The effect of diabetes self-management training on perceived quality of life

Alicia Rae Huggler

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ABSTRACT

THE EFFECT OF DIABETES SELF-MANAGEMENT TRAINING ON PERCEIVED QUALITY OF LIFE

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Northern Illinois University, 2015
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Background: This study determined whether there was an improved quality of life (QOL) following diabetes self-management training (DSMT), based on Problem Areas in Diabetes (PAID) questionnaire responses. Methods: A total 59 people with diabetes participated: DSMT (n=28) and No DSMT (n=31). DSMT classes were three weeks in a row and three hours in duration. Results: The dependent t test was used to determine significance. The DSMT group had a significant improvement in scores on the PAID questionnaire from baseline of 30.98 +/-21.59 to the end of the study of 19.46 +/-19.14, indicating improved QOL (i.e. lower PAID scores=lower perceived diabetes distress). The control group had no significant changes in PAID scores from baseline 27.30 +/-14.31 to the end of the study 27.67 +/-16.95, indicating there was no QOL improvement.

Conclusion: DSMT classes helped to improve participants’ perceived QOL.
THE EFFECT OF DIABETES SELF-MANAGEMENT TRAINING ON PERCEIVED QUALITY OF LIFE

BY

ALICIA RAE HUGGLER
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A THESIS SUBMITTED TO THE GRADUATE SCHOOL
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Thesis Director
Dr. Judith Lukaszuk
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CHAPTER 1

INTRODUCTION

Background

Numerous studies have demonstrated that educational interventions to improve the self-management of diabetes have led to an increased perceived quality of life (QOL), although further research is needed to determine the distinct reasons participants believe that their QOL improved (1). Possible reasons for increased perceived QOL were improved self-efficacy, improved metabolic control (HbA1c outcomes), enhanced sense of mastery over the potential consequences of diabetes, change of diet, the incorporation of exercise, and social support (1).

There are numerous benefits in assessing a patient’s perceived QOL (1). For instance, it allows health care providers and researchers to better understand how living with diabetes impacts perceived QOL (1). People with diabetes have knowledge and skill deficits related to medication administration, glucose testing, diet, sick day guidelines, and foot care (2, 3). Due to knowledge and skill deficits, uncontrolled diabetes occurs, which in turn results in patient hospitalization (3). Less than half of the people with type two diabetes have ideal glycemic control (HbA1c <7.0%) (2). Today, one of the goals of Healthy People 2020 is to increase
the proportion of individuals with diabetes who receive formal diabetes education (4, 5). If more individuals with diabetes received diabetes education, it may lead to better glycemic control and a greater overall perceived QOL.

**Statement of the Problem**

The purpose of this study is to determine if diabetes self-management training (DSMT), a type of intervention used to improve the self-management of diabetes, improves perceived QOL. A secondary objective was to identify the factors participants attributed/associated to their perceived improvement on QOL, such as self-efficacy (confidence), improved metabolic control (HbA1c outcomes), enhanced sense of mastery over the potential consequences of diabetes, a result of changing their diet and exercise behavior, group camaraderie or social support.

**Hypothesis**

The following hypothesis was investigated:

People who have been diagnosed with type one or type two diabetes who have completed DSMT will report a higher perceived QOL (i.e. lower PAID score) after attending DSMT classes than those who have not attended DSMT classes.
**Independent Variable**

Diabetes self-management training (DSMT)

**Dependent Variables**

The participant score on the Problem Areas in Diabetes (PAID) questionnaire is one of the dependent variables (Appendix A). A QOL survey (Appendix B) was also given at a follow-up date following DSMT classes (11-week time frame) and the control group also received a survey after 11 weeks to be consistent with the experimental group to determine whether or not there was a specific reason for the improvement in perceived QOL. The specific reasons that may play an important role in improving one’s perceived quality of life (i.e. self-efficacy, HbA1c values, enhanced self-mastery over the potential consequences of diabetes, change of diet and incorporation of exercise, social support) are also dependent variables.

**Control**

Group of individuals who have diabetes but did not attend DSMT classes
CHAPTER 2

REVIEW OF LITERATURE

Introduction

Diabetes is a chronic medical illness that requires careful adherence to a daily treatment regimen that can be complex and demanding (6, 7, 8). The criteria for the diagnosis of diabetes is either a hemoglobin A1c (HbA1c) value greater than or equal to 6.5%, a fasting plasma glucose (FPG) of greater than or equal to 126 mg/dL, a two-hour plasma glucose of greater than or equal to 200 mg/dL during an oral glucose tolerance test (OGTT) using a glucose load of 75 g glucose dissolved in water, or a random plasma glucose concentration greater than or equal to 200 mg/dL (8).

In the past 25 years, the number of people with diabetes has more than doubled (9). Nearly 24 million people today in the United States have been diagnosed with diabetes (5, 10-15). Of those individuals, approximately 18 million have been diagnosed with the disease while six million of those individuals are unaware that they have diabetes (13). Also, 57 million people in the United States have pre-diabetes, a condition that increases the risk for developing diabetes (10, 16). People with diabetes they also have an increased risk of developing cardiovascular disease, kidney disease, and vascular disease (9). Today,
about 75% of aging adults have at least one chronic condition (5). Due to complications of diabetes, it is the seventh leading cause of death in the United States (4).

Diabetes is one of the most widespread and costliest of all chronic diseases in the United States (15). The annual direct and indirect costs associated with diabetes and its complications are hefty (13). In 2007, the total estimated cost of diabetes in the United States was $174 billion (15, 16). This amount includes $116 billion in excess medical expenses and $58 billion due to a reduction of national productivity (15, 16). Medical costs account for $27 billion for care to directly treat diabetes and $31 billion in excess general medical expenses (16). People with diabetes induce average expenditures of $11,744 per year, and $6,649 of that expenditure is associated with diabetes (16).

Patients hospitalized for diabetes-related complications account for 22% of all hospital charges (5). The increased health care cost accrual by those with diabetes is related to the complexity and mix of comorbid conditions that can be caused by diabetes (5). The burden of diabetes is inflicted on all sectors of society in higher insurance premiums paid by employees and employers, reduced earnings through productivity loss, and reduced overall QOL for people with diabetes (16). However, patients who participate in diabetes education are more likely to follow best practice treatment recommendations (particularly among those who have Medicare) and have lower Medicare and commercial claim costs (8).
The accumulated costs associated with treating individuals with diabetes and the increasing incidence of the disease reinforce the need to find and implement diabetes programs that successfully control, or even prevent, the onset of diabetes (16). Two landmark studies, the Diabetes Prevention Program and the Diabetes Control and Complications Trial study, demonstrated the importance of lifestyle intervention and intensive therapy (16). As described in the Diabetes Control and Complications Trial study findings, registered dietitians (RDs) are recognized as fundamental members of diabetes health care teams (16). As a result, RD involvement in diabetes care and education has increased tremendously over the last 10 years (16). Today, RDs may provide medical nutrition therapy (MNT) services for individuals with diabetes and nutrition education to these same individuals through DSMT programs (16).

Although diabetes is a lifelong condition, millions of people can live full, satisfying lives while managing their diabetes (10). The improvement of perceived QOL for those who have diabetes can be attributed to many different factors. In a meta-analysis of QOL outcomes following DSMT that included 20 comparisons across 1,892 subjects, the findings documented that people with diabetes experience improved QOL after receiving interventions designed to improve diabetes self-management behaviors (1). These findings are important because health care is not only focused on decreasing morbidity, mortality, and costs but also increasing QOL, especially for those who have to live with a chronic disease such as diabetes (1). The overall goals of diabetes treatment are to help keep glucose levels
within target; keep blood pressure and cholesterol levels in target, balance the diabetes treatment plan with daily life; prevent, delay, or slow the progression of health problems associated with diabetes; and help those with diabetes feel better each day (10, 17, 18).

However, even though QOL has been shown to improve in those who obtain self-management education, the reasons for the perceived QOL improvement are not known because interventions to help them manage their disease are not specifically designed to affect QOL (1). It has been stated in the literature that the reasons persons feel their QOL has improved after participating in an intervention designed to help them manage their chronic disease could be due to many different factors. These factors include self-efficacy (confidence), improved metabolic control (HbA1c outcomes), enhanced sense of mastery over the potential consequences of diabetes, a result of changing their diet and exercise behavior, and/or group camaraderie or social support or another reason not listed (1). While perceived QOL in diabetes patients has been studied in relation to patient demographics, type of diabetes, and diabetes treatment, it historically has not been routinely measured as part of diabetes self-management clinical trials (1). Glasgow found that only 17% of DSMT clinical trials reported in the late 1990s included a QOL outcome (1).

**QOL and Diabetes**

Researchers continue to focus on knowledge and glycemic control without focusing on a holistic view of patient function, longevity, and perceived QOL in
those with diabetes (2). It has been stated that quality of life outcomes must be brought to the forefront in future research (2). Research on QOL has increased tremendously since 1990 (14). QOL is commonly recognized as a multidimensional concept including physical health, social functioning, satisfaction with treatment, concerns about the future, and overall well-being (5, 14).

QOL is an important health outcome and is the ultimate goal of interventions to improve health (19). QOL is measured as physical and social functioning and perceived physical and mental well-being (19). It has been reported that people with diabetes have a worse perceived QOL than people without chronic disease but a better perceived QOL than people with other chronic diseases (19). The duration and type of diabetes are not consistently associated with perceived QOL (19). Intensive treatment does not impair perceived QOL and having better glycemic control is associated with better perceived QOL (19).

People with diabetes often feel challenged by their disease and its daily management demands (3, 19). The reason people who have diabetes may have a lower perceived QOL than those without diabetes could be because individuals with diabetes must deal with their diabetes all day, every day, making innumerable decisions a day in order to achieve the non-diabetic metabolic state (19). In addition, diabetes therapy, such as insulin therapy, can considerably affect QOL either positively, by reducing symptoms of hyperglycemia, or negatively, by increasing symptoms of hypoglycemia (19). The psychosocial toll of having diabetes is often a
heavy one and can affect self-care behavior and even long-term glycemic control, the risk of developing long-term complications, and perceived QOL (19).

**Potential Reasons for Increased Quality of Life**

**Self-Efficacy (Confidence)**

Since diabetes is a self-managed disease, effective self-management requires patients to comprehend and use medication, intricate treatment strategies, and problem-solving skills (13, 18). Since a lot of the burden in controlling diabetes is on the patient, it is important that he/she has good self-efficacy (9). Self-efficacy can be defined as “the belief in one’s own ability to perform a certain task” (9). Current research reports that self-management education increases self-efficacy (1, 5). Increased self-efficacy with diabetes self-management has been said to be habitually linked to increased perceived QOL in those with type one or type two diabetes (1, 19). Therefore, it can be hypothesized that self-efficacy taught in self-management classes could be the main reason for QOL improvements. Facing a disease that is difficult to manage can cause someone with diabetes to feel helpless and can significantly decrease one’s overall sense of well-being (20). However, if an individual with diabetes feels as though he/she can manage his/her diabetes, this may prevent him/her from feeling helpless, which may lead to the perceived increase in QOL (20).
**Improved Metabolic Control (HbA1c Outcomes)**

Hemoglobin A1C (HbA1c) is a laboratory blood test that displays the average glucose level within the last two to three months (8, 10). A normal HbA1c range for someone without diabetes is around 4% to 6% (10). The HbA1c target for people with diabetes is usually under 7% (5, 10). If someone with diabetes works to try and control their blood glucose level, the improvement in metabolic control (HbA1c outcome) following interventions may be the main reason for an improvement in perceived QOL, since glycemic control has appeared to have an effect on perceived QOL (1,5, 19).

In a recent meta-analysis of HbA1c outcomes, an effect size of .29 was reported, which consisted of a post-intervention HbA1c value of 7.38% for the treatment group and 7.83% for the control group (1). Even though the effect size seems low, this example was shown by the author to be considered clinically meaningful (1). A number of studies regarding HbA1c and QOL suggest that a relationship does exist, especially when diabetes-specific QOL scales are used versus generic scales (19).

In a randomized, controlled, double-blind trial where participants either took glipizide GITS (a sulfonylurea which assists the pancreas in releasing more insulin) or a placebo, Testa and colleagues assessed various outcomes, including QOL, and found that increases of HbA1c of more than or equal to 1% lead to an ample reduction in QOL, while decreases of HbA1c of more than or equal to 1% displayed smaller but clinically significant improvements in QOL (19). The authors
explained that QOL could have been improved because of the fact that participants in the study experienced barely any hypoglycemic episodes, thus creating no counterbalance to the QOL improvements seen with reduced hyperglycemia (19). Also, that the control group had substantial hyperglycemia, thus increasing the probability that any glycaemia-related effects on QOL could be observed (19).

Another study conducted between October 2009 and August 2010 assessed whether or not the PAID scale (Japanese version) scores correlated with glycemic control (21). In the study, 3,479 patients’ data for type one and type two diabetes were obtained at the Tenri Hospital in Nara, Japan (21). It was determined that diabetes distress measured by the PAID survey was associated with poor glycemic control, and this association was modified by diabetes therapy (21). The average age of participants was 64.3 years, average time since diabetes diagnosis was 13.9 years, and average HbA1c was 7.5% (7). Five percent of participants had type one diabetes and 44.5% of participants received insulin therapy (7).

In a study conducted by Franciosi et al., the frequency and the factors associated with the practice of self-monitoring blood glucose (SMBG) was determined with its association with QOL (22). In this study, 2,855 people with type two diabetes participated and were recruited from 101 outpatient diabetes clinics by 103 general practitioners (22). The patients were requested to complete a questionnaire investigating SMBG practice, the presence and severity of diabetes complications and comorbidities, and their perceived QOL (22). The study revealed that for those with type two diabetes, there is a correlation between self-monitoring and improved
metabolic control for those treated with insulin (22). For patients not treated with insulin, a higher frequency of SMBG was related to higher HbA1c levels, therefore suggesting that patients with poor metabolic control have a greater tendency to self-monitor (22). Overall, for those with diabetes who obtain an HbA1c value less than 7% may feel that this has positively affected their QOL.

**Enhanced Sense of Mastery over the Potential Consequences of Diabetes**

People may feel that their QOL has improved due to enhanced sense of mastery over the potential consequences of diabetes, which may occur from education such as DSMT classes (1). Complications of diabetes have been said to be the most important disease-specific causation of QOL (19). Since self-care can be considered demanding, dismaying, and overwhelming, being able to gain control by self-care could enhance one’s perceived QOL (20). Also, the fact that long-term complications may be severe and can lead to considerable changes in the patient’s capability of functioning in daily life could be another reason being able to manage diabetes could reduce or prevent adverse complications from occurring by proper self-care (20). Long-term complications of having diabetes could include vision loss, kidney damage, heart disease, erection problems, peripheral neuropathy resulting in life-long pain, amputation of limbs and/or having trouble walking, or can lead to other autonomic neuropathy problems (such as gastroparesis or loss of bladder function) (20). Therefore, if a patient is able to manage his/her diabetes this can relieve any stress or worry about obtaining any of these long-term complications
which can lead to his/her perceived increase of QOL (20).

Those with diabetes can also bear the brunt of short-term complications while living with diabetes (20). These include increased blood glucose levels causing one to feel fatigued, sleeping difficulties, frequent infections, and other issues (20). Patient education can also be important in involving patients to become more self-sufficient in managing their own diabetes and lead to an increased adherence to therapy (17). Suboptimal QOL may cause severity of diabetes and contribute to a perception of having a threatening disease trajectory (5). Diabetes severity, years of having diabetes, perceived risk of developing complications, and comorbid conditions would be negatively associated with health-related QOL (5). In addition, those who perceive their diabetes to be threatening would be likely to have suboptimal health-related QOL (5).

In a study by Scollan-Koliopulous et al., 110 individuals were surveyed using the Brief Illness Perception Questionnaire, a 26-item Short Form Health Survey (SF-36) (5). Hospital adults who lived in an urban area were considered very low income, were surveyed in order to determine the severity of their diabetes, expected disease trajectory, and perceived QOL (5). Overall, the findings of this study indicated that those who view themselves as being at high risk for diabetes-related complications such as amputation, kidney failure, stroke or nerve damage are the same individuals who perceive their diabetes to be less threatening (5). The author said that may be due to the acceptance of those who have had diabetes for a longer
duration and may represent a precise self-assessment of reality of one’s circumstances while living with diabetes (5). Acceptance of functional loss is a desired outcome of adjustment in coping with diabetes and has been shown to improve perceived QOL (5). Acceptance of diabetes as a threat would be a prerequisite to problem-solving, coping, and self-care behavior, and self-care behavior leads to glycemic control, which will ultimately lead to improved physical and mental functioning (5). Resources therefore can help those with a longer duration of diabetes accept the inalterable functional loss associated with living with diabetes to the degree that motivation can be continued to maintain self-care behavior so that the functional limitations can be self-managed (5). Overall, by being able to properly manage diabetes and feeling as though complications are avoidable by doing so can potentially increase perceived QOL in those with diabetes.

Result of Changing Their Diet and Exercise Behavior

As stated by the American Diabetes Association (ADA), medical treatment and lifestyle modifications including physical activity and changes in diet are the foundation of effective diabetes management (23). Those with diabetes who improve their diet and exercise habits in a positive manner may experience improved perceived QOL (1). Previous research has documented improved QOL following positive health behavior change among those who have diabetes (1). Diabetes edu-
cators can address barriers of being active such as physical, environmental, psychological, and time limitations to their patients to help patients increase their current level of activity (24).

There are numerous benefits of healthy eating for people with diabetes including improvement of glycemic control and lipid profiles, maintenance of blood pressure in the target range, and weight loss or weight maintenance (13, 24). Also, exercise is substantial for those with type one and type two diabetes (13, 24). For those with type two diabetes specifically, partaking in regular exercise may improve glycemic control and reduce the risk of macro- and microvascular complications, increase insulin sensitivity, decrease stress and depression, aid in weight loss/maintenance, and help to control lipids and blood pressure, thereby reducing the risk of heart disease (13). Patients with type one diabetes can also benefit from regular physical activity as well (13). Outcomes of regular exercise can include improvements in glycemic control, reduced risk of heart disease, improvements in lipid profile and blood pressure, improvements of endothelial function (a marker for heart disease risk), improvements in insulin sensitivity, and weight loss (13).

Current evidence strongly supports the benefits of becoming physically active as a way to manage diabetes (8, 13). Recommendations for adults who have diabetes are at least 150 min/week of moderate-intensity aerobic activity during at least three days per week, with no more than two consecutive days without exercise (8). Also, adults with type two diabetes should perform resistance training at least twice per week if able (8), although sudden changes in diet and exercise behavior
could be considered overwhelming to diabetes patients, especially to those who need life-long behavior change in order to avoid complications that can be caused by unmanaged diabetes (1). This in turn may cause people with diabetes to fear making lifestyle changes because they fear that their QOL could be negatively affected (1). However, studies are proving the opposite to be true (1). Even a minuscule increase in activity level can have a tremendous positive effect on diabetes control and overall health (10). It can help lower blood glucose levels; increase insulin sensitivity; create a feeling of well-being; increase energy levels, improve heart health and lower blood pressure, increase strength, endurance, and flexibility; and aid in weight loss and weight loss maintenance (10).

Each patient is responsible for deciding what, when, and how much to eat each day (24). Factors of deciding what to eat include food availability, family eating patterns, habits, emotions, food preferences, blood glucose control, and knowledge of how food affects diabetes control and overall health (24). Also, being able to make healthy food choices, understanding serving sizes, and learning when the best times to eat each day are crucial in managing diabetes (24). Also, those with diabetes need to know how to count fat and carbohydrate grams, how to read labels, and how to properly measure out food in order to properly manage blood glucose levels (24). Also, by making appropriate food choices, controlling weight and achieving optimal blood glucose levels, many people with diabetes are able to manage their diabetes without having to rely on medication (24). Patient education such as DSMT can help to improve one’s diet, current physical activity level, and
smoking cessation efforts, all of which can help to improve glycemic control and postpone or prevent negative complications to occur (17). Therefore, a lifestyle change including diet and physical activity behavior modification can be the root cause for one’s perceived improvement of overall QOL.

**Social Support**

Group camaraderie could also be a reason for improvements in perceived QOL for those who participate in DSMT classes. Researchers have reported that higher levels of perceived social support are correlated with higher levels of social functioning in people with diabetes who are following an intensive insulin treatment plan; higher levels of social support were also correlated with higher overall perceived QOL in patients with type one diabetes (19). Also, higher self-reported levels of self-efficacy and diabetes-related social support were associated with higher scores on the Finnish version of the SF-20 (generic QOL scale measure) in a group of patients with type one diabetes and better social relations and fewer family altercations were correlated with improved health-related QOL as assessed by the Duke Health Profile and the General Health Perceptions Questionnaire (19).

Diabetes can affect the quantity and quality of a patient’s relationships with others (20). Patients may have to change daily habits in order to effectively manage their diabetes (20). This may lead to friends and family members rebelling and avoiding participating in any necessary changes the patient needs to make in order to manage his or her diabetes (20). On the other hand, friends or family members
may begin to push for self-care changes when the patient is unwilling to make any changes to improve his/her diabetes (20). Friends and family members could potentially also begin to act like the “diabetes police,” which may cause arguments to occur (20). People with diabetes may also feel alone, different, unsupported, and/or believe that no one understands what living with diabetes is truly like (20). Therefore, being a part of DSMT classes may help the patient to feel supported and feel understood by others also participating in DSMT classes and could therefore be the greatest reason for an improvement of perceived QOL (20).

**Diabetes Self-Management Training (DSMT)**

DSMT helps teach individuals with diabetes how to properly manage their diabetes and has been a crucial part of clinical management since the 1930s (2). Under Medicare regulations, DSMT includes a nutrition education component based on the National Standards for Diabetes Self-Management Education, endorsed by the American Diabetes Association (ADA) to promote quality education for people living with diabetes (16, 25). These standards are reviewed about every five years by key organizations and federal agencies within the diabetes education community (8, 16, 25). The American Diabetes Association Education Recognition Program assesses whether or not DSMT applicants meet the National Standards for Diabetes Self-Management Education (16). Also, all DSMT programs must be ac-
credited by a national accreditation organization approved by the Centers for Medicare and Medicaid Services (CMS) (16). Currently, CMS recognizes the ADA and the Indian Health Service as approved national accreditation organizations (16).

DSMT includes instruction of how to test and interpret blood glucose levels, education about diet and exercise, instruction of insulin treatment plans needed by certain patients, and motivation for patients to self-manage their diabetes (26). Unfortunately, more than 50% of people with diabetes either receive limited or no education at all (3). In a nationwide sample, 41% of people with type one diabetes, 51% of people with insulin-treated type two diabetes, and 76% of people with non-insulin-treated type two diabetes stated they had never attended a diabetes education class, course or any other education program designed for those with diabetes, even though DSMT is a crucial component in diabetes care (3, 13). The AADE recognizes the need to make DSMT available to all persons with diabetes (13).

In the Balanced Budget Act of 1997, Congress permitted Medicare to pay for DSMT if the treating physician or treating qualified non-physician practitioner (NPP) certifies that such services are needed (8, 26). Medicare covers the cost for DSMT when DSMT is provided by someone who meets certain quality standards (16, 26). The referring physician or NPP “must maintain the plan of care in the beneficiary’s medical record and documentation substantiating the need for training on an individual basis when group training is typically covered, if so ordered” (26). The order must include a statement signed by the physician (or NPP) that the ser-
vice is needed as well as the number of initial or follow-up hours ordered (the provider can order less than 10 hours of training), the topics needed to be covered in DSMT classes, and whether or not the beneficiary should receive individual or group training (26). The primary providers of DSMT are registered nurses, registered dietitians, and registered pharmacists (3, 13, 25). However, those who are able to provide DSMT are physicians, nurse practitioners, dietitians, and diabetes educators (26). Overall, DSMT has been proven to be more effective when provided by a multidisciplinary team with a well-rounded plan of care (25). Multiple professional interventions have been shown to lead to improvements in patient outcomes and improvement of the process of care as well (17).

The Centers for Medicare and Medicaid Services (CMS) stated that patients who meet the following criteria within 12 months before training begins are eligible to participate in DSMT (26). The criteria for eligibility includes being newly diagnosed, having a change in treatment, or are at risk for complications such as inadequate glycemic control (i.e. emergency room visits or hospitalizations due to acute episodes of severe hyper- or hypoglycemia); diagnosis with eye disease; lack of feeling in feet or foot problems such as ulcers, deformities, or amputation; and diagnosis with kidney disease, all of which are related to diabetes (26). Skills taught in DSMT classes include carbohydrate counting, portion control, meal spacing, and self-monitoring of blood glucose (SMBG) (27). Education also includes information about proper exercise, heart-healthy eating, foot care, sick day management,
monitoring for diabetes complications, self-management problem solving, and information regarding the progression of type two diabetes (27). Patients are told to monitor their current behavior by keeping food and blood glucose records and are encouraged to create treatment and behavior goals (27). Medicare beneficiaries with Part B coverage may be eligible for 10 hours of initial training in a 12-month period, and this plan covers up to two hours of follow-up training for each subsequent year after that (21). Medicare Part B covers expenses for medical services provided in an outpatient setting such as DSMT to those who qualify (23).

To limit variation in educational interventions, the National Standards for Diabetes Self-Management Education Programs (DSMEs) were developed (27, 28). DSMT and DSME are interchangeable names for the program. The standards for the program are that patients with diabetes require both knowledge and skills to manage their disease, which result in more informed choices and beneficial changes in behavior (27). Appropriate self-management behavior improves clinical indicators and reduces one’s risk of developing diabetes-related complications (27). Based on this evidence-based conjecture, the seven outcome areas of diabetes education recently defined by the American Association of Diabetes Educators (AADE) and the 10 content areas identified in the National Standards for DSMEs are stated in behavioral terms to guide educators to promote behavior change, rather than focusing solely on increasing knowledge, which has been the traditional approach (27, 28). The seven outcome areas of diabetes education focus on seven self-care behaviors that are essential for improved health status and greater QOL
The seven AADE self-care behaviors are healthy eating, being active, monitoring, taking medication, problem solving, health coping, and reducing risks (5, 13, 24, 28).

As stated by the American Association of Diabetes Educators (AADE), diabetes education through DSMT is a way people with or at risk of developing diabetes gain the knowledge and skills needed to change behavior and successfully self-manage diabetes and to prevent complications (28). The intervention is designed to help participants achieve optimal health status, a better QOL, and reduce the need of the individual to have to pay a lot of money towards health care (28). One of the most important factors influencing the manner in which diabetes education has been delivered over the past decade is the monetary constraints imposed on these types of programs (27). Group-based education therefore was supported by the Balanced Budget Act of 1997, and it resulted in the reimbursement for diabetes education from the Health Care Finance Administration (HCFA) (27). This outcome encouraged diabetes programs to deliver education in a group setting instead of an individual setting (27). The HCFA stated that group sizes for DSMT should consist of 2 to 20 members or an average of 10 individuals at each session (27). Interventions that also include a follow-up component were shown to improve the process measures (17). If follow-up is not included in a program it has been shown to increase one’s risk of developing complications from the diabetes (17).
QOL Scale

QOL measures should be used to guide and evaluate treatment interventions (19). Health-related QOL (HRQOL) is the value assigned to duration of life such as impairments, functional states, and perceptions that are influenced by disease, injury, treatment, or policy (14). Health outcomes research for chronic illness is becoming increasingly concerned with the patient’s view of the clinical effectiveness and treatment process (14). More and more, researchers have used disease-specific assessments instead of generic measures to increase the effectiveness of being able to identify the factors most important to the health-related QOL of people with a specific disease (14, 19). Disease-specific instruments provide a more detailed and accurate assessment of patients’ concerns and are an important primary endpoint in clinical trials designed to measure changes in HRQOL (14).

Studies utilizing generic instruments such as the SF-36, SF-20 or non-English language versions of these instruments often report null findings (19). Only one study which used the SF-36 to assess QOL found significant associations between HbA1c and some SF-36 scales in a few sub-populations (19). In a study of 150 insulin-requiring adults, HbA1c levels were significantly related to diabetes specific scale scores but were not related to SF-36 scale scores (19). It has been stated that a well-designed generic QOL scale will not cover certain aspects of living with diabetes such as hypoglycemia, insulin injections, SMBG, and dietary restrictions,
which may be critical to measure to determine an individual’s health-related QOL (12, 19, 29).

**PAID Questionnaire**

The PAID survey is a measure of psychosocial adaptation specific to diabetes (19) (Appendix A). The PAID survey contains items measuring the burden of the illness, satisfaction or dissatisfaction with treatment, impact of treatment, and worries about the future while living with diabetes (19). The PAID survey was developed by researchers associated with the Joslin Diabetes and Harvard Medical School (14). The author designed the PAID survey in order to determine the emotional responses of living with diabetes for those with type one or type two diabetes and was also designed as a clinical tool and an outcomes measure (19, 30). For a HRQOL instrument to be considered a well-designed measurement tool, it must have good reliability, validity, responsiveness, and interpretability at the item and scale levels (30).

The PAID Questionnaire consists of 20 questions that cover various emotional states frequently reported for those with type one and type two diabetes (30). The PAID survey provides a total score ranging from 0 to 100, where a higher score indicates greater diabetes-related distress (6, 15, 30). The PAID uses a 5 item Likert-type scale that includes: Not a problem = 0, Minor problem = 1, Moderate problem = 2, Somewhat serious problem = 3, Serious problem = 4 (15, 30). The 0-
100 total score is given by adding the 0-4 responses given for each of the 20 PAID questions and multiplying this sum by 1.25 (15, 30).

Internal consistency reliability is assessed and evaluates the relationship between all items and their ability to measure a single underlying domain (14). Reliability estimates between 0.70 and 0.90 are recommended for instruments used for groups and or individuals (14). Validity assesses whether an instrument measures what it was designed to measure (14). Validity can be evaluated qualitatively by examining the instrument and quantitatively by factor analysis and comparisons with related variables (14). These two forms of validity are qualitative matters of deciding whether or not an instrument is designed for what it is supposed to measure (14). Responsiveness refers to an instrument’s ability to detect change (14). For assessing whether or not a change occurred, an effect size of 0.2 is considered small, 0.5 is medium and 0.8 or greater indicates that a large change has occurred (14).

The PAID survey it has been shown to have a consistent high internal reliability (alpha=0.90); sound (r=0.28) 2-month test-retest reliability; strong correlation with theoretically related constructs such as emotional distress, depression, diabetes self-care behaviors, diabetes coping, and health beliefs; and significant predictive power for glycemic control in a study that tracked a managed-care population control for a year (30). In cross-sectional studies, the PAID survey has been found to be negatively correlated with age, weakly related to HbA1c, and unrelated to duration of diabetes, education, ethnicity, and gender when adjusted for age (30). A
study conducted by Welch et al. gave the PAID Questionnaire to 451 insulin-requiring women with insulin-dependent diabetes mellitus (IDDM) and non-insulin-dependent diabetes mellitus (NIDDM) and found high internal reliability, sound concurrent validity in terms of the pattern of correlations with a number of theoretically related measures (e.g. hypoglycemia fear, psychiatric symptoms), and evidence of a predictive validity for adherence to treatment and blood glucose control (6).

**Studies on Diabetes Self-Management Training (DSMT)**

In a study conducted by Rickheim et al., group education versus individual diabetes education was compared in a total of 170 subjects with type two diabetes (27). Each person was randomly assigned to either the group (n=87) or the individual (n=83) setting (27). Participants received education in four total classes delivered at consistent time intervals during a six-month time period (27). Participants from both group and individual diabetes educational settings had similar improvements in knowledge, BMI, HRQOL, and attitudes (27). However, participants in the individual setting had a 1.7 +/- 1.9% reduction in HbA1c (P<0.01), whereas participants assigned to the group setting had a 2.5 +/- 1.8% reduction in HbA1c (p<0.01). The difference in HbA1c improvements was significantly greater in subjects assigned to group education sessions compared to those in the individual education sessions (p<0.05).
DSMT is recognized as an integral component of effective diabetes management (13). A large body of evidence supports the effectiveness of DSMT in improving diabetes outcomes (13). In fact, a meta-analysis showed that patients who received self-management education in a group setting improved their diabetes knowledge and reduced their blood glucose levels, HbA1c levels, systolic blood pressure levels, and body weight, therefore reducing their need for medication (13). A systematic review of 71 trials by Warsi and colleagues also showed reductions in HbA1c and systolic blood pressure in patients who received training in DSMT (13). Also, Norris and colleagues demonstrated that self-management education improves HbA1c at immediate follow-up and that increased contact time is associated with an increased effect (13).

Brown and colleagues demonstrated that culturally competent self-management education, in individual and support group settings, improved health outcomes in Mexican Americans, particularly those with HbA1c levels under 10% (13). A study by Piatt et al. showed that DSMT improved clinical and behavioral outcomes in an underserved community (13). Numerous studies strongly support the cost reduction benefit of DSMT (13).

Effective self-management and perceived QOL are the key outcomes of DSMT and should be measured and monitored as part of care (8). DSMT helps patients optimize metabolic control, prevent and manage complications, and maximize perceived QOL in a cost-effective manner (8). Better outcomes are reported for DSMT interventions that are longer, include follow-up support, are culturally and
age appropriate, are tailored to individual needs and preferences, address psychosocial issues and incorporate behavioral strategies (8).

**Studies Utilizing the PAID Questionnaire**

A study was conducted by Chawla et al. in order to assess whether or not providing primary care physicians the results of a questionnaire completed by their patients would result in improvement in a patient’s glycemic control and/or post-encounter satisfaction score (15). A six-month longitudinal study was conducted which involved four general internal medicine physicians in northwest Indiana and 61 patients in four different offices (15). The inclusion criteria for the patient sample were broad: 18 years or older, diagnosis of type one or type two diabetes, and no severe visual or cognitive impairment (15). At baseline, three-month, and six-month clinic visits, patients completed the PAID Questionnaire and results were provided to the physician prior to the clinical encounter (15). Satisfaction was determined post-encounter and HbA1c was checked at all three visits, with the first visit serving as baseline (15).

Patients were divided into three groups (15). The first group consisted of patients who had poor HbA1c control (>8%), moderate control (7.1-7.9%), and good control (<7) (15). This resulted in all three groups having improved HbA1c values, reduced perceived problem areas, and increased satisfaction with the quality of care received (15). The effects were more significant after the first visit and for patients with poorer glycemic control at the start of the intervention.
This study showed that the PAID instrument facilitates a therapeutic relationship between the patient and physician, has the most effect at the initial encounter, and makes the most impact on at-risk patients with poor glycemic control (15). In this study physicians recommended the tool be used for those who are newly diagnosed and for high-risk patients already at poor control and concluded that the PAID Questionnaire has value at initial visit (15). This study showed that once a patient’s specific problem was identified the physicians would be better able to address it, resulting in improved metabolic health outcomes and greater patient satisfaction with the care process (15).

Results of this study can benefit participants and providers of DSMT because if there is a common theme among participants, it can help providers of DSMT to focus on areas that patients have the lowest PAID score on (15). Also, by knowing how DSMT classes affect patients’ PAID scores will help to show if DSMT is increasing perceived QOL for a certain reason, or if there isn’t a common pattern, there could be a benefit of providing PAID Questionnaires to patients before DSMT classes in order for the providers to be aware of the areas they need to focus more on for a better outcome for patients (3, 15).

A pre-test/three-month post-test case study conducted by Lorig et al. of a community-based, peer-led diabetes self-management program for 109 Spanish-speaking patients sought to determine the effectiveness of community-based diabetes self-management classes (18). Patients had to have type two diabetes; be willing
to complete an informed consent form and baseline, three-month, and one-year questionnaires; and be able to attend the course at a site near their home (18). This was a pilot study that measured: 1) health behaviors (e.g. diet, exercise, relaxation, foot examination, communication with providers, glucose monitoring); 2) self-efficacy; 3) health status (self-reported health, role function, fatigue, physical discomfort, health distress); and 4) health care utilization (visits in the last 3 months to a physician, diabetes-related visits, nurse visits, home visits, emergency room visits, hospitalizations, days in hospital) (18). In six weeks, participants significantly (P<0.05) improved all studied behaviors with the exception of examining their feet (18). Also, self-efficacy for managing diabetes improved (P<0.0001), and all five health status outcomes also improved (P<0.05) (18). This study suggests that this type of education may be an effective way of improving the QOL for some people with diabetes (18).

**Conclusion**

QOL in people with diabetes can be improved by various interventions, including the introduction of blood glucose-lowering agents, changes in insulin delivery systems, and educational and counseling programs designed to facilitate the development of diabetes-specific coping skills (19). Providers of DSMT programs can tell patients with diabetes that evidence suggests that participating in DSMT can cause improved perceived QOL (1). Also, if there is a specific reason for the majority of participants to believe their perceived QOL had improved, it can be
more motivating for them to participate in DSMT when they are aware of the reason their perceived QOL may be enhanced (1). If DSMT providers gave PAID Questionnaires to participants before DSMT classes it could help to focus resources and therefore maximize health benefits of participants (25). Patients’ needs should determine the program’s content or focus (18). In addition, if an improvement of a certain area of the PAID questionnaire is made then it can help providers to understand how the DSMT classes are affecting participants.
CHAPTER 3

METHODS

Subjects

Sixty-two men and women were selected to participate in this study (Appendix C). Subjects had a history of either type one or type two diabetes. The experimental group was recruited by Centegra Health System and the control group was initially going to be recruited by endocrinologists at Centegra Health System. However, based on the busy schedules of the endocrinologists, this did not come into fruition. Therefore, the control group was recruited via Facebook. In order for the primary investigator to recruit the control group using Facebook, an IRB amendment (Appendix D) was filed for and permission was obtained. The control-group participants were eligible for this study if they were not currently participating in DSMT classes.

All subjects who participated in the study were informed of the risks and benefits associated with this study and signed a written consent form (Appendix C) to participate in the study in accordance with the Institutional Review Boards (Appendix E) at Northern Illinois University and Centegra Health System.
Experimental Design

This study used a quasi-experimental nonequivalent control group design. The experimental group participated in DSMT classes, and the control group did not participate in DSMT classes.

The DSMT classes were held for three consecutive weeks, one day per week, with each session lasting three hours. Both experimental and control groups completed the second PAID Questionnaire after 11 total weeks (3-week time frame of DSMT classes and 2-month follow-up). This way both groups were given the same amount of time between pre- and post-testing. Additionally, a survey was included at the end of the 11-week time frame to investigate factors having the greatest impact on perceived QOL (Appendix B). For the experimental group, the data was collected via the DSMT instructors (i.e. nurses, registered dietitians, pharmacists). For the control group, the data was collected via an e-mail address that was created for the study by the primary investigator.

Instrument Reliability

The PAID Questionnaire was used to determine participants’ perceived quality of life while living with diabetes. The PAID Questionnaire consisted of 20 questions. In order to obtain a PAID score you add up all of the scores of the 20 questions and multiply this number by 1.25 to give a total score out of 100 possible points. The higher the PAID score the higher the perceived diabetes distress the
participant had. An initial, internal consistency estimate check for the PAID Questionnaire via Cronbach’s alpha (α) indicated that the experimental group showed high internal consistency with α=.91, and the PAID Questionnaire for the control group also showed high internal consistency with α=.84. For survey research the cut-off value for score reliability is $\alpha \geq .80$ (31).

The 5-point Likert-scale questions were used to determine whether or not there was a specific reason for the quality of life improvement. An initial, internal consistency estimate check for the Likert-scale questions via Cronbach’s alpha (α) indicated that the five items had $\alpha = .91$. This signified that there was high internal consistency and the items on the survey were highly inter-correlated. The individual potential reasons for quality of life improvement were self-efficacy, HbA1c values, enhanced self-mastery over the potential consequences of diabetes, improvement of diet and exercise and social support; $\alpha = .88, \alpha = .86, \alpha = .88, \alpha = .89, \alpha = .92$ respectively.

**Data Analysis**

The PAID Questionnaire was used to measure perceived burden of illness, satisfaction or dissatisfaction with treatment, impact of treatment, and worries about the future (19). The 20 questions on the PAID Questionnaire were:

1. Not having clear and concrete goals for your diabetes care?
2. Feeling discouraged with your diabetes treatment plan?
3. Feeling scared when you think about living with diabetes?
4. Uncomfortable social situations related to your diabetes care (e.g. people telling you what to eat)?

5. Feelings of deprivation regarding food and meals?

6. Feeling depressed when you think about living with diabetes?

7. Not knowing if your mood or feelings are related to your diabetes?

8. Feeling overwhelmed by your diabetes?

9. Worrying about low blood sugar reactions?

10. Feeling angry when you think about living with diabetes?

11. Feeling constantly concerned about food and eating?

12. Worrying about the future and the possibility of serious complications?

13. Feelings of guilt or anxiety when you get off track with your diabetes management?

14. Not “accepting” your diabetes?

15. Feeling unsatisfied with your diabetes physician?

16. Feeling that diabetes is taking up too much of your mental and physical energy every day?

17. Feeling alone with your diabetes?

18. Feeling that your friends and family are not supportive of your diabetes management efforts?

19. Coping with complications of diabetes?

20. Feeling “burned out” by the constant effort needed to manage diabetes?
For each question the participant would then answer by choosing a response i.e. (0= not a problem, 1= minor problem, 2=moderate problem, 3= somewhat serious problem, 4= serious problem). All responses were totaled when the PAID Questionnaire was completed by the participant. The sum of all PAID scores were then added together and multiplied by 1.25 (15, 30). The PAID scores produced a range score of 0 to 100, where a higher score indicates greater distress (30). A higher level of diabetes-related distress has been proven to be in the 40s on a scale from 0 to 100 compared with scores in the mid-20s to 30s range, which shows a lesser extent of diabetes distress in the participant (30).

The mean PAID score at baseline and at follow-up were analyzed via SPSS using the dependent t test to determine significance. Responsiveness was calculated using the dependent t test and by the effect size calculation using Cohen’s d, which is the standardized mean difference between the pre-test mean and the post-test mean (30). Cohen’s d is only calculated if statistically significant findings exist. Cohen’s d guidelines were used to determine the magnitude of effect sizes: 0.2 (i.e. two-tenths of a SD for the paired mean difference) represents a small effect, 0.5 a moderate effect, and 0.8 a large effect (6, 30).

To determine whether or not there was a specific reason for ones perceived improvement in quality of life, there was a statement given with a fill-in-the-blank portion (i.e. “My quality of life had improved because of ____________”) with reasons listed such as self-efficacy (belief in one’s capabilities to achieve a goal or an outcome), improved metabolic control (HbA1c %), enhanced self-mastery over
the potential consequences of diabetes, improvement of diet and exercise, social support, or other (fill in the blank) for the participant to state whether or not they believe this reason had an impact on improving their quality of life (Appendix B).

For each statement the participant could state degree of agreement (i.e. 1= strongly disagree, 2= disagree, 3=neutral or N/A, 4= agree, 5= strongly agree). The Likert-scale questions on the quality of life survey given post-study were analyzed via SPSS using the independent t test to determine the difference of mean survey responses comparing the experimental and control groups. Power was also determined for each potential reason in the improvement of QOL. Data was analyzed using the Statistical Package for Social Sciences (SPSS) for Windows (Version 22.0; SPSS, Inc., Chicago, IL).
CHAPTER 4

RESULTS

Subjects

A total of 62 subjects completed the study and 30 of them agreed to participate in DSMT classes and were placed in the experimental group. However, two individuals who agreed to participate in the study ended up only completing one of three DSMT classes; therefore, both were excluded from the study, resulting in 28 participants in the experimental group (n=28). One of those individuals was unable to complete all classes because she needed surgery, and the other individual had insurance coverage issues. Another individual in the experimental group completed only two of three DSMT classes but was still included in the results, and another participant completed classes but later ran into an issue where she was told classes would be covered by insurance and found out after taking all three classes that she had to pay $1,200.00 out of pocket for the classes. The individual having to pay out of pocket was still included in the results to ensure there were enough participants in the experimental group to be able to show a possible significant difference between the experimental group and the control group. Out of 32 individuals who agreed to participate in the study as the control group, one of them dropped out due
to not having enough time to commit to finishing the last portion of the study, result-
ing in 31 participants for this group.

The mean age for participants in the experimental group was 57.5 +/- 10.6 years. Participants’ ages in the experimental group ranged from their thirties to sev-
enties. In this group, one participant was in her thirties, five participants were in
their forties, nine participants were in their fifties, ten participants were in their six-
ties, and three participants were in their seventies. For the control group, the mean
age for participants was 46.8 +/- 17.6 years. Participants’ ages in the control group
ranged from their twenties to nineties. For the control group, nine of them in their
twenties, one in his thirties, seven participants in their forties, nine participants in
their fifties, two participants in their sixties, two participants in their seventies, no
one was in their eighties, but one participant was in her nineties (Table 1).

In the experimental group, 15 females and 13 males that completed the
study. In the control group, 21 females and 10 males that completed the study. As
for the ethnicities of the participants, the experimental consisted of individuals who
were Asian (1 participant), Caucasian/non-Hispanic (25 participants), and “other”
ethnicity (2 participants). For the control group, the ethnic backgrounds of partici-
pants were American Indian or Alaskan Native (1 participant), Black or African
American (3 participants), and Caucasian/non-Hispanic (27 participants) (Table 1).
Table 1. Demographics of Subjects

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<td>11</td>
</tr>
<tr>
<td>(Type two)</td>
<td>27</td>
<td>20</td>
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</table>

<table>
<thead>
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<th>4.8 +/- 1.44</th>
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<td>1</td>
</tr>
<tr>
<td>(Grades 9-11=2)</td>
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<td>0</td>
</tr>
<tr>
<td>(High School Diploma or GED=3)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>(Some College=4)</td>
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<td>7</td>
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<tr>
<td>(Associate’s Degree=5)</td>
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<td>(Bachelor’s Degree=6)</td>
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<tr>
<td>(Master’s Degree=7)</td>
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<tr>
<td>(PhD=8)</td>
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<td>0</td>
</tr>
<tr>
<td>(Other=9)</td>
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<td>0</td>
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<tr>
<td>(Other: Trade School)</td>
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</table>

(Continued on following page)
Table 1. Continued.

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<td>(Working Part-Time=2)</td>
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<td>(Working Full-Time=3)</td>
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<td>(Retired=4)</td>
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<td>0</td>
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<td>Missing Data</td>
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<td>0</td>
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<th>1.8 +/- 0.43</th>
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<td>(yes=1)</td>
<td>1</td>
<td>7</td>
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<tr>
<td>(No=2)</td>
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<td>24</td>
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<tr>
<td>(Tobacco Only=3)</td>
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<td>0</td>
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<table>
<thead>
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<th>Other Chronic Disease or illness</th>
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<th>7.6 +/- 2.62</th>
</tr>
</thead>
<tbody>
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<td>1</td>
<td>2</td>
</tr>
<tr>
<td>(Cancer=2)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>(Chronic Kidney Disease=3)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>(Depression=4)</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>(Heart Disease=5)</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>(High blood pressure=6)</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>(Neuropathy=7)</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>(Peripheral Vascular Disease=8)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>(Retinopathy=9)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>(Other=10)</td>
<td>24</td>
<td>23</td>
</tr>
</tbody>
</table>
As for marital status, in the experimental group there were four participants who were single, 16 who were married, five who were divorced, one who was widowed, one who was separated, and one person did not complete the question. For the control group, there were nine participants who were single, 20 who were married, one who was divorced, and one participant was widowed (Table 1).

As for household number, the mean number for the experimental group was 2.6 +/- 1.47 people. For the experimental group seven participants lived alone, ten had two people living at home, two had three people living at home, three had four people living at home, five had five or more people living at home, and one person did not complete the question. For household number for the control group the mean number of people living at home was 2.7 +/- 1.32 people. For the control group, five participants lived alone, 11 had two people living at home, seven had three people living at home, three had four people living at home, and five had five or more people living at home (Table 1).

For the experimental group, the length of time of diagnosis with diabetes ranged from 6 months to 25 years with ten participants diagnosed within 1-6 months prior to the study, eight participants diagnosed within 7-12 months prior to the study, six participants diagnosed 13 months to 5 years prior to the study, two participants diagnosed 10-20 years prior to the study, and two other participants diagnosed 21-25 years prior to the study. For the control group, diagnosis ranged between 7 months to 32 years: one participant was diagnosed with diabetes 7-12 months prior to the study, another diagnosed one year and one month to five years
prior to the study, fifteen diagnosed 5-10 years prior to the study, nine diagnosed 10-20 years prior to the study, three diagnosed 21-25 years prior to the study, one diagnosed 25 years prior to the study and another diagnosed 32 years prior to the study (Table 1).

Type two diabetes was predominantly in the experimental group, with only one participant with type one diabetes and 27 of the participants with type two diabetes. In the control group, 11 participants had type one diabetes, and 20 participants had type two diabetes (Table 1).

As for education level, in the experimental group, six participants received a high school diploma or GED, nine completed some college, one completed an associate’s degree, six completed a bachelor’s degree, three completed a master’s degree, and one participant completed trade school. For the control group, one person completed grades 1-8, five received a high school diploma or GED, seven completed some college, four completed an associate’s degree, 12 completed a bachelor’s degree, and two completed a master’s degree (Table 1).

For employment status, in the experimental group two participants were unemployed, one was working part time, nine were working full time, 11 were retired, four were on disability, and one person did not complete the question. For the control group, two participants were unemployed, three were working part time, 22 were working full time, and four were retired (Table 1).

As for whether or not participants in either group were smokers, out of 28 experimental group members, one participant smoked, one chewed tobacco, and 26
were non-smokers. Out of 31 control group members, seven participants smoked while 24 of them did not smoke (Table 1).

Participants were also asked about other chronic diseases or illnesses they were being treated for. In the experimental group, one participant had asthma, one had cancer, one had chronic kidney disease, five had depression, eleven had high blood pressure, four had neuropathy, one had peripheral vascular disease, and one had retinopathy. Other chronic diseases or illnesses reported by participants in the experimental group included arthritis (3 participants), kidney stones (1 participant), high cholesterol (2 participants), immune deficiency (1 participant), hypothyroidism (2 participants), sleep apnea (2 participants), diverticulitis (1 participant), cataracts (1 participant), bipolar disorder (1 participant), back and shoulder pain with surgery complications (1 participant), spinal stenosis (1 participant), quadruple bypass surgery (1 participant), anxiety (2 participants), obsessive compulsive disorder (1 participant), post-traumatic stress disorder (1 participant), binge eating disorder (1 participant), gastroesophageal reflux disease (1 participant).

The other chronic diseases reported for the control group included asthma (2 participants), depression (4 participants), heart disease (3 participants), high blood pressure (11 participants), neuropathy (5 participants), and retinopathy (2 participants). Other chronic diseases or illnesses among the control group were growth hormone deficiency (1 participant), ulcerative colitis (1 participant), anemia (1 participant), fibromyalgia (1 participant), arthritis (1 participant), high cholesterol (1 participant), degenerative joint disease (1 participant), minor gastroparesis
(1 participant), hypothyroidism (1 participant), and polycystic ovarian syndrome (1 participant).

**Interpreting the Data**

Histograms for pre- and post-PAID scores for the experimental group appeared to be normally distributed (Figure 1). In addition, skewness (to determine if data was symmetric) and kurtosis (to determine if data was peaked or flat relative to a normal distribution) were viewed both pre- and post-test in the experimental group. The skewness was .629 and the kurtosis was -0.82 for the pre-test histogram for the experimental group. The skewness was 1.32 and the kurtosis was .84 for the post-test histogram. Since values for the pre- and post-test histograms were between +2 and -2 and descriptive evidence showed that the data set was normally distributed, the data could be accurately interpreted.
There was a significant improvement in the overall PAID score from baseline to 11 weeks after the experimental group participated in DSMT. At baseline the experimental group had mean PAID scores of 30.98 +/- 21.59 and after 11 weeks, the experimental group experienced a 12-point decrease with a mean score of 19.46 +/- 19.14 after DSMT intervention (Table 2). The mean difference between the pre-test and post-test scores for the experimental group was 11.52 (Table 3). This resulted in a one-tailed significance value of P=0.005 (.001/2= 0.005) (Table 3). Therefore, we were able to reject the null hypothesis and conclude that participants in this study with a type one or type two diabetes diagnosis, who completed DSMT intervention experienced significantly higher perceived QOL (i.e.
lower PAID score) compared to those who had not attended DSMT classes: $t(27) = 3.639, p< 0.025$ (1-tailed test) (Table 3).

Table 2. Paid Scores Pre- and Post- Study Data

<table>
<thead>
<tr>
<th>Pair</th>
<th>PreE</th>
<th>PostE</th>
<th>PreC</th>
<th>PostC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>30.9821</td>
<td>19.4643</td>
<td>27.2968</td>
<td>27.6694</td>
</tr>
<tr>
<td>N</td>
<td>28</td>
<td>28</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Std. Error Mean</td>
<td>4.08064</td>
<td>3.61727</td>
<td>2.56929</td>
<td>3.04499</td>
</tr>
</tbody>
</table>

Table 3. Paid Scores Mean Difference Data and Level of Significance

<table>
<thead>
<tr>
<th>Pair</th>
<th>PreE-PostE</th>
<th>PreC-PostC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>11.51706</td>
<td>-37.258</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>16.74757</td>
<td>13.45867</td>
</tr>
<tr>
<td>Std. Error Mean</td>
<td>3.16499</td>
<td>2.41725</td>
</tr>
<tr>
<td>Lower</td>
<td>5.02383</td>
<td>-5.39026</td>
</tr>
<tr>
<td>Upper</td>
<td>18.01189</td>
<td>4.56410</td>
</tr>
<tr>
<td>t</td>
<td>3.639</td>
<td>-1.54</td>
</tr>
<tr>
<td>df</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.001</td>
<td>.879</td>
</tr>
</tbody>
</table>
Overall, the calculated power of this study was 0.55, which suggests that in this study there was a 55% probability of finding an effect. Typically a high power is shown by a calculated power of 80% or higher. However, if there were more participants the power would potentially be higher and show far more than a 12-point PAID Questionnaire score improvement from pre- to post-test for the experimental group participants in the study.

For the control group, a mean PAID score of 27.30 +/- 14.31 at baseline and after a 2-month and 3-week time frames, the mean PAID score was 27.67 +/- 16.95, which was slightly higher than the original PAID score at baseline (Table 2). The pre-test and post-test mean PAID score difference was -0.37, which was not significantly different (P=0.879) (Table 3). Since the pre- and post-test mean scores were not significantly different from each other, the null hypothesis was unable to be rejected.

**Cohen’s d**

For the experimental group, since there was a significant difference in pre- and post-PAID Questionnaire scores, Cohen’s d was determined to find the effect size. The effect size was 0.57, which showed that the DSMT classes had a moderate effect on improvement of perceived quality of life. If you take the paired difference standard deviation value of 16.75 (Table 3) and multiply that by the Cohen’s d value of 0.57 (i.e. 16.75 x 0.57=9.55) you would get 9.55 or approximately 10. This suggests that from pre- to post-, study participants on average improved their PAID
Questionnaire scores by 10 points or by 10%. For the control group, there were no significant differences between pre- and post-test PAID Questionnaire mean scores. The control groups mean PAID scores did not significantly improve from a mean PAID score of 27.3 +/- 14.31 pre-study to a mean PAID score of 27.7 +/- 16.95 post-study (i.e. P=0.89). Therefore, we did not conduct Cohen’s d because there was no effect (P>0.05).

**Potential Reasons for Increased Quality of Life**

Since QOL improved for the experimental group as opposed to the control group based on the pre- and post- PAID Questionnaires, a QOL survey was created in order to help determine whether or not there was a specific reason for the improvement that differed from the opinion of the control group. Power was determined for each potential specific reason for the improvement of quality of life comparing the experimental and control groups to determine the percent probability that there would be a significant difference between groups.

**Self-Efficacy**

For the experimental group, the mean score on the PAID Questionnaire was 4.11 +/- 1.10 (Table 4). For the control group, the mean score on the PAID Questionnaire was 3.87 +/- 1.02 (Table 4). For self-efficacy, the power was 0.14 or around a 14% probability that there would be a significant difference between both groups. Based on these values the significance value for a two-tailed independent t
test was P=0.397 (Table 5). Since this is not less than or equal to 0.05, the null hypothesis was rejected and both the experimental and control groups did not have significant differences in their belief of self-efficacy having an improvement on his/her perceived quality of life.

Table 4. Likert-Scale Mean Scores for Individual Potential Reasons for Improvement of Quality of Life

<table>
<thead>
<tr>
<th>Group Reason</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
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</thead>
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<tr>
<td>Self Efficacy</td>
<td>Control</td>
<td>31</td>
<td>3.87</td>
<td>1.024</td>
<td>.184</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td>28</td>
<td>4.11</td>
<td>1.100</td>
<td>.208</td>
</tr>
<tr>
<td>HbA1c</td>
<td>Control</td>
<td>31</td>
<td>3.97</td>
<td>1.048</td>
<td>.188</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td>28</td>
<td>3.61</td>
<td>1.227</td>
<td>.232</td>
</tr>
<tr>
<td>Enhanced Self-Mastery</td>
<td>Control</td>
<td>31</td>
<td>3.58</td>
<td>1.311</td>
<td>.235</td>
</tr>
<tr>
<td>Diet and Exercise</td>
<td>Control</td>
<td>31</td>
<td>3.87</td>
<td>1.231</td>
<td>.221</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td>28</td>
<td>3.96</td>
<td>1.071</td>
<td>.202</td>
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<tr>
<td>Social Support</td>
<td>Control</td>
<td>31</td>
<td>3.48</td>
<td>.996</td>
<td>.179</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
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<td>3.36</td>
<td>1.062</td>
<td>.201</td>
</tr>
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</table>

**Improved Metabolic Control (HbA1c %)**

The mean score on the PAID Questionnaire was 3.61 +/- 1.23 (Table 4). For the control group, the mean score on the PAID Questionnaire was 3.97 +/- 1.05 (Table 4). For improved metabolic control or HbA1c values, the power was 0.22 or around a 22% probability that there would be a significant difference between
groups. Based on these values, the significance value for a two-tailed independent $t$ test was $P=0.229$ (Table 5). Since this is not less than or equal to 0.05, the null hypothesis was rejected and neither the experimental nor control group had significant differences in their belief that an improvement of metabolic control (HbA1c %) values improved their perceived quality of life.

Table 5. Likert-Scale Potential Reasons for Improvement of Quality of Life Data and Significance

<table>
<thead>
<tr>
<th></th>
<th>Levene's Test for Equality of Variances</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>Sig.</td>
<td>F</td>
<td>Sig.</td>
<td>df</td>
<td>Mean Difference</td>
<td>Std. Error of Difference</td>
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<td>Self Efficacy</td>
<td>Equal variances assumed</td>
<td>3.96</td>
<td>.030</td>
<td>-1.854</td>
<td>.081</td>
<td>56,316</td>
<td>-2.36</td>
<td>2.77</td>
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<tr>
<td></td>
<td>Equal variances not assumed</td>
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<tr>
<td>HbA1c</td>
<td>Equal variances assumed</td>
<td>2.70</td>
<td>.000</td>
<td>1.727</td>
<td>.090</td>
<td>32,295</td>
<td>0.51</td>
<td>2.96</td>
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<td>Equal variances not assumed</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Enhanced Self.</td>
<td>Equal variances assumed</td>
<td>3.94</td>
<td>.052</td>
<td>-1.886</td>
<td>.064</td>
<td>56,158</td>
<td>-2.76</td>
<td>3.11</td>
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<tr>
<td>Mastery</td>
<td>Equal variances not assumed</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dist and Execl</td>
<td>Equal variances assumed</td>
<td>0.94</td>
<td>.390</td>
<td>-0.209</td>
<td>.809</td>
<td>56,297</td>
<td>-0.03</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Support</td>
<td>Equal variances assumed</td>
<td>0.01</td>
<td>.910</td>
<td>0.472</td>
<td>.970</td>
<td>56,447</td>
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<td></td>
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</tr>
</tbody>
</table>
Enhanced Self-Mastery over the Potential Consequences of Diabetes

For the experimental group, the mean score on the PAID Questionnaire was 3.86 +/- 1.04 (Table 4). For the control group, the mean score on the PAID Questionnaire was 3.58 +/- 1.31 (Table 4). For the enhanced self-mastery over the potential consequences of diabetes, the power was 0.14 or around a 14% probability that there would be a significant difference between groups. Based on these values, the significance value for a two-tailed independent t test was P=0.377 (Table 5). Since this is not less than or equal to 0.05, the null hypothesis was rejected and neither the experimental nor control group had significant differences in their beliefs of enhanced self-mastery over the potential consequences of diabetes having an improvement on their perceived quality of life.

Improvement of Diet and Exercise

For the experimental group, the mean score on the PAID Questionnaire was 3.96 +/- 1.07 (Table 4). For the control group, the mean score on the PAID Questionnaire was 3.87 +/- 1.23 (Table 4). For the improvement of diet and exercise, the power was 0.06 or around a 6% probability that there would be a significant difference between groups. Based on these values, the significance value for a two-tailed independent t test was P=0.758 (Table 5). Since this is not less than or equal to 0.05, the null hypothesis was rejected and neither the experimental nor control group had significant differences in their beliefs of an improvement of diet and exercise having an improvement on their perceived quality of life.
Social Support

For the experimental group, the mean score on the PAID Questionnaire was 3.36 +/- 1.06 (Table 4). For the control group, the mean score on the PAID Questionnaire was 3.48 +/- 1.00 (Table 4). For social support, the power was 0.07 or around a 7% probability that there would be a significant difference between both groups. Based on these values, the significance value for a two-tailed independent t test was P=0.638 (Table 5). Since this is not less than or equal to 0.05, the null hypothesis was rejected and neither the experimental nor control group had significant differences in their beliefs of social support having an improvement on their perceived quality of life.
CHAPTER 5

DISCUSSION

Education Intervention

The purpose of this study was two-fold: 1) to determine if people with diabetes improved their QOL by attending DSMT classes and 2) to determine if there was a specific reason that QOL may improve for those participating in DSMT classes. This study found that perceived QOL does improve for people with diabetes after participating in DSMT classes and the findings of this study concur with a meta-analysis of 20 comparisons, a study by Lorig et al., and a study by Richiem et al. (1, 18, 27). Unfortunately, this study was unable to determine specific reasons for QOL improvement and there have been no other studies done by which to compare these results.

PAID Questionnaire Results

For the DSMT group, the mean baseline PAID scores were 31 and post-study the mean PAID scores were 19 (i.e. 31-19=12) (Table 2). Therefore, the mean PAID score was found to be significantly lowered by around 12 points (i.e. a 12% decrease out of 100 total PAID Questionnaire points). In the literature, a PAID score in the
mid-20s to 30s range showed a lesser extent of diabetes distress than scores in the 40s or higher (30). In this study, on average, the experimental group participants began DSMT classes with a perceived lesser extent of diabetes distress (i.e. 31 mean PAID score) compared with participants of other studies listed in the literature. After DSMT the PAID scores decreased by around 12 points (i.e. 31-19=12), indicating that after DSMT classes, on average, experimental group participants felt an even lesser extent of diabetes distress and a greater overall perceived QOL.

However, for the control group the mean PAID score pre-study was 27, which was slightly lower than the experimental group pre-study (Table 2). This indicates that on average the control group participants started this study with a lesser extent of diabetes distress than other people with diabetes have shown in the literature (i.e. greater diabetes distress with a PAID score in the 40s or higher) (30). However, post-study the mean PAID score for the control group was 28 (i.e. 27-28=-1). This showed that there was no significant difference in PAID scores for the control group from pre- to post-study and there was even a slight increase (i.e. higher scores= greater diabetes distress). This means that even though the control group participants did not show an improvement in perceived QOL from baseline to post-study, this group still perceived their overall diabetes level of distress to not be that detrimental (30).
Potential Reasons for Increased Quality of Life

Self-Efficacy

Self-efficacy is defined as the belief in one’s ability to perform a certain task (9). When it comes to diabetes, having good self-efficacy would mean one is able to achieve optimal blood glucose control based on being able to properly self-manage one’s diabetes. On the 5-point Likert scale, the experimental group had a mean score of 4.11, with a score of 4 indicating that on average participants in the experimental group agreed that their overall perceived quality of life improved specifically because of self-efficacy (Table 4). However, even though the control group’s mean PAID Questionnaire score did not significantly improve pre- and post-test, the control group still completed the Likert-scale questions used to determine whether or not a participant believed their quality of life had improved over the last 11 weeks, and whether or not there were any specific reasons the participants believed the improvement occurred. On the 5-point Likert scale, the control group’s mean score was 3.87; rounded up to 4 this would indicate that the control group also agreed their overall perceived quality of life improved due to self-efficacy (Table 4). Since self-efficacy as the specific reason for improvement of perceived quality of life was not listed in the literature, it could not be compared to other studies.

However, it was stated in the literature that diabetes is predominantly a self-managed disease and whether or not a participant was in the experimental or control group, he/she would have to rely on being able to have good self-efficacy to
manage his/her diabetes, which in turn makes sense that both groups believed that self-efficacy had an influence on improving perceived quality of life (17, 29). Also, it was stated in the literature that self-management education increased self-efficacy (1, 27). However, self-efficacy was not measured in the current study.

**Improved Metabolic Control (HbA1c %)**

Hemoglobin A1c (HbA1c) is a laboratory blood test that shows an individual their average glucose level over the last two to three months (6, 30). A normal A1c for someone without diabetes is between 4% to 6% (6). The A1c target for individuals with diabetes is less than 7% (6, 27).

On the 5-point Likert scale, the experimental group had a mean score of 3.61, with a score of 4 indicating that on average participants in the experimental group agreed that their overall perceived quality of life improved specifically because of improved HbA1c values (Table 4). Again, even though the control group’s mean PAID Questionnaire score did not have a significant improvement pre- and post-test, the control group still completed the Likert-scale questions used to determine whether or not a participant believed her quality of life had improved over the last 11 weeks and whether or not there were any specific reasons the participant believed the improvement occurred. On the 5-point Likert scale, the control group’s mean score was 3.97; rounded up to 4 this would indicate that the control group also agreed their overall perceived quality of life improved due to improved HbA1c values (Table 4).
A study in Japan was conducted to determine whether or not the PAID scale scores correlated with glycemic control (5). In this study, 3,479 patients’ data for type one and two diabetes were obtained and it was determined that diabetes distress measured by the PAID Questionnaire was associated with poor glycemic control, and the association was modified by diabetes therapy (5).

However, in this study, HbA1c values were not measured for either the experimental or control groups, and effect of glycemic control could not be determined. Self-reports were used to determine if an individual believed his/her quality of life improved specifically due to the improvement of metabolic control or HbA1c values.

**Enhanced Self-Mastery over the Potential Consequences of Diabetes**

Complications of diabetes have been said to be the most important disease-specific causation of QOL (19). Since self-care can be considered demanding, dismaying, and overwhelming, being able to gain control by self-care could enhance one’s perceived QOL (20). Also, the fact that long-term complications can be severe and can lead to considerable changes in the patient’s capability of functioning in daily life could be another reason being able to manage diabetes could reduce or prevent adverse complications from occurring by proper self-care (20). Long-term complications of having diabetes could include vision loss, kidney damage, heart disease, erection problems, peripheral neuropathy resulting in life-long pain, amputation of limbs and/or trouble walking, and may lead to other autonomic neuropathy
problems (such as gastroparesis or loss of bladder function) (20). Therefore, if a patient is able to manage his/her diabetes this can relieve any stress or worry about obtaining any of these long-term complications which can lead to his/her perceived increase of QOL (20).

On the 5-point Likert scale, the experimental group had a mean score of 3.86, with a score of 4 indicating that on average participants in the experimental group agreed that their overall perceived quality of life improved specifically because of the enhanced self-mastery over the potential consequences of diabetes (Table 4). Once more, even though the control group’s mean PAID Questionnaire score did not have a significant improvement pre- and post-test, the control group still completed the Likert-scale questions used to determine whether or not a participant believed his quality of life had improved over the last 11 weeks and whether or not there were any specific reasons the participant believed the improvement occurred. On the 5-point Likert scale, the control group’s mean score was 3.58; rounded up to 4 this would indicate that the control group also agreed their overall perceived quality of life improved due to the enhanced self-mastery over the potential consequences of diabetes (Table 4). Since enhanced self-mastery over the potential consequences of diabetes being the specific reason for improvement of perceived quality of life was not listed in the literature, it could not be compared to other studies.

However, another study found that people who view themselves as high risk for diabetes-related complications such as amputation, kidney failure, stroke or
nerve damage are the same individuals who perceive their diabetes to be less threatening (5). The author suggested that may be due to the acceptance of the disease among those who have had been diagnosed long term and may represent a precise self-assessment of reality of one’s circumstances while living with diabetes (5). Acceptance of functional loss is a desired outcome of adjustment in coping with diabetes and has been shown to improve perceived QOL (5). Acceptance of diabetes as a threat would be a prerequisite to problem solving, coping and self-care behavior, and self-care behavior leads to glycemic control, which will ultimately lead to improved physical and mental functioning (5). In the study at hand, experimental group members on average were diagnosed more recently than the control group members (Table 1). Based on previous literature, the control group members may have begun the study feeling a lesser extent of diabetes distress because they have been diagnosed for a longer time and have accepted their diabetes. For the experimental group, they were more newly diagnosed with diabetes and they might not be aware of the diabetes-related complications that may occur if one does not properly manage diabetes.

**Improvement of Diet and Exercise**

As stated by the American Diabetes Association (ADA), medical treatment and lifestyle modifications including physical activity and changes in diet are the foundation of effective diabetes management (23).
On the 5-point Likert scale, the experimental group had a mean score of 3.96, with a score of 4 indicating that on average participants in the experimental group agreed that their overall perceived quality of life improved specifically because of an improvement of diet and exercise. Once more, even though the control group’s mean PAID Questionnaire score did not have a significant improvement pre- and post-test, the control group still completed the Likert-scale questions used to determine whether or not a participant believed her quality of life had improved over the last 11 weeks and whether or not there were any specific reasons the participant believed the improvement occurred. On the 5-point Likert scale, the control group’s mean score was 3.87; rounded up to 4 this would indicate that the control group also agreed their overall perceived quality of life improved due to an improvement of diet and exercise (Table 4). Since an improvement of diet and exercise being the specific reason for improvement of perceived quality of life was not listed in the literature, it could not be compared to other studies.

Previous research has documented improved QOL following positive health behavior change among those who have diabetes (1). Outcomes of regular exercise can include improvements in glycemic control, reduced risk of heart disease, improvements in lipid profile and blood pressure, improvements of endothelial function (a marker for heart disease risk), improvements in insulin sensitivity, and weight loss (13). Even a minuscule increase in activity level can have a tremendous positive effect on diabetes control and overall health (10). It can help lower blood glucose levels; increase insulin sensitivity; create a feeling of well-being; increase
energy levels; improve heart health and lower blood pressure; increase strength, endurance, and flexibility; and also aid in weight loss and weight loss maintenance (10). In this study, both the experimental group and control group believed exercising does help to improve their overall quality of life.

For nutrition, each patient is responsible for deciding what, when, and how much to eat each day (24). Factors of deciding what to eat include food availability, family eating patterns, habits, emotions, food preferences, blood glucose control, and knowledge of how food affects diabetes control and overall health (24). Also, being able to make healthy food choices, understanding serving sizes, and learning when the best times to eat each day are crucial in managing diabetes (24). Furthermore, those with diabetes need to know how to count fat and carbohydrate grams, how to read labels, and how to properly measure out food in order to properly manage blood glucose levels (24). Additionally, by making appropriate food choices, controlling weight and achieving optimal blood glucose levels, many people with diabetes are able to manage their diabetes without having to rely on medication (24). In this study, both the experimental group and control group believed that eating a healthful diet does help to improve their overall quality of life.

For this study, we had to rely on self-report that the individual believed his/her quality of life improved specifically due to the improvement of diet and exercise, as no participant had to fill out activity or food logs.
Social Support

On the 5-point Likert scale, the experimental group had a mean score of 3.36, with a score of 3 indicating that on average participants in the experimental group were neutral or it was non-applicable that their overall perceived quality of life improved specifically because of social support (Table 4). Once again, even though the control groups mean PAID Questionnaire score did not have a significant improvement pre- and post-test, the control group still completed the Likert scale questions used to determine whether or not a participant believed his quality of life had improved over the last 11 weeks and whether or not there were any specific reasons the participant believed the improvement occurred. On the 5-point Likert scale, the group’s score was 3.48; rounded down to 3 this would indicate that the control group also agreed they felt neutral or it was non-applicable for their overall perceived quality of life to have improved due to social support (Table 4). Since social support being the specific reason for improvement of perceived quality of life was not listed in the literature, it could not be compared to other studies.

However, in the literature, researchers have reported that higher levels of perceived social support are correlated with higher levels of social functioning in people with diabetes who are following an intensive insulin treatment; higher levels of social support were also correlated with higher overall perceived QOL in patients with type one diabetes (19). In this study, both experimental and control groups on average felt neutral or that it was non-applicable that social support plays an important role in improving their QOL. Also, higher self-reported levels of self-
efficacy and diabetes-related social support were associated with higher scores on the Finnish version of the SF-20 (generic QOL scale measure) in a group of patients with type one diabetes, and better social relations and fewer family altercations were correlated with improved health-related QOL as assessed by the Duke Health Profile and the General Health Perceptions Questionnaire (19). In the current study, based on the diabetes specific QOL questionnaire (i.e. PAID), both the experimental group and control group felt neutral or that it was non-applicable that social support does play an important role in improving QOL. This may be because the individuals are in charge of managing their own diabetes and having good self-efficacy in being able to manage their diabetes, being able to have enhanced self-mastery over the potential consequences of diabetes, and having an improvement of their diet and exercise habits play a greater role in helping to improve their overall perceived quality of life.

**Conclusion**

Individuals participating in DSMT classes had a greater improvement in QOL based on the PAID Questionnaire scores compared to those who did not participate in DSMT classes. However, there was not one specific reason that was found in this study to have caused the improvement in perceived QOL to occur post-study based off the 5-point Likert scale ratings on the QOL survey. In addition, there were no differences between the groups regarding factors associated with QOL improvement. The experimental and control groups Likert-scale ratings
of specific reasons for the improvement in QOL were not significantly different from one another (Table 5).
CHAPTER 6

LIMITATIONS AND FUTURE RESEARCH

Limitations

For the experimental group, many of the participants of the study did not set up two-month follow-up appointments at the diabetes center like they were supposed to. Therefore, telephone calls had to be made to collect the answers of the follow-up PAID Questionnaire and QOL survey from the participants in order to aim for complete studies for participants around 11 weeks. Also, the study was designed to have the control group consist of individuals seeing an endocrinologist but not taking DSMT classes. However, the two endocrinologists at the hospital the participants were recruited from were unable to commit to helping with the study. Therefore, the control group participants had to be recruited via Facebook depending on whether or not they met study criteria. The participants were asked whether or not they recently or currently were participating in DSMT classes; however, it was not very clear whether or not each individual participant had ever taken DSMT, which may have skewed the results. Another limitation was the difference in ages of both the experimental group and the control group, congruent sub-sample sizes, and the different types of diabetes both groups had (Table 1).
Also, at the end of the QOL survey, the Likert-scale questions were designed to determine whether or not there was a specific reason perceived QOL improved after taking DSMT classes (11-week time frame). Even though the mean PAID score for the control group pre- and post-study did not significantly improve (i.e. by showing a lower mean PAID score post-study), the control group had similar ratings of the experimental group.

**Future Research**

Future research should use a larger sample size to help determine the specific reasons for an improvement of perceived quality of life. Also, for the Likert-scale questions, they should be given to the experimental group and control group pre- and post-study to get better insight of how DSMT specifically improves QOL.

DSMT classes positively impact one’s perceived quality of life based on this study and what was found in the literature; however, DSMT is costly. Out of pocket, for the three classes alone it would cost someone $1,200 if they did not have Medicare Part B or another insurance company that would help cover charges of the classes. It is important that clinicians and researchers find ways to help people of all socioeconomic backgrounds receive some sort of diabetes education to help others self-manage their diabetes and prevent serious complications. Currently there is no cure for diabetes and therefore there needs to be an aim of improving the overall health and well-being of these individuals. Also, these individuals need help
with improving their overall perceived quality of life, as diabetes is a life-long disease that affects millions of people.
REFERENCES


   Accessed December 14th, 2013.


Appendix A

PAID QUESTIONNAIRE
Problem Areas In Diabetes (PAID) Questionnaire

INSTRUCTIONS: Which of the following diabetes issues are currently a problem for you? Circle the number that gives the best answer for you. Please provide an answer for each question.

1. Not having clear and concrete goals for your diabetes care? 0 1 2 3 4
2. Feeling discouraged with your diabetes treatment plan? 0 1 2 3 4
3. Feeling scared when you think about living with diabetes? 0 1 2 3 4
4. Uncomfortable social situations related to your diabetes care (e.g., people telling you what to eat)? 0 1 2 3 4
5. Feelings of deprivation regarding food and meals? 0 1 2 3 4
6. Feeling depressed when you think about living with diabetes? 0 1 2 3 4
7. Not knowing if your mood or feelings are related to your diabetes? 0 1 2 3 4
8. Feeling overwhelmed by your diabetes? 0 1 2 3 4
9. Worrying about low blood sugar reactions? 0 1 2 3 4
10. Feeling angry when you think about living with diabetes? 0 1 2 3 4
11. Feeling constantly concerned about food and eating? 0 1 2 3 4
12. Worrying about the future and the possibility of serious complications? 0 1 2 3 4
13. Feelings of guilt or anxiety when you get off track with your diabetes management? 0 1 2 3 4
14. Not “accepting” your diabetes? 0 1 2 3 4
15. Feeling unsatisfied with your diabetes physician? 0 1 2 3 4
16. Feeling that diabetes is taking up too much of your mental and physical energy every day? 0 1 2 3 4
17. Feeling alone with your diabetes? 0 1 2 3 4
18. Feeling that your friends and family are not supportive of your diabetes management efforts? 0 1 2 3 4
19. Coping with complications of diabetes? 0 1 2 3 4
20. Feeling “burned out” by the constant effort needed to manage diabetes? 0 1 2 3 4

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Appendix B

QOL SURVEY
Quality of Life Survey

Name of Participant: __________________________________________

1. Have you attended all 3-three hour Diabetes Self-Management Training (DSMT) Sessions? (circle YES or NO)

2. Please write your age in years: ________ years old

3. Sex: ____Male

    ____Female

4. How do you describe yourself?

    ____American Indian or Alaskan Native
    ____Asian
    ____Black or African American
    ____Caucasian (non-Hispanic)
    ____Hispanic or Latino/a
    ____Native Hawaiian or other Pacific Islander
    ____Other: ______________________________

5. Do you classify yourself as...(please check only one answer)

    ____Single
    ____Married
    ____Divorced
    ____Widowed

6. What is your household number?

    ____1 (only you)
    ____2
    ____3
    ____4
    ____5 or more people
7. Please write how long you have been diagnosed with diabetes?
   ________ months /or ________years
8. Were you diagnosed with...
   ___Type one diabetes
   ___Type two diabetes

9. What is your highest level of education? (Please choose only one answer)
   ___Grades 1-8
   ___Grades 9-11
   ___High school diploma or GED
   ___Some College
   ___Associate’s degree
   ___Bachelor’s degree
   ___Master’s degree
   ___PhD

10. What is your current employment status? (Please choose only one answer)
     ___Not employed
     ___Working part-time
     ___Working full time
     ___Retired

11. Do you currently smoke? (circle YES or NO)

12. Other than diabetes, do you have any other chronic disease or illness?
    (Please check all that apply)
     ___Asthma
     ___Cancer
     ___Chronic Kidney Disease
     ___Depression
     ___Heart Disease
     ___High blood pressure
     ___Neuropathy
     ___Peripheral Vascular Disease
     ___Retinopathy
     ___Other: _____________________
For the following questions choose from:
1-Strongly Disagree
2-Disagree
3-Neutral or N/A
4-Agree
5-Strongly Agree

Please circle one:

“My quality of life has improved because of____________________.”

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<td>Self-efficacy (belief in one's capabilities to achieve a goal or an outcome)</td>
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<td>Improved metabolic control (HbA1c %)</td>
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<td>Social Support</td>
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<td>Other (Fill in the blank)</td>
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Thank you for your participation!
Appendix C

CONSENT LETTERS AND RECRUITMENT FLYER
Consent to Participate in the Diabetes Self-Management Training (DSMT) Study
You have been invited to participate in a research project designed to assess quality of life in relation to the participation of attending all three-(3 hour) DSMT classes or by seeing an endocrinologist or primary care physician and not attending DSMT. This study will be conducted by Alicia Huggler, a graduate student in Nutrition and at Northern Illinois University.
If you meet the requirements of this study, you will be asked to complete a Problem Areas in Diabetes (PAID) questionnaire before you begin DSMT classes, and again after you have completed all three sessions (3 week time frame), at the 2 month follow-up meeting. If you are seeing an endocrinologist or primary care physician and are not attending DSMT classes you will take the PAID questionnaire at baseline and again after 2 months and 3 weeks to be consistent with the DSMT group. Both groups will additionally complete a Quality of Life Survey during the follow-up time as well. The questionnaire and survey will each take around 10-15 minutes to complete.
I am aware that my participation is voluntary and may be withdrawn at any time without any penalty or prejudice, and that if I have any additional questions, I may contact Alicia Huggler at or her thesis chair and academic advisor at NIU Dr. Judith Lukaszuk at . I understand that if I would like further information regarding my rights as a research subject, I may contact the Office of Research Compliance at Northern Illinois University at .
I understand that the intended benefits of this study include information on the effects of DSMT and perceived quality of life.
I understand that all information gathered during this study will be kept confidential by giving all participants a number that is representative of them. Also, I am aware that all information will be kept in a confidential file cabinet, which is locked when not in use. The results of this study will also only be accessible by the researcher, her advisor, and the DSMT educators.
I understand that my signature below is consent to participate in the DSMT study. I understand that my consent to participate does not constitute a waiver of any legal rights or redress I might have as a result of my participation, and I acknowledge that I have received a copy of this consent form. I am also aware that if I enter my email address or phone number on the Sign in form I am eligible to win 1 of 4 raffle prizes (each are a $15 gift card to Target)
Printed Name: ______________________________ Date: ___________________________
Signature: ______________________________
Consent to Participate in the Diabetes Self-Management Training (DSMT) Study

You have been invited to participate in a research project designed to assess quality of life in relation to the participation of attending all three-(3 hour) DSMT classes or by seeing an endocrinologist or primary care physician and not attending DSMT. This study will be conducted by Alicia Huggler, a graduate student in Nutrition and at Northern Illinois University.

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Printed Name: __________________________________ Date: __________________________
Signature: __________________________________________

PARTICIPANT COPY
ATTENTION: Adults aged 18 years or older
Nutrition and Dietetics Research Project- Spring 2014

Who’s Requested?

• Males and Females 18 years or older

• People with type one or type two diabetes

• Are going to be attending Diabetes Self-Management Training (DSMT classes) OR are currently seeing an endocrinologist at Centegra hospital.

What Do You Need To Do?

• Complete a Problem Areas in Diabetes (PAID) questionnaire

• After 3 weeks: Complete another PAID questionnaire & a Quality of Life Survey

***Both the questionnaire and survey take only 10-15 minutes to complete***

Why?

• To determine whether or not DSMT classes have an effect on quality of life

Who to contact?

• Alicia Huggler at DSMTstudy@yahoo.com

Control your Diabetes. For Life.
Appendix D

IRB AMENDMENT APPLICATION
Any amendment to an approved protocol must be reviewed and approved by the IRB before the amendment is implemented. Such amendments may include changes to the study design, procedures, enrollment, methods of recruitment, personnel or consent form.

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<tr>
<td>Principal Investigator</td>
<td>Name: Alicia Huggler</td>
</tr>
<tr>
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<td>Phone: [REDACTED] E-mail: [REDACTED]</td>
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<td></td>
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A. If this amendment involves any change in personnel, please complete the following information:

1. List all personnel being removed from the project:
2. List all personnel being added to the project. Include a description of their qualifications to conduct the research and their training in human subjects protection (CITI training or proof of equivalent training).

B. For all other changes to the project, please provide the following information

1. Describe the proposed changes and explain why they are being made.
   For the recruitment process for my control group I was unable to use the endocrinologists because of their busy schedules. Therefore I will obtain my control group through social media (i.e. Facebook) and will give and receive questionnaires etc. though email.

2. Do the changes described above change the level of risk to the participants? If so, explain whether the risks are increased or decreased, and describe the nature of the change in risk.

3. Please list any study documents that will be revised because of this amendment, such as consent forms, recruitment materials, questionnaires, etc. Also, please attach a copy of these revised documents to this application.
Alicia Huggler
10/20/2014
Principal Investigator signature
date