individual effects on study results.

2. Internal validity is another area of concern for this study. Internal validity is dependent upon the stability of data collection instruments. The instruments used in this study were modified in consultation with and with permission from authors of the scales. It is important to note that modifications to the instruments may have resulted in an inability to capture the intended nature of the constructs of diabetes self-care and diabetes self-efficacy, and may pose a threat to internal validity. More studies would need to be done to establish construct validity of the tools.

The diabetes self-care construct was measured using a modified version of the Summary of Diabetes Self-Care Activities questionnaire (SDSCA). Only one item on this well established and tested instrument had been modified for use in this study, thus, adding to the validity of this measure. However, this places some limitations on being able to compare this study's results with other study results using the original total scale. Given the lack of empirical testing with the modified version of this instrument, more research using larger randomized samples would be useful in establishing construct validity.

The concept of self-efficacy was measured using a modified version of the Diabetes Self-Efficacy Scale (DSES). The original DSES, which is a 25 item tool had been tested for internal validity. For this study, 14 out of the 25 items needed to be modified to reflect the content being taught at the diabetes education clinic. Although this was done in consultation with the author of the scale, who made suggestions for

changes in wording, these modifications add concern related to construct validity for this scale. Because of this, results cannot be compared with other study results using the original total scale. Once again, more empirical research using the modified version of this scale would need to be carried out to establish validity.

Another threat to internal validity is the possible inaccuracy of responses obtained from participants from either the DSES, SDSCA, or the Demographic questionnaire. For this study, it was necessary to rely on self-report for these measures. This can result in a number of possible problems. For the demographic questionnaire, participants may have had difficulties in remembering when they were diagnosed with diabetes. In addition, some participants may have responded in a way which would make them appear "better" with regard to level of education or level of income. With regard to the DSES or SDSCA, participants may have responded on the questionnaires in a way which would make them appear more compliant.

3. The control of extraneous variables on self-care or self-efficacy scores such as mood, illness, or other life events was not possible, but could have affected the results of the study. During data collection, some participants commented that their responses may have been affected because of a current life event, illness, or setback in their disease.

4. There was a lack of consistency in reported lengths of diabetes diagnosis. This could have had implications on self-efficacy or self-care scores. For instance, those individuals who have been diagnosed for a longer may be coping better and therefore have improved self-efficacy or self-care skills. Conversely, those with a long-time diagnosis may demonstrated decreased adherence to diabetes self-care regimens due to a

long-standing familiarity with a routine which they may find boring or ineffective. On the other hand, those recently diagnosed do not have the benefit of the years of knowledge and experience which could have negatively impacted on their reported levels of self-efficacy or self-care.

5. A relatively small sample size resulted in lower power of statistical procedures to detect a large effect. Increased power causes one to have more confidence in significant results. A larger sample could have provided an opportunity to identify more subtle relationships between variables that did not correlate significantly.

6. Statistical analyses were conducted on group data and offers information about how the study group as a whole performed. Information on individual participants was not examined. It is possible that certain participants may have performed in a completely differently manner than that which was represented by the entire sample.

7. Study results could have been affected by the fact that the diabetes education facilitators were not consistent for all sessions offered. Although the facilitators follow the same curriculum, differences in teaching styles, and varying emphases on content or behaviour modification could have been presented. Additionally, individual facilitators ultimately bring personal beliefs and values which influence their interpretation of the educational content.

8. Location for data collection was not always consistent for all participants. Participants completed the second set of questionnaires in their home independently, and various environmental influences could have affected their responses. Additionally, some individuals chose to meet the researcher at a location other than the home, which could

have affected responses in a different way. Finally, because of an inability to meet with the researcher, some participants chose to complete final set of questionnaires independently and mailed them to the researcher.

9. There were some inconsistencies in time periods for data collection (i.e. Time 1= up to one week prior to class, Time 2=no later than one day after class, Time 3=3-4 weeks after class). The differences in data collection times among participants may have been confounding variables in the study. Though fairly consistent, better results could have been obtained if all participants completed the required questionnaires at identical times prior to or after the education session.

10. This study does not provide information on longitudinal measures of self-efficacy & self-care beyond one month after diabetes education session. A study which would have spanned a longer time period (e.g., 6 months to1 year could have provided more information regarding the extended impact of the group education on self-efficacy and self-care.

Implications for Diabetes Education

The results of this study have implications for practitioners providing diabetes education to clients. It is important to note that Social Cognitive Theory is not a framework used at the clinic for diabetes education, nor is improving self-efficacy considered an explicit goal of the program. Self-efficacy is incorporated into the Diabetes Education Resource (DER) manuals as one concept, among many which are used from a variety of different models (e.g., Health Belief Model, Transtheoretical Model, etc.). However, results of this research study indicate that self-efficacy improved over the

course of the study (from pre-program to post-program). Although improving self-efficacy is not an explicit goal of the program, it was evident that the four sources of information were incorporated into the program (verbal persuasion, performance accomplishment, vicarious experiences, physiological state).

This study supports the importance of incorporating self-efficacy and its four sources of information into diabetes education curricula. Van de Laar and Van der Bijl (2001) discuss strategies for enhancing self-efficacy in diabetes education by directing efforts toward the four sources of information. Performance accomplishments help people focus on their successes. By helping people set achievable short term goals and focussing on the success of attaining these goals, self-efficacy may be enhanced. Positive results achieved by the client should be attributed to personal efforts, and not to accidents, coincidence, or as a result of professional help. Attaining goals may be achieved by breaking up tasks into steps; first easy, then difficult, thereby allowing the client to build self-efficacy at each step.

Verbal persuasion can be used to persuade individuals to adopt self-care behaviours needed to manage their diabetes. For clients to build self-efficacy using this source of information, it is important for the diabetes educator to offer positive feedback, as clients will have more confidence in themselves if others have the confidence they will succeed. The success of verbal persuasion depends on the reliability of the source. In other words, clients will experience increases in self-efficacy if the educator demonstrates expertise, credibility, and attractiveness.

Vicarious experience allows individuals who have had success with regard to

adopting lifestyle changes model for others who have diabetes. In group education, effective modeling can be achieved by placing individuals with similar characteristics in the same group whenever possible. Modeling can also be done through the use of videos using comparable models, role playing (best incorporated in group education), or demonstrations by educators or peers.

Diabetes self-efficacy may be enhanced through information gained from a client's physiological state. This can be achieved by improving a client's physical condition. This may involve dealing with health complications or specific health events. Self-efficacy can also be increased by reducing stress. Individuals will experience increased self-efficacy when they are relaxed. Stress reduction techniques may include hypnosis, biofeedback, relaxation, medication, or meditation. Finally, self-efficacy can also be increased by decreasing negative emotions associated with one's condition, or by correcting false interpretations of a client's physical condition.

It is important to ensure diabetes educators and practitioners understand the concept of self-efficacy and its use in diabetes education. This can be done by providing an inservice to educators on the concept of self-efficacy and the four sources of information. Self-efficacy enhancing strategies directed toward the four sources of information can be incorporated into teaching strategies used in the inservice. Therefore, by enhancing self-efficacy of educators, the concept can be more easily understood.

It is plausible to suggest that the purposeful inclusion of these four sources of information into the diabetes education program would enhance self-efficacy, and thus one's ability to carry out the required self-care to manage one's diabetes and maintain

optimal blood glucose levels. The UKPDS (1998) and the DCCT (1993) have illustrated the importance of maintaining blood glucose levels as close to normal levels as possible. By doing this, the onset of long-term complications related to diabetes may be delayed or eliminated altogether.

Implications for Research

The findings of this study provide implications for continued research in this field. Although the findings add support to the importance of the use of self-efficacy in diabetes education programs, much more can be done to add to this growing body of knowledge. One of the limitations of this study was its brevity with respect to time intervals for measurement. Follow-up self-efficacy and self-care scores were measured one month after the educational program. A number of researchers have recommended conducting longitudinal studies where variables such as self-efficacy and self care can be measured at 6 month or one year time periods (Rubin et al., 1989; 1993). It would also be beneficial to replicate this study using a larger sample size so that the verity or limits of its findings could be established.

Another limitation of this study was the use of a quasi-experimental study design. Both characteristics of lack of randomization and control group contributed to the weakness of the quasi-experiment in allowing the researcher to make causal inferences (Polit & Hungler, 1995). The use of a true experimental research design, employing both characteristics of randomization and control group are recommended in cementing the validity of the findings of this study.

Nursing Education

The knowledge gained from this study holds relevance for nursing education. Nurses are faced with the challenging task of assisting patients to make lifestyle changes, not only for diabetes, but for many other acute and long-term diseases. This study has demonstrated that self-efficacy increases as a result of diabetes education, which in turn improves diabetes self-care practices. The findings of this study could be extended to other acute and chronic diseases where patients are required to make changes affecting their self-care practices. There may be benefit to teaching the relevance and use of the self-efficacy concept to both practising nurses and nursing students. The importance of self-efficacy as it applies to patient education should be incorporated into nursing curricula so that benefits to the client may be seen. Continuing education for practising nurses can include seminars on the usefulness of self-efficacy in client education.

Summary of Research Study

This study examined the effects of health education on self efficacy and self-care practices of adults with Type 2 diabetes. This study adds to current and past research examining the role of self-efficacy in diabetes education. The results of the data analysis showed overall improvements in both self-efficacy and self-care over the course of the diabetes education program. Self-efficacy, though shown to be positively correlated with self-care at the outset of the program, did not emerge as a significant predictor of self-care at the follow-up data collection period. Level of education was shown to be positively correlated with pre-program and post-program self-efficacy.

Diabetes education programs have the difficult task of preparing adults with Type

2 diabetes with the information they need to manage their disease and prevent long-term complications associated with it. The findings of this study provide information to diabetes educators and program planners about the benefits of incorporating the concept of self-efficacy into diabetes education programs. This study also provides support for the use of Social Cognitive Theory as a framework for understanding the how individuals acquire and maintain diabetes self-care behaviours. Directions for continued diabetes education and research are provided.

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Appendix A

Operational Definitions

Construct	Concept/Variable	Operational Definition
Person	Person with diabetes	Adult with Type 2 diabetes currently managing blood glucose levels with the use of diet, exercise, and oral hypoglycemic agents (OHA)
Efficacy Expectation	Diabetes self-efficacy	The belief about one's ability of performing a specific behaviour in a particular situation (Bandura, 1986). Self-efficacy reflects a person's perceived, rather than actual capabilities, and it is these perceptions and not one's true abilities that influence behaviour (Strecher et al., 1986). In diabetes, self-efficacy refers to one's belief in one's ability to monitor, plan, and carry out the self-care behaviours necessary to control one's diabetes.
Independent Variable	Diabetes group education session	Introductory group education class for Type 2 adults on oral hypoglycemics at Youville Clinic, Diabetes Education Resource (DER) Winnipeg, Manitoba. The class is 4 hours in duration (2 hours with Registered Nurse and 2 hours with Registered Dietician).
Behaviour	Diabetes self-care	Those daily behaviours of monitoring, planning, and carrying out of the self-care behaviours typically required of persons to manage their diabetes (Hurley & Shea, 1992). These behaviours include self blood glucose monitoring, nutrition management, physical activity, medication management, and foot care (Meltzer et al., 1998)
Outcome	Improved self-efficacy & self-care	Improvement in self-efficacy or self-care scores (>.5)

Appendix B

Diabetes Self-Efficacy Scale (DSES)

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 managing *your* diabetes. After reading each statement, check the box that best expresses your beliefs. There are no right or wrong answers.

Check ✓ 1 If you strongly disagree with the statement
2 If you moderately disagree with the statement
3 If you slightly disagree with the statement
4 If you slightly agree with the statement
5 If you moderately agree with the statement
6 If you strongly agree with the statement
NA If the statement does not apply to you

	1 strongly disagree	2 moderately disagree	3 slightly disagree	4 slightly agree	5 moderately agree	6 strongly agree	not apply
1. Making healthy food choices to control my diabetes is very difficult for me.							
2. I can't exercise because I don't know how much exercise is safe for me.							
3. It is too difficult for me to take my diabetes medication(s).							

	1 strongly disagree	2 moderately disagree	3 slightly disagree	4 slightly agree	5 moderately agree	6 strongly agree	not apply
4. I have trouble making healthy food choices to control my diabetes on holidays such as birthdays, and other special occasions.							
5. I can't get myself to exercise in bad weather.							
6. When I go to parties, I can continue to make healthy food choices to control my diabetes.							
7. I have trouble taking care of my diabetes.							
8. I can't manage my diabetes in new situations.							
9. Exercising regularly is too difficult for me.							
10. My diabetes constantly defeats me.							
11. I am able to make healthy food choices while on vacations to control my diabetes/blood sugar levels							
12. I have trouble finding ways to add exercise to my daily routine.							
13. I have difficulty taking my diabetes medicine(s) when away from home so I avoid eating out.							

	1 strongly disagree	2 moderately disagree	3 slightly disagree	4 slightly agree	5 moderately agree	6 strongly agree	not apply
14. I can adjust the foods that I eat to prevent low blood sugar reactions when I exercise.							
15. Making healthy food choices to control my diabetes is too confusing for me to follow.							
16. I can't exercise because I worry about having a low blood sugar reaction because of my diabetes.							
17. I have the skills necessary to take care of my diabetes.							
18. It's difficult for me to make healthy food choices to control my diabetes around people who are not aware that I'm diabetic.							
19. I can't make healthy food choices to control my diabetes when I eat out.							
20. I can adjust my food choices when I get sick to manage my diabetes or sugar levels.							

Modified from original Diabetes Self-Efficacy Scale (1986) developed by Katherine Crabtree, RN, DNSc, Professor of Nursing, Oregon Health Sciences University (1986).

Appendix C

Summary of Diabetes Self-Care Activities (SDSCA) Measure

The questions below ask you about your diabetes self-care activities during the past 7 days. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick. Circle the appropriate response for each question.

Diet

1. How many of the last SEVEN DAYS have you followed a healthful eating plan? (Circle one)

   0 1 2 3 4 5 6 7

2. On average, over the past month, how many DAYS PER WEEK have you followed your eating plan? (Circle one)

   0 1 2 3 4 5 6 7

3. On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables? (Circle one)

   0 1 2 3 4 5 6 7

4. On how many of the last SEVEN DAYS did you eat high fat foods such as full fat (rather than lean) red meat or full fat dairy products? (Circle one)

   0 1 2 3 4 5 6 7

Exercise

5. On how many of the last SEVEN DAYS did you participated in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking). (Circle one)

0 1 2 3 4 5 6 7

6. On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work? (Circle one)

0 1 2 3 4 5 6 7

Blood Sugar Testing

7. On how many of the last SEVEN DAYS did you test your blood sugar? (Circle one)

0 1 2 3 4 5 6 7

8. On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider? (Circle one)

0 1 2 3 4 5 6 7

Foot Care

9. On how many of the last SEVEN DAYS did you check your feet? (Circle one)

0 1 2 3 4 5 6 7

10. On how many of the last SEVEN DAYS did you inspect the inside of your shoes? (Circle one)

0 1 2 3 4 5 6 7

Medications

11. On how many of the last SEVEN DAYS, did you take your recommended diabetes medication? (Circle one)

0 1 2 3 4 5 6 7

Smoking

12. Have you smoked a cigarette--even one puff--during the past SEVEN DAYS?

0. No

1. Yes. *If yes*, how many cigarettes did you smoke on an average day?

Number of cigarettes_____

Modified from Original Summary of Diabetes Self-Care Activities (SDSCA) questionnaire developed by Toobert, Hampson, & Glasgow (2000)

Appendix D

Demographic Questionnaire

1. Gender: ☐ Male ☐ Female

2. What is your date of birth?_____

3. What is your marital status?
   - ☐ Single
   - ☐ Married
   - ☐ Common law
   - ☐ Separated
   - ☐ Divorced
   - ☐ Widowed

4. **Education**: (Circle last year of education completed)

   Grade school through high school
   1 2 3 4 5 6 7 8 9 10 11 12 13

   Vocational or community college
   1 2 3 4

   University
   1 2 3 4 5 6 7 8 9

5. What is your racial background?
   1. White
   - ☐ Native/Metis
   - ☐ Asian
   - ☐ Black
   - ☐ Other_____

6. Mark the response that most accurately reflects your **total family income** for last year before taxes:

- ☐ Below $10,000
- ☐ $10,000-19,999
- ☐ $20,000-29,999
- ☐ $30,000-39,999
- ☐ $40,000-49,999
- ☐ $50,000-59,999
- ☐ $60,000-69,999
- ☐ $70,000-79,999
- ☐ $80,000-89,999
- ☐ $90,000-99,999
- ☐ Above $100,000

7. When were you told that you had diabetes? (include date)

_____

8. Have you ever attended a diabetes patient education program (a series of classes)?

No ____ Yes ____ (If "Yes", when?_____)

10. How would you rate your understanding of diabetes and its treatment? Circle one number.

Poor						Excellent
1	2	3	4	5	6	7

11. Are you now taking diabetes pills? ☐ Yes ☐ No

Thank you for taking the time to fill out this questionnaire.

Adapted from University of Michigan Diabetes Research and Training Center "Diabetes Attitude Questionnaire" Diabetes Empowerment Scale

Appendix E

Request for Permission to Release Names of Potential Participants
(Used by Youville Clinic staff when approaching or contacting potential participants)

Ana Stipanović is a registered nurse and a Master of Nursing student from the Faculty of Nursing, University of Manitoba. She is doing a research project as part of her thesis on behaviours of adults with Type 2 diabetes undergoing a diabetes education program.

Any information given is strictly confidential. Whether or not you decide to participate will in no way affect the care you receive.

Mrs. Stipanović would like to talk to you and tell you more about the study so that you can decide if you would like to participate. Would it be alright with you if I give her your name, phone number, and date of your diabetes education class so that she can explain the study to you?

(If agreeable, the name of the individual is given to the researcher and the staff member thanks him/her).

(If the individual declines, the staff member thanks the individual for his/her time).

Appendix F

Explanation of the Study to Potential Participants

(Used by the researcher when approaching potential participants in person or by phone)

Hello, my name is Ana Stipanović and the staff member at Youville Clinic gave me your name as being willing to hear more about a research study I am doing. I am a registered nurse and a Master's student at the Faculty of Nursing, University of Manitoba. I am conducting research as part of my thesis on self-efficacy and self-care behaviours of adults with Type 2 diabetes undergoing a diabetes education program. Do you have time to talk right now?

The study consists of completing 3 questionnaires which look at how you are in managing your diabetes. Altogether, the questions should take about 15-20 minutes to complete on each occasion. You would be required to answer the questionnaires at three time periods: three questionnaires no longer than one week before your diabetes class, one questionnaire up to one day after the class, and two questionnaires approximately three to four weeks later, in your home. The first questionnaire looks at your self-efficacy (how confident you are) about being able perform your diabetes care activities. The second questionnaire includes questions about how you carry out your actual diabetes self-care activities. The third questionnaire includes questions about yourself such as age, education, and duration of illness.

The information you provide will be confidential because your name will not appear on the questionnaires. You may refuse to participate in the study or stop answering questions at any time you wish without affecting the care you receive.

Would you be interested in participating in this study?

(If yes, then make appointment to meet at a place of convenience.)

(If no, "Thank you very much for taking the time to listen to me".)

Appendix G

Consent Form

The Effects of a Group Education Session on Self-Efficacy and Self-Care for Adults with Type 2 Diabetes

I,_____agree to participate in the questionnaire portion of the study, "The Effects of a Group Education Session on Self-efficacy and Self-care for Adults with Type 2 Diabetes". The purpose of this study is to determine how one's level of self-efficacy (confidence in one's ability to perform a given task) affects one's ability to perform self-care behaviours necessary to manage one's diabetes. The results of the study may be helpful to health professionals providing diabetes education and care to clients with Type 2 diabetes because it may provide information about how they might improve the education and care they give. The study is conducted by Ana Stipanović, a Master of Nursing student from the Faculty of Nursing at the University of Manitoba. The study is in compliance with the Personal Health Information Act (PHIA). The study has been approved by the Education/Nursing Research Ethics Board. Any complaint regarding a procedure may be reported to the Human Ethics Secretariat (474-7122). Access has been approved by the Youville Clinic.

My participation involves answering three questionnaires which will take approximately 15-20 minutes to complete in my home on three separate occasions. I will be asked to complete three questionnaires no longer than one week before the class, one questionnaire up to one day after the class, and two questionnaires 3-4 weeks after the class. The first questionnaire looks at my self-efficacy (how confident I am) about being able perform my diabetes care activities. The second questionnaire includes questions about how I carry out my actual diabetes self-care activities. The third questionnaire includes questions about myself such as age, education, and duration of illness. I understand that my participation is voluntary and that I may withdraw from the study at any time by simply telling the researcher. I

understand that my decision to participate or not to participate in the study will in no way affect the care I receive.

The information I provide will be confidential because my name will not be on the questionnaires. Findings outlining a report of grouped data may be published. There are no known risks involved with participating in this study. I understand that I will receive answers to any questions about the study at any time. The researcher, Ana Stipanović can be reached locally at [redacted]. Her advisor is Dr. Judith Scanlan and can be reached at [redacted]

_____

Name (please print)

_____

Signature

_____

Date

I am interested in receiving a copy of the study results "The Effects of a Group Education Session on Self-Efficacy and Self-Care for Adults with Type 2 Diabetes" once the study has been completed.

Name:_____

Address:_____

_____

_____

Phone:_____

Appendix H

Criteria for Inclusion of Potential Participants into Study
(used by Youville Clinic staff when screening for potential participants)

When screening for potential participants, they should have the following characteristics:

♦Adults with Type 2 diabetes who attend the Introductory Oral Agents Class at the Youville Clinic Diabetes Education Resource (DER).

♦Adults currently managing blood glucose levels with the use of oral agents (OHA) but who are not taking insulin.

♦Adults can be at any stage of their diabetes diagnosis. Length of diagnosis is not a limiting factor in recruitment.

♦All potential participants are required speak and read English.

♦All potential participants are required to be over the age of 18 years.

♦Pregnant women with gestational diabetes will not be included in the study.

Appendix I

Description of Group Diabetes Education Session

The Youville Clinic Introductory Oral Hypoglyemic group education session is a 4 hour comprehensive outpatient education program in which clients receive instruction from a nurse and dietician. Instruction includes information regarding pathophysiology of diabetes, self blood glucose monitoring, diet, exercise, medications and management of emergency situations. The session also provides instruction on complications and the benefits of good glycemic control. Clients are provided glucometers for free. Attempts to target self-efficacy are made through the use of verbal persuasion, vicarious experience, and enactive attainment (performance accomplishments). Clients are told to manage diet, exercise, and medications, and they have the opportunity to share their knowledge and experience in diabetes management with others. In a few instances, individuals are asked about previous successes in diabetes management or in other areas of behaviour.

Appendix J

Reliability Estimates for Diabetes Self-Efficacy Scale (DSES) and Summary of Diabetes Self-Care Activities Questionnaire (SDSCA)

Reliability Estimates for Subscales of DSES				
Subscale	**# of items**	**Pre-Program Inter-item correlations (coefficient α)**	**Post-Program Inter-item correlations (coefficient α)**	**Follow-up Inter-item correlations (coefficient α)**
Diet	9	0.5102	0.4847	0.5381
Exercise	5	0.8146	0.6622	0.7528
General Self-Management	4	0.1915	0.3851	0.2614
Medications	2	0.1326	0.0116	0.7794

Reliability Estimates for Subscales of SDSCA			
Subscale	**# of items**	**Pre-Program Inter-item correlations (*r*)**	**Follow-up Inter-item correlations (*r*)**
Diet	4	0.4212	0.4308
Exercise	2	0.6924	0.9472
Blood-glucose testing	2	0.8317	0.7295
Foot Care	2	0.7394	0.7238
-	-	mean=0.6712	mean=.7078