GLYCEMIC CONTROL AMONG TYPE 2 DIABETICS

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Keywords: type 2 diabetes, glycemic control, adherence, medication, self-efficacy
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ABSTRACT

The purpose of the present study was to examine the relationship between diabetics’ socioeconomic status, self-efficacy, education levels, gender, and ethnicity and their medication and physical activity (i.e., healthy exercise) adherence regarding to their physicians and health educators’ counsels. Also, the study investigated whether or not the respondents adhered to medication prescription and physical activity routines. The study used a non-probability convenience sampling technique to recruit 102 type 2 diabetics (female, \( n = 65 \) and male, \( n = 37 \)) from Indiana and Illinois Counties surrounding Vigo County, Indiana. The respondents reported their self-care activities throughout the seven days prior to completing the study questionnaire. A positive (direct) relationship between self-efficacy and healthy exercise, and a positive association between gender and self-efficacy were found (\( P < 0.5 \)). Besides, while the majority of the respondents adhered to medication treatment, nonetheless medication non-compliance level among the patients was alarming. Interventions that can boost patients’ confidence to successfully engage in the Centers for Disease Control and Prevention (CDC) and the American Diabetes Association (ADA)’s endorsed physical activity routines may be helpful. These interventions may include diabetes education follow-ups to improve patients’ self-efficacy scores (\( M = 4.73 \)). Also, healthcare professionals may need to develop more operational plans to improve medication adherence levels among type two diabetics. Moreover, the present study suggests that diet and exercise treatments may be considered as potentials that can lead future success for blood glucose control among type 2 diabetics.
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CHAPTER 1

Introduction

Achieving ideal blood glucose levels is essential to caring for type 2 diabetics (Nuckols et al., 2011). Critical factors for maintaining optimal blood glucose levels among type 2 diabetics include adherence to a proper diet, engaging in adequate physically activity, medication compliance, and routine monitoring of blood glucose levels (Sousa & Zauszniewski, 2005). Many type 2 diabetics do not maintain adequate glycemic control (Krass et al., 2011). Suboptimal blood glucose levels among type 2 diabetics can lead to serious health conditions, such as cardiovascular diseases (CVD), stroke, kidney failure, nerve damage, and eye damage among other health complications (Center for Disease Control and Prevention [CDC], 2012d).

In addition to its physical complications, type 2 diabetes is financially damaging. This condition impacts the quality of life of millions of people, and it has become an enormous economic burden for the public and for the U.S. government (Madden, Loeb, & Smith, 2008). Type 2 diabetes accounts for 90 percent of all adult diabetic cases in the U.S. (Hillaire & Woods, 2013). This detrimental health condition is already a serious health threat and an increasing public health burden to millions of people around the globe (Wild, Roglic, Green, Sicree, & King, 2004). It is predicted that there will be 366 million global cases of type 2 diabetes by the year 2030 (Wild et al., 2004). There are ongoing efforts in the U.S. and in many parts of the world to lessen the health risks associated with the disease. Therefore, it is important to explore
the factors that influence type 2 diabetics’ adherence to physicians and health educators’ recommendations concerning medication and exercise practices.

**Statement of the Problem**

In order to maintain optimum blood glucose levels, type 2 diabetics need to follow properly physicians’ and health educators’ recommendations regarding medication and exercise. Several factors, such as socioeconomic status (SES), education level, self-efficacy, gender, and race, may influence negatively diabetic patients’ adherence to physicians’ and health educators’ recommendations.

**Purpose of the Study**

There is limited work examining the different factors that may influence the adherence of type 2 diabetics to physicians and health educators’ instructions. Therefore, the purpose of this study was to examine the relationship between type 2 diabetics’ SES, education level, self-efficacy, gender, and race and their adherence to physicians’ and health educators’ recommendations with regards to medication and exercise routines.

**Research Question**

The following research question guided the investigation to identify factors that may influence type 2 diabetics’ adherence to physicians and health educators’ recommendations.

- What are the relationship between type 2 diabetics’ SES, education level, self-efficacy, gender, and race and their adherence to physicians’ and health educators’ recommendations in relation to medication and exercise routines.

**Null Hypotheses**

- There is no relationship between type 2 diabetics’ socioeconomic status (SES) and their diabetes medications and physical activity adherence.
• There is no relationship between type 2 diabetics’ self-efficacy and their diabetes medications and physical activity adherence.

• There is no relationship between type 2 diabetics’ educational levels and their diabetes medications and physical activity adherence.

• There is no relationship between type 2 diabetics’ gender and their diabetes medications and physical activity adherence.

• There is no relationship between type 2 diabetics’ race and their diabetes medications and physical activity adherence.

Research Hypotheses

• There is relationship between type 2 diabetics’ socioeconomic status (SES) and their diabetes medications and physical activity adherence.

• There is relationship between type 2 diabetics’ self-efficacy and their diabetes medications and physical activity adherence.

• There is relationship between type 2 diabetics’ educational levels and their diabetes medications and physical activity adherence.

• There is relationship between type 2 diabetics’ gender and their diabetes medications and physical activity adherence.

• There is relationship between type 2 diabetics’ race and their diabetes medications and physical activity adherence.

Delimitations

The study had the following delimitations:

• Only type 2 diabetics from Vigo County, Indiana and the surrounding counties were included in the study.
• Only type 2 diabetics aged 18 years and older were included in the study.

• Study population was 102 respondents.

• The study was conducted in Terre Haute Regional Hospital and Diabetes Endocrinology Clinic. Both health care facilities are located in Terre Haute, Indiana.

Limitations

The study had the following limitations:

• Some of the study population may decline to take part in the study or quit during the study.

• Most of the research data was based on patients’ self-reports; therefore, the researcher had no control over how carefully or honestly patients respond to the study questionnaire.

Assumptions

There were several assumptions for this study:

• Subjects answered the study questions honestly to the best of their knowledge.

• Subjects followed the study instructions and thereby submit valid data.

• Subjects provided the completed questionnaires according to schedule to the researcher.

Definition of Terms

• Patients’ adherence to physicians and health educators’ guidelines: Adherence has been defined as “active, voluntary, and collaborative involvement of the patient in a mutually acceptable course of behavior to produce a therapeutic result” (Ho, Bryson, & Rumsfeld, 2009).
• Glycemic control: normal levels of blood glucose according to the American Diabetes Association (ADA) criteria in 2013 (ADA, 2013b)
  1. Hemoglobin A1C ≥6.5%.
  2. Fasting Plasma Glucose ≥126 mg/dl.
  3. Two hour plasma glucose ≥200 mg/dl during an oral glucose tolerance test.

**Summary of Chapter One**

Maintaining healthy blood glucose levels in type 2 diabetics is necessary to prevent serious health conditions such as CVDs, stroke, kidney failure, blindness, and amputations. However, adhering to physicians and health educators’ recommendations about dietary change, regular physically activity, medication compliance, and routine self-monitoring blood glucose levels are essential for the diabetic patients to maintain healthy and optimal blood glucose levels. Nevertheless, some type 2 diabetic patients fail to improve their glycemic levels for different reasons, including non-compliance to a prescribed medication regimen, lack of exercise, and poor diet. The primary goal of this study was to identify what factors influence patients’ adherence to physicians and health educators’ instructions concerning diabetes medications and exercise routines. The following chapter reviews some of these factors which may affect type 2 diabetic patients’ adherence in physicians and health educators’ instructions.
CHAPTER 2

LITERATURE REVIEW

Sources of the Literature

A number of scholarly databases were searched in order to retrieve the maximum amount of relevant literature that discusses the topic under investigation, “Blood Glucose Control among Recently-Diagnosed Type 2 Diabetics.” Most of the data of this literature review was derived from the EBSCOhost databases, mainly Health Source: Nursing/Academic Edition. However, some of the reviewed literature was derived from other educational and research databases including CINAHL, ProQuest, PubMed from the National Library of Medicine, and WorldCat. Also, some of the information in this literature review section was retrieved from the websites of reliable governmental and non-governmental agencies, such as the Centers for Disease Control and Prevention (CDC) and the American Diabetes Association (ADA). Only the literature written in English and related to the research topic was identified and reviewed extensively. The following terms were used to identify the relevant literature for this study.
Table 2.1

*Keywords for Database Search*

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**Type Two Diabetes Mellitus**

*Risk Factors and Effects of Type 2 Diabetes.* Diabetes mellitus is a chronic disease in which personal self-care is necessary to prevent morbidity and mortality (Kav et al., 2010). Among people with type 2 diabetes, either their body does not produce a sufficient amount of insulin or their cells ignore the use of insulin (ADA, 2013a). According to the CDC (2012d), diabetes can cause serious health conditions such as cardiovascular diseases, kidney failure, blindness, and lower-extremities amputations, among other health complications. Obesity is considered to be one of the major risk factors of developing type 2 diabetes (Beane, 2011); however, there are other lifestyle aspects that contribute to type 2 diabetes. Lack of physical activity, alcohol consumption, smoking, and unhealthy eating habits can play a significant role in developing the disease (Van Dam, 2003).

*Diabetes Projection Worldwide.* Type 2 diabetes is a major health threat and a rising public health burden to millions of people worldwide. The number of people with diabetes will rise. It is expected that type 2 diabetes’ prevalence in developing nations will rise 69 percent, and there could be a 20% increase in developed countries (Kaiser, Vollenweider, Waeber, &
Marques-Vidal, 2012). This chronic metabolic disorder has become an epidemic in some countries, further exacerbating the existing burden for public health and healthcare providers in many locations (Olokoba, Obateru, & Olokoba, 2012). Population growth, increasing urbanization in developing countries, obesity, and increasing sedentary lifestyle are different risk factors contributing to the rise in diabetes around the globe (Acee, 2012).

**Diabetes Cost and Projection in the U.S.** In the United States, diabetes is the seventh leading cause of mortality (Qaseem, Humphrey, Sweet, Starkey, & Shekelle, 2012). According to the ADA (2014), the prevalence of diabetes in the U.S. was 29.1 million people in 2012. That was 9.3% of the total population. In 2010, 1.9 million people aged twenty and older were newly-diagnosed with diabetes in the U.S. (Hillaire & Woods, 2013).

The cost of diabetes treatment and its subsequent complications in U.S., such as cardiovascular diseases (CVD), is estimated to be over $130 billion each year (Minshal et al, 2008). In 2012, the cost of diagnosed diabetes in the U.S. rose to $245 billion (ADA, 2013d). If the current trends of the diabetes, especially type 2 diabetes, remains unchanged, the prevalence of the disease among U.S. residents will range between one in every three or one in every five people by the year 2050 (CDC, 2010). The growing rate of diabetes among the U.S. population can cost more billions of dollars of public and private money if the trends in the prevalence of the disease remain unchanged.

**Patients’ Adherence for Glycemic Control**

Although healthcare providers encourage patients with diabetes to follow instructions, ultimately, patients’ self-management is the key to achieve good glycemic results (Borgsteede et al., 2011). Adherence, which is an important element in the treatment of diabetes, is a behavior in which patients’ actions such as taking medication or changing exercise and diet habits
coincide with physicians’ guidelines (Vimalavathini, Agarwal, & Gitanjali, 2008). Diabetes management demands changes in dietary behavior (e.g., eating health food), physical activity, and adherence to medication regimens (Hertz, Unger, & Lustik, 2005). However, diabetics may have difficulties adapting to the new behaviors regarding diet, exercise, and medication (Hertz et al., 2005).

Adhering to physicians and health educators’ recommendations about medications, diet habits, physical activity routines, and the routine physician visits per year may help type 2 diabetics achieve the best blood glucose outcomes and prevent diabetes complications like CVDs. Nonetheless, adherence rates among type 2 diabetics are fairly low; the adherence rate is between 36 percent and 94 percent (Borgsteede et al., 2011). Researchers have found that younger, working-aged diabetics and women were more likely to be noncompliant (Hertz et al., 2005). Also, self-assessment (i.e., one’s own evaluation without external effort) can help type 2 diabetics comply with dietary guidelines, make food selections, and “provide a means to deliver feedback on progress made in achieving dietary goals” (Sevick et al., 2010, p. 1). Behavior change among type 2 diabetics is a key factor in meeting optimal glycemic goals (Shi, Ostwald, & Wang, 2010). Therefore, it has been recommended that type 2 diabetics need to be active players in setting optimum glycemic goals for themselves (Ismail-Beiget et al., 2011).

**Dietary Non-adherence.** While it is common that physical activity and dietary adjustments are significant throughout the course of the disease (Van de Laar et al., 2006), many type 2 diabetics may not follow the instructions from physicians, health educators, and dieticians about dietary change. Non-compliant behavior is likely to persist, even for many people who are on dietary plans (Sevick et al., 2010). For many type 2 diabetics, altering their dietary behaviors has proven to be beyond their reach (Vijan et al., 2011). Therefore, many of these patients fail to
maintain good glycemic outcomes. In most cases, patients with diabetes have similar dietary practices compared to the general public (Kohinor, Stronks, Nicolaou, & Haafkens, 2011). However, according to the National Institutes of Health (NIH, 2011) patients with diabetes need to make the following food choices:

- Eat smaller portions
- Eat less fat
- Eat more fiber by eating more whole-grain foods
- Eat variety of fruits and vegetables everyday
- Eat fewer foods that are high in sugar
- Eat fewer foods that are high in salts
- Never skip meals
- Limit the amount of alcohol you drink
- And make changes slowly

**Physical Activity Non-adherence.** Physical activity is important for diabetics along with proper meal planning and taking medications as prescribed by physicians (ADA, 2013b). However, people with diabetes are believed to be less ready to improve their physical activity than people without the diseases (Vähäsarja et al., 2012). According to the CDC (2012a), diabetic individuals need at least 30 minutes of moderate-intensity physical activity on five or more days each week. According to the World Health Organization (WHO, 2014), moderate-intensity physical activity involves a reasonable amount of energy and noticeably increases the heart rate. Moderate-intensity includes brisk walking, dancing, gardening, housework and domestic chores, traditional hunting and gathering, general building tasks, and carrying or moving moderate loads (< 20kg; WHO, 2014). On the other hand, WHO (2014) defines
vigorous-intensity physical activity any exercise that requires an enormous amount of energy and causes rapid breathing and a significant rise in heart rate. According to WHO (2014), vigorous-intensity physical activity includes running, fast cycling, aerobics, fast swimming, competitive sports (e.g., football and basketball), heavy shoveling or digging ditches, and carrying or moving heavy loads ( > 20kg). The ADA recommends the following types of physical activity for diabetics to manage their diabetes: aerobic exercise and strength training. The aerobic exercise (e.g., swimming, cycling, walking, and rowing) helps the body use insulin better, improves blood circulation, and lowers heart disease risks (ADA, 2013c). The ADA endorses the CDC’s recommendation that type 2 diabetics need to perform at least 30 minutes of moderate to vigorous aerobic exercise five days a week, with no more than two consecutive days between exercising (ADA, 2013c). Also, the strength training (e.g., lifting light weights, resistance bands, heavy gardening, and free weight) lowers blood glucose in the body, helps to maintain strong muscles, and minimizes the risks for developing osteoporosis and bone fractures (ADA, 2013d) and ADA recommends twice a week. Sites serving as recruitment venues for the current study (i.e., Terre Haute Regional Hospital and Diabetes Endocrinology Clinic) confirmed that they instruct patients to follow the ADA’s physical activity procedure.

**Medication Non-adherence.** According to CDC (2013a), medication adherence is “the patient’s conformance with the provider’s recommendation with respect to timing, dosage, and frequency of medication-taking during the prescribed length of time” (p. 5). Although dietary and exercise behavior change are essential to control blood glucose levels, adherence to physicians’ guidelines about medication is equally important (Fediaevsky, Chwalow, & Tibiana-Rufi, 2005). While it is common that diabetics are advised about lifestyle changes and adherence to medications (as prescribed by physicians), medication non-compliance is prevalent among
For example, in the Netherlands, type 2 diabetics’ adherence rate with oral glucose-reducing medications was between 61 percent and 85 percent (Wabe, Angoma, & Hussein, 2011).

Factors that Influence Patients’ Adherence

Asche, LaFleur, and Conner (2011) reported that better compliance among type 2 diabetics leads to improved glycemic outcomes. However, several factors influence diabetic patients’ adherence to physicians and health educators’ instructions to improve their blood glucose levels. These factors include socioeconomic status (SES), education level of the patient, and the patient’s self-efficacy. Also, the factors may include gender and race.

Socioeconomic Status. There is an inverse relationship between SES and the prevalence of type 2 diabetes among people (Haffner, 1998), and SES may influence the adherence rate of the type 2 diabetics with regards to medication and exercise. For instance, low-income families usually have “less access to both healthy food choices and opportunities for physical activity” (CDC, 2013b). Peeters et al. (2010) reported that socioeconomic status may prevent some diabetic patients from getting access to medications and the materials needed for blood glucose control. In other words, diabetic patients from low income families with a low education background may have difficulties enrolling in exercise practices, and buying diabetes medications on a regular basis. All these challenges may influence type 2 diabetics’ adherence to treatment regimens prescribed by physicians and health educators. Work by Borgsteede et al. (2011) indicated that patients’ compliance is influenced by their experience with the disease, their past medications, and their friends and family members. Furthermore, patients’ socioeconomic status may influence their beliefs about the disease as Piette, Heisler, Haran, and Juip (2010) suggest in the following statement:
Many low-income patients with diabetes hold negative beliefs about their treatments, and that these beliefs are particularly prominent among African Americans. A trusting relationship with a primary care provider may mitigate these patient concerns but did not explain the consistent disparities in beliefs across racial groups, nor racial disparities in cost-related medication underuse. Clinicians should consider identifying ways to provide patients with more information about their treatments, and in particular should consider raising some of the specific areas of concern identified in this study during outpatient encounters. (p. 11)

**Education Level.** Many type 2 diabetics may not follow physicians and health educator’s instructions about medication, exercise, and diet treatment to maintain optimum blood glucose levels. Al-Qazaz et al. (2011) argue that patients’ level of education and their compliance to medication are two variable factors that affect glycemic outcomes. The researchers concluded that “knowledge enhancement of patients with diabetes may improve their self-management activity and increase their awareness about the control of the disease” (Al-Qazaz et al., 2011, p. 7). Patients can manage to control their blood glucose levels when they understand their disease better. However, some of the type 2 diabetics may have difficulties understanding the disease in the first several years after the diagnosis. Ali and Jusoff (2009) found that long term diabetic patients understand the disease better than recently-diagnosed diabetics who do not realize that diabetes is a silent illness that may not show its effects long after the diagnosis.

On the other hand, researchers differ on some of the factors that may influence type 2 diabetics’ adherence to recommendations. For example, Harris, Eastman, Cowie, Flegal, and Eberhardt (1999) reported that “education, income, health insurance coverage, number of physician visits per year, and other variables were not predictive of poor glycemic control” (p.
5. They refer to a Michigan community study of 18 Caucasians and a South Carolina study of nine African Americans and Caucasians, wherein both studies concluded no association between poor glycemic outcomes and patients’ educational levels (as cited in Harris et al., 1999, p. 5). Study limitations were not included in the Harris et al. (1999) study, however, the number of the study participants from a Michigan community and a South Carolina study were significantly small.

**Race and Gender.** The race of the type 2 diabetics may influence patients’ adherence levels to the physicians and health educators’ instructions. A study conducted by Shenolikar, Balkrishnan, Camacho, Whitmire, and Anderson (2006) supported the claim that the medication adherence rate among Caucasian American type 2 diabetics is higher than the adherence rate among African American type 2 diabetics. Because of this, African Americans have worse blood glucose control than Caucasian Americans (Osborn et al., 2011). However, Shenolikar et al. (2006) found that “factors such as patients’ beliefs and attitudes, other factors such as socioeconomic status, type of insurance, and access could lend some explanation for the reasons for such differences” (p. 6). Also, Adams et al. (2008) found that there is a continuous gap between African Americans and Caucasian Americans regarding their glycemic levels, even when the patients’ medication refill adherence rate is high. The researchers suggest that one explanation for the discrepancy is that African American diabetics develop more severe diabetes before they start medication treatment. Alongside race, gender may also be another factor that can influence diabetics’ adherence to physicians and health educators’ recommendations with regards to medication and exercise. Men and women have different perceptions regarding to the willingness to take remedial health actions (Ramesh, 2000). However, researchers found that women, along with working-aged diabetics, are more likely to be non-adherent to physicians’
recommendations about diabetes treatments (e.g., medication and exercise adherence) (Hertz et al., 2005).

**Self-efficacy.** Self-efficacy may also have direct association with diabetes glycemic control and diabetics’ medication and exercise adherence. Self-efficacy is a key factor for the diabetics in managing active self-care (Gao et al., 2013). Gao et al. (2013) argued that self-efficacy has a strong and direct link to better glycemic control. People are more likely to engage in a health behavior when they view it as beneficial and likely to reduce a health risk that would have serious consequences if left unchecked (Glanz, Rimer & Viswanath, 2008). Therefore, some diabetics may comprehend the health complications from uncontrolled blood sugars, such as kidney failure and heart diseases, than other diabetics. As a result, they regularly take their diabetes medications, eat healthy diets, and perform exercise routines as instructed by their doctors and health educators. Diabetics’ self-efficacy in adhering to physicians and health educators recommendations can be based on the benefits and the consequences of performing or ignoring certain activities.

**Summary of Chapter Two**

Type 2 diabetes mellitus is a major health risk and a growing public health burden to the world, particularly to the U.S., where the prevalence of the disease is expected to rise in the coming decades. The cost of the disease and its complications such as CVDs in U.S. will swell if the current trend of diabetes remains the same.

Adherence to physicians and health educators’ recommendations about medication and exercise regimens is important to maintain good glycemic outcomes among type 2 diabetics. However, there are factors that may influence diabetics’ adherence to physicians and health educators’ instructions, and these factors may be particularly detrimental among type 2 diabetics.
These factors may include socioeconomic status (SES), the education level of the patient, health insurance coverage, gender, race, age, and the patients’ self-efficacy with regards to medication and exercise adherence.

Therefore, the importance of an investigation of the association between the adherence to physicians and health educators’ recommendations and blood glucose levels among type 2 diabetics cannot be overstated. It is necessary to examine factors that may influence patients’ adherence to physicians and health educators’ recommendations among type 2 diabetics in order to develop appropriate interventions to improve glycemic control and prevent negative health outcomes among diabetics.
CHAPTER 3

METHODS

Ethical Approval Statement

The study was exempted by the Institutional Review Board (IRB) of Indiana State University (See Appendix A). Patients’ privacy and the confidentiality of the data obtained were protected and not disclosed to the public. Patients’ names and addresses were not included in the study questionnaire assuring patients’ privacy during and after the study as well.

Study Participants

Participants. The study participants were type 2 diabetics. The participants were mainly from counties in Indiana (Vigo, Parke, Clay, Sullivan, and Vermillion) and Illinois (Edgar and Clark). However, some of the study participants were from Indiana and Illinoi Counties, which are outside the seven Counties that were the focus of this study. Nonetheless, most of these counties have similar diabetes prevalence rates as shown in Tables 3.3. A sample of type 2 diabetics of both sexes was obtained from Terre Haute Regional Hospital and the Diabetes Endocrinology Clinic, two healthcare institutions in Terre Haute, Indiana. Any type 2 diabetes patient at the healthcare facilities over the age of 18 was eligible to participate in the study. Leaflets explaining the study were placed in the two healthcare facilities. Those patients who accepted the invitation were provided with the study questionnaire when they visited the
healthcare facilities for physician appointments, hospital visits, and/or diabetes education sessions.

**Recruitment and Sampling Techniques**

The study used a non-probability convenience sampling technique and recruited 102 type 2 diabetic respondents. The reason for using convenience sampling was because it was inexpensive, saved time, and the respondents were readily available. Inclusion criteria for the study selection of these patients were the following:

- Participants have been diagnosed with type 2 diabetes.
- Participants have visited a physician after being diagnosed with type 2 diabetes.
- Participants were 18 years or older by the date they respond to the study questionnaire.
- Participants were able to read and write in English.
- The study relied on patients’ self-report of their diabetes status.

The exclusion criteria for the study selection were the following:

- Type 2 diabetic patients who did not visit physicians’ offices after being diagnosed with the disease.
- Individuals younger than 18 years old.
- Those who could not read and write in English were not included in the study.
- Individuals who were mentally incapacitated, prisoners, or others whose ability to give voluntary informed consent may be in question.

**Overview of the Study Population Counties**

The following tables delineate the population demographics of the Indiana and Illinois counties in which the study participants were assumed to be from based on their participation in a diabetes education program in Terre Haute, Indiana. The statistics from the table are important
because they describe the characteristics of the study population in relation to race, gender, SES, and their education levels, among other things.

Table 3.1

_Indiana Counties Population Statistics According to the United States Census Bureau (USCB) Report (USCB, 2012a, b, c, d, and e)_

<table>
<thead>
<tr>
<th>Quick facts</th>
<th>Vigo</th>
<th>Clay</th>
<th>Sullivan</th>
<th>Vermillion</th>
<th>Parke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population 2012 estimate</td>
<td>108,428</td>
<td>26,837</td>
<td>21,188</td>
<td>16,040</td>
<td>17,069</td>
</tr>
<tr>
<td>Female/Male percent</td>
<td>49.3/50.7</td>
<td>50.9/49.1</td>
<td>45.6/54.4</td>
<td>50.5/49.5</td>
<td>53.4/46.6</td>
</tr>
<tr>
<td>Caucasian Persons percent, 2011</td>
<td>88.6</td>
<td>98.0</td>
<td>93.8</td>
<td>98.3</td>
<td>96.3</td>
</tr>
<tr>
<td>African American persons, 2011</td>
<td>7.1</td>
<td>0.5</td>
<td>4.6</td>
<td>0.4</td>
<td>2.6</td>
</tr>
<tr>
<td>American Indian, 2011</td>
<td>0.4</td>
<td>0.2</td>
<td>0.3</td>
<td>0.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Asian Persons, 2011</td>
<td>1.8</td>
<td>0.3</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Native Hawaiian and other Pacific Islander persons, 2011</td>
<td>Z</td>
<td>Z</td>
<td>Z</td>
<td>Z</td>
<td>Z</td>
</tr>
<tr>
<td>High School Graduate, percent in 2011</td>
<td>85.7</td>
<td>87.6</td>
<td>85.9</td>
<td>87.8</td>
<td>80.8</td>
</tr>
<tr>
<td>Bachelor's degree or higher, percent in 2011</td>
<td>21.1</td>
<td>14.3</td>
<td>13.4</td>
<td>13.8</td>
<td>13.9</td>
</tr>
<tr>
<td>Median household income in 2011</td>
<td>39,534</td>
<td>46,916</td>
<td>47,640</td>
<td>43,856</td>
<td>42,441</td>
</tr>
<tr>
<td>Persons below poverty level, percent in 2011</td>
<td>18.5</td>
<td>12.7</td>
<td>13.3</td>
<td>13.6</td>
<td>14.8</td>
</tr>
</tbody>
</table>
Table 3.2


<table>
<thead>
<tr>
<th>Quick Facts</th>
<th>Edgar</th>
<th>Clark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population, 2012 estimate</td>
<td>18,191</td>
<td>16,209</td>
</tr>
<tr>
<td>Female/Male percent</td>
<td>51.5/48.5</td>
<td>51.3/48.7</td>
</tr>
<tr>
<td>Caucasian Persons percent, 2011</td>
<td>98.6</td>
<td>98.2</td>
</tr>
<tr>
<td>African American persons, 2011</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>American Indian, 2011</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Asian Persons, 2011</td>
<td>0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>Native Hawaiian and other Pacific Islander persons, 2011</td>
<td>Z</td>
<td>Z</td>
</tr>
<tr>
<td>High School Graduate, percent in 2011</td>
<td>88.6</td>
<td>89.0</td>
</tr>
<tr>
<td>Bachelor's degree or higher, percent in 2011</td>
<td>17.2</td>
<td>17.4</td>
</tr>
<tr>
<td>Median household income in 2011</td>
<td>$42,947</td>
<td>$47,933</td>
</tr>
<tr>
<td>Persons below poverty level, percent in 2011</td>
<td>14.9</td>
<td>10.2</td>
</tr>
</tbody>
</table>
Diabetes Prevalence of Illinois and Indiana Counties

According to the CDC (2012b, 2012c) reports, Table 3.3 shows diabetes prevalence rate of the Indiana and Illinois counties from which participants was drawn.

Table 3.3

**Indiana and Illinois Diabetes Prevalence**

<table>
<thead>
<tr>
<th>County</th>
<th>Diagnosed prevalence in 2010 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay County, IN</td>
<td>10.6</td>
</tr>
<tr>
<td>Parke County, IN</td>
<td>12.0</td>
</tr>
<tr>
<td>Sullivan County, IN</td>
<td>10.9</td>
</tr>
<tr>
<td>Vermillion County, IN</td>
<td>12.7</td>
</tr>
<tr>
<td>Vigo County, IN</td>
<td>8.8</td>
</tr>
<tr>
<td>Clark, IL</td>
<td>9.3</td>
</tr>
<tr>
<td>Edgar, IL</td>
<td>11.2</td>
</tr>
</tbody>
</table>

Study Variables

The study variables that were analyzed comprised of nominal, ordinal, interval and ratio measurements. Based on the research question, the independent variables were the factors that might influence patients’ adherence to physicians and health educators’ recommendations. These factors might include patients’ SES (as determined by annual household income), educational levels, self-efficacy, gender, and race. The dependent variables of the study were the patients’ adherence to physicians and health educators’ recommendations among type 2 diabetics with regards to medication treatment and physical activity (i.e., healthy exercise) routines. The study examined the relationship between the aforesaid independent variables and patients’ medication and exercise adherence as recommended by physicians and diabetes health educators.
Table 3.4

*Dependent and Independent Variables for the Research Statement*

<table>
<thead>
<tr>
<th>Research statement</th>
<th>Dependent variables</th>
<th>Independent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factors influence patients’ adherence to physicians and health educators’ recommendations</td>
<td>Patients’ adherence to physicians and health educators’ recommendations about medication and physical activity</td>
<td>Factors influence patients’ adherence (i.e., gender, ethnic origin, SES, education level, and Self-efficacy)</td>
</tr>
</tbody>
</table>

**Data Collection Method**

**Study Design.** This correlation research is designed to determine the relationship among the aforesaid variables. The study reported the Pearson’s Product Correlation \((r)\) with the degrees of freedom \((N – 2)\) with the \(P\)-value and significance information. Participants reported their self-care activities during the seven days prior to their responses to the study questionnaire.

**Instrumentation.** This quantitative study used a questionnaire (see Appendix B) as an instrument to collect data from the respondents. The questions in this survey were adopted from two different questionnaires developed by Stanford University School of Medicine and University of Louisville’s Psychology Lab. The University of Louisville’s questionnaire was developed, revised, and edited by multidisciplinary research and clinical staff of a United States University-based Diabetes Research and Training Center (Stetson et al., 2011). According to Stetson et al. (2011), the University of Louisville’s questionnaire was “feasible to administer in a clinical setting and was a valid and reliable measure of diabetes self-care behaviors, skills and control perceptions and barriers” (p. 329). Similarly, the Stanford University School of Medicine’s questionnaire was used to determine the efficiency of community based diabetes self-management program. The Stanford University’s instrument efficiently measured the participants’ health status, health behavior, healthcare utilization, and self-efficacy. Those
measures were based on diabetes linked problems (Lorig, Ritter, Villa, & Armas, 2009). To ensure the relevance of the data collected through this questionnaire some questions that were not found in the two adapted questionnaires were added. The study questionnaire, which was organized in blocks, included restricted and unrestricted, nonintrusive questions that the respondents understood without difficulty. The close-ended questions comprised of dichotomous, multiple choice, rating, and ranking types of questions. The open-ended questions were limited and consisted of a blank space where the respondents wrote their answers. The researcher avoided using double-barreled and double negative questions and defined terms that the respondents might misapprehend.

**Data Analysis**

Once the data were collected, they were entered into the Statistical Package for the Social Sciences (SPSS), a computer database system for statistical analyses. The data were stored in such a way that each row represented one respondent and each column represented a variable from the questionnaire. The data were cleaned by examining whether or not the values were operational and reliable. If the participants’ response was “don’t know,” it was coded -9; the “missing” was coded as (0). Consistency checks for the data were conducted by confirming that the data from the paper survey were entered into the SPSS correctly. Program files (batch files) were created in the SPSS statistical analysis program to process the data. The data were saved regularly to avoid any loss or damage. Variables and values were labeled for tabulations and analyses. Descriptive statistics, which summarizes data’s frequency and respondents’ demographics in terms of gender, ethnicity, income, and education in addition to the healthy exercise and medication variables, were created by using SPSS. The descriptive information was calculated using the analysis menu.
The study measured the relationship between the interval/ratio level variables to be studied by using a correlation analysis menu from the SPSS. In this technique, the level of relationship between two or more variables was expressed by the Correlation Coefficient $r$ (Neutens & Rubinson, 2010) along with $P$-value. The correlations were considered to be significant at the 0.05 level. All tests of association were used considering the levels of measurement, nominal, ordinal, and interval. For example, interval/ratio data used correlation analysis. Additionally, the results from the four exercise variables (questions 1, 3, 4 and 6) were combined assigning “1” if the respondents were adherent and “0” if they were not adherent. For example, if the respondents performed at least 30 minutes of moderate to vigorous aerobic exercise during the past week (e.g., swimming, cycling, walking, and rowing) five days a week, they were considered adherent and they were given “1”; if they did not perform, they were not considered adherent and were given “0”. Also, if the respondents reported they spent during the past week 30 minutes or more of physical activity on five or more days each week, they were considered adherent, and they were given “1”; if they did not, they were not considered adherent and were given “0”. In addition, the results from the seven self-efficacy variables (for each respondent) were combined and then divided by seven to get the average number which represented the self-efficacy score for the respondents. Moreover, for the medical adherence variable, respondents’ prescribed medications were reviewed and assessed whether or not each respondent took the medications as prescribed by physicians. Respondents who took medications as prescribed by physicians were considered adherent and were given “1”. Respondents who did not take medications as prescribed by physicians were not considered adherent and were given “0”. Furthermore, the ethnic origin variable was changed into dichotomous in order to perform the correlation analysis. It consisted of two races: White and non-White, which were given “1”
and “0” respectively. Also, the gender independent variable was represented by a dichotomous variable, where female was coded as “1” and male as “2”.

**Summary of Chapter Three**

The study depended on the approval of the IRB at ISU. Participants’ privacy and the confidentiality of the data obtained were secured. The study population was type 2 diabetics. A sample of 102 type 2 diabetics of both sexes was recruited from two healthcare facilities in Terre Haute, Indiana (Diabetes Endocrinology Clinic and Terre Haute Regional Hospital). The study used a non-probability convenience sampling technique to recruit respondents because it was fast and had a low-cost. The variables that were analyzed included race, gender, education level, SES, and patients’ self-efficacy with regards to medication and healthy exercise adherence. The study investigated the relationship between those variables. The data collection process was based on a descriptive correlation design to examine if there were associations between the variables. A simple questionnaire was given to each respondent along with a consent form and a leaflet explaining the study as an instrument to collect data from the respondents. Once the data were collected, they were entered into SPSS for statistical analyses in order to facilitate data analysis. Correlation analysis technique was used to generate results.
CHAPTER FOUR

RESULTS

The purpose of this study was to examine factors that might influence patients’ adherence to physicians and health educators’ instructions in relation to diabetes medications and exercise routines. The study was intended to test the relationship between diabetics’ socioeconomic status, self-efficacy, education levels, gender, and ethnicity and their medication and physical activity adherence regarding to their physicians’ and health educators’ counsels. The study took place at Terre Haute Regional Hospital, where 89 patients were recruited, and in the Diabetes Endocrinology Clinic, where 15 patients were recruited. The total of the individuals who accepted to participate in the study were 104, of whom 102 were included in the study (N = 102). Age ranged from 32-85 ($M = 62.19, SD = 11.74$). Two of the 104 individuals who agreed to participate in the study were excluded for the following reasons: one participant who completed the questionnaire stated that she was not a type 2 diabetic, and the other participant admitted that he had not visited a physician since being diagnosed with type 2 diabetes. Neither case met the inclusion criteria described in chapter three for the study.

Demographic Characteristics of Participants

The respondents’ characteristics are summarized in Table 4.1. The number of the participants for the study was 102 of whom 65 (63.7 %) were female and 37 (36.3%) were male.
The study participants acknowledged that their health status was as follows: 40% reported fair health, 37% indicated good health, 8% said very well, and 2% said excellent. Less than 12% of the participants reported their health status was poor. Forty-two respondents (42%) said they had finished high school and 48% had some level of college education. The majority of the respondents (52%) had income of $30,000 or less. Additionally, the majority said they were white (89.2%), while 9.0% and 2.0% reported they were Black/African Americans or other, respectively.
Table 4.1

Demographic Characteristics of Participants \((N = 102)\)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>65</td>
<td>63.7</td>
</tr>
<tr>
<td>Male</td>
<td>37</td>
<td>36.3</td>
</tr>
<tr>
<td>Ethnic origin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>91</td>
<td>89.2</td>
</tr>
<tr>
<td>Black or African American</td>
<td>9</td>
<td>8.8</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>2.0</td>
</tr>
<tr>
<td>Annual income ($)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$10,000</td>
<td>16</td>
<td>16.0</td>
</tr>
<tr>
<td>$10,001 - $20,000</td>
<td>23</td>
<td>23.0</td>
</tr>
<tr>
<td>$20,001 - $30,000</td>
<td>13</td>
<td>13.0</td>
</tr>
<tr>
<td>$30,001 - $40,000</td>
<td>15</td>
<td>15.0</td>
</tr>
<tr>
<td>$40,001 - $50,000</td>
<td>12</td>
<td>12.0</td>
</tr>
<tr>
<td>$50,001 - $60,000</td>
<td>6</td>
<td>6.0</td>
</tr>
<tr>
<td>$60,001 +</td>
<td>15</td>
<td>15.0</td>
</tr>
<tr>
<td>Missing</td>
<td>2</td>
<td>2.0</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not completed high school</td>
<td>11</td>
<td>10.8</td>
</tr>
<tr>
<td>Completed high school</td>
<td>42</td>
<td>41.6</td>
</tr>
<tr>
<td>Not completed four year college</td>
<td>33</td>
<td>32.7</td>
</tr>
<tr>
<td>Completed four year college</td>
<td>9</td>
<td>8.9</td>
</tr>
<tr>
<td>Graduate school</td>
<td>4</td>
<td>4.0</td>
</tr>
<tr>
<td>Post graduate school</td>
<td>2</td>
<td>2.0</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Physical Activity-Related Variables

Table 4.2 presents results of the level of the participants’ workout intensity in the past week. The majority said they engaged in moderate exercise ($n = 73, 72.0\%$). Only one respondent reported exercising vigorously. Twenty seven participants did not respond to this question. Additionally, participants were asked whether they had gone more than two days in a row without exercising in the past week. Twenty-four percent of the sample reported no ($n = 22$), and 68% reported that yes, they had gone more than two days in a row without exercising ($n = 69$). Ten participants did not respond to this question. Thirteen percent of the respondents reported doing strength activities in the past week ($n = 13$), and 76% did not ($n = 77$). Nine participants did not respond to this question.
Table 4.2

*Exercise-related Variables (N = 102)*

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level of workout intensity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>73</td>
<td>71.6</td>
</tr>
<tr>
<td>Vigorous</td>
<td>1</td>
<td>0.9</td>
</tr>
<tr>
<td>Missing</td>
<td>27</td>
<td>26.0</td>
</tr>
<tr>
<td><strong>Exercise continuity (two or more days in a row without exercise in the past week)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>69</td>
<td>67.6</td>
</tr>
<tr>
<td>No</td>
<td>22</td>
<td>21.6</td>
</tr>
<tr>
<td>Don’t know</td>
<td>1</td>
<td>1.0</td>
</tr>
<tr>
<td>Missing</td>
<td>10</td>
<td>9.8</td>
</tr>
<tr>
<td><strong>Strength training activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13</td>
<td>12.7</td>
</tr>
<tr>
<td>No</td>
<td>77</td>
<td>75.5</td>
</tr>
<tr>
<td>Don’t know</td>
<td>3</td>
<td>2.9</td>
</tr>
<tr>
<td>Missing</td>
<td>9</td>
<td>8.8</td>
</tr>
</tbody>
</table>

**Adherence to Medical Prescriptions among Respondents**

Table 4.3 summarizes the medical adherence level among the respondents. Respondents who were told to take Pills and Insulin shots (n = 22), 55% reported being adherent. Of those instructed to take insulin shots along with diet and exercise (n = 4) and those told to change their diet and exercise (n = 7), 75% and 100% reported being adherent respectively.
Table 4.3

Prescribed Treatment and Reported Adherence Levels among Participants (N = 102)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>%</th>
<th>Adherent</th>
<th>Adherent%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pills</td>
<td>38</td>
<td>38.0</td>
<td>25</td>
<td>66.0</td>
</tr>
<tr>
<td>Insulin Shots</td>
<td>23</td>
<td>22.5</td>
<td>14</td>
<td>60.0</td>
</tr>
<tr>
<td>Both Pills and Insulin Shots</td>
<td>22</td>
<td>22.0</td>
<td>12</td>
<td>55.0</td>
</tr>
<tr>
<td>Diet and Exercise only</td>
<td>7</td>
<td>7.0</td>
<td>7</td>
<td>100.0</td>
</tr>
<tr>
<td>Insulin Shots, Diet and Exercise</td>
<td>4</td>
<td>4.0</td>
<td>3</td>
<td>75.0</td>
</tr>
<tr>
<td>Pills, Diet and Exercise</td>
<td>3</td>
<td>3.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>All of the above</td>
<td>2</td>
<td>2.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>3.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Correlation Analysis between Self-efficacy, Healthy exercise, and Gender

Table 4.4 presents results from the correlation among different variables associated with Type 2 diabetics’ adherence to physicians’ recommendations with regards to medications and physical activity. The only independent variable that was significantly correlated with an outcome of interest was self-efficacy, which was associated with increased likelihood of engaging in healthy levels of exercise $r (100) = .555, p < .05$. Self-efficacy was, in turn, correlated with gender $r (100) = .207, p < .05$, indicating that males had higher levels of self-efficacy. No other correlations were statistically significant. All tests were two-tailed.
Table 4.4

*Correlations of Variables Associated with Type 2 Diabetics’ Medical and Exercise Adherence*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Gender</th>
<th>Race</th>
<th>Income</th>
<th>Education</th>
<th>Medical adherence</th>
<th>Healthy Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>-.001</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>.121</td>
<td>-.146</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.022</td>
<td>.019</td>
<td>.331*</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Adherence</td>
<td>-.188</td>
<td>.044</td>
<td>.022</td>
<td>-.015</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>Healthy Exercise</td>
<td>.119</td>
<td>.145</td>
<td>-.080</td>
<td>-.133</td>
<td>-.022</td>
<td>--</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>.207*</td>
<td>.014</td>
<td>.161</td>
<td>.086</td>
<td>-.110</td>
<td>.555*</td>
</tr>
</tbody>
</table>

*Note.* *P* < .05. All tests were two-tailed.
Respondents’ Self-efficacy Scores

Respondents’ self-efficacy-related scores ranged from 1 - 10 ($M = 4.73$, $SD = 2.19$).

Table 4.5

*Respondents’ Average Score for the Self-efficacy-related Variables (N = 102)*

<table>
<thead>
<tr>
<th>Measure</th>
<th>N</th>
<th>MIN</th>
<th>MAX</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average score for the self-efficacy questions</td>
<td>102</td>
<td>1</td>
<td>10</td>
<td>4.73</td>
<td>2.19</td>
</tr>
</tbody>
</table>

*Note.* MIN = Minimum; MAX = Maximum.
CHAPTER FIVE

DISCUSSION

The current study tested the relationships between income, education level, gender, ethnicity, and self-efficacy and type 2 diabetics’ adherence to medications and physical activity routines. Also, the study examined whether the respondents were properly following physicians and health educators’ treatment with regards to diabetes medications and physical activity routines. The study confirmed a direct correlation between self-efficacy and physical activity adherence as well as a positive relationship between gender and self-efficacy. Also, the study revealed that the majority of the study participants were adherent to physicians’ prescription with regard to medication treatments (insulin shots, pills, or shots and pills) and diet and exercise modification advice.

Medication Adherence

The majority of the respondents who were told to take pills for their diabetes condition were adherent and took their pills regularly as prescribed by physicians. Similarly, most of the respondents who were prescribed to take insulin shots and those who were recommended for both pills and insulin shots together took their medications on a regular basis. Additionally, most of the respondents, who reported insulin shots along with diet and exercise as their prescribed treatment, were adherent. However, the number of respondents who were not adherent in taking
medications routinely (Insulin shots, pills, or pills and insulin shots) was alarming (40.0%, 34.0%, and 45.0% respectively). As a result, while our finding was consistent with a meta-analysis study by Odegard & Capoccia (2007), who reported that medication adherence among type 2 diabetics was higher and ranged from 53.0% to 98.0%, it was at variance with previous studies that reported the opposite. The evidence from another study suggested that medication non-compliance was prevalent among diabetics (Hauber, Mohamed, Johnson, & Falvey, 2009), and that self-reported medical adherence was suboptimal of 49.0% for primary care type 2 diabetics (Aikens & Piette, 2012). Therefore, the current study suggested that more inclusive studies, which include all missing ethnic groups, are necessary to examine the precision of the differing results.

**Self-efficacy and Healthy Exercise**

Behavior change among type 2 diabetics is crucial to achieve ideal glycemic objectives (Shi, Ostwald, & Wang, 2010). The necessary behavior changes include improving physical activity, which is essential for diabetics along with eating healthier foods and taking medications as recommended by physicians (ADA, 2013b). Thus, it has been suggested that type 2 diabetics need to take an active role in designing optimum glycemic goals for themselves to control diabetes condition (Ismail-Beigit et al., 2011). Both the CDC (2012a) and the ADA (2013c) recommend that diabetics need 30 minutes of moderate to vigorous-intensity physical activity or aerobic exercise on five or more days each week. However, diabetics were less prepared to improve their physical activity than non-diabetics (Vähäsarja et al., 2012). In accordance with a study conducted by Heymann, Mishali, & Omer (2010), our study found a direct correlation between self-efficacy and healthy exercise, i.e., respondents with higher self-efficacy had higher scores of healthy exercise. Also, the current result was in line with findings from similar studies.
that tested those variables (Aljasem, Peyrot, Wissow, & Rubin, 2001; Samardzija, Braun, Keithley, & Quinn, 2012). Thus, the present study suggested that the respondents who reported higher scores of self-efficacy were more likely to engage in physical activity as recommended by physicians and health educators. The current study did not test whether there was a relationship between patients’ diabetes education follow-ups and their exercise self-efficacy. However, we hypothesize that there is a relationship between these two variables. Therefore, future studies may investigate whether patients’ routine diabetes education follow-ups are correlated with their exercise self-efficacy.

**Gender and Self-efficacy**

Additionally, the current study tested whether gender (Female coded as “1” and male as “2”) has a relationship with diabetics’ self-efficacy in relation to physicians and health educators’ counsel on the subject of medication and physical activity routines. Previous studies reported that men and women have different views about confidence in taking curative health actions (Ramesh, 2000) including medication and physical activity routines. Hertz et al. (2005) reported that women were more likely to be non-adherent to physicians’ counsel about the diabetes treatments. The present study revealed a direct relationship between gender and self-efficacy which was, in turn, associated with healthy exercise behaviors. The result was in line with a finding reported by Wray & Chiu (2011) who found that while women had better diet and blood glucose monitoring, they reported less satisfying self-efficacy scores. However, other studies reported no gender difference in both self-efficacy (Grier, 1999; Hankonen, Absetz, Ghisletta, Renner, & Uutela, 2010) and medication adherence (Wray & Chiu, 2011).
Limitations and Conclusion

There are a number of limitations to the present study. First, most of the research data were based on respondents’ self-reports. Therefore, the researcher had no control over how carefully or honestly participants responded to the study questionnaire. Second, data of some of the ethnic origins such as Asian, Native Hawaiian and American Indian were missing due to inaccessibility of these ethnic origins at the time of the study and the recruitment venues. Additional studies, focusing on the missing ethnic groups, are necessary to explore the relationship between the aforesaid variables. Furthermore, future studies on this topic may need to recruit larger number of participants to ensure better diversity among the participants with regards to age, ethnicity, and income. As a final point, the present study has shown the impact of positive self-efficacy on healthy exercise, where respondents with higher exercise self-efficacy were more likely to be physically active. It provided the healthcare professionals with essential information about the confidence level of type 2 diabetics to be physically active. Because of the respondents’ low self-efficacy ($M = 4.73$), the current study recommends that future studies may investigate the possible barriers to exercise self-efficacy among type 2 diabetics in general, female diabetics in particular. These barriers may include lack of diabetes education follow-ups, absence of social support, and work related barriers. Researchers need to study the potential strategies to improve patients’ physical activity adherence as well. Also, clinicians and healthcare educators need to develop interventions, which can boost type 2 diabetics’ confidence level to effectively engage in the CDC and ADA recommended physical activity routines. In addition, the result of the current study supported the previous findings that the majority of type 2 diabetics adhere to medication prescription. However, while the adherence level of the respondents who were told to change their diet and exercise were encouraging, the medication
non-compliance level among the patients was alarming and an important concern. Therefore, healthcare professionals should develop more effective strategies to improve medication adherence level among type two diabetics. Additionally, the current study suggests that diet and exercise treatments may be considered as two prospects that can lead future success for type 2 diabetics’ glycemic control.
REFERENCES


APPENDIX A: IRB EXEMPT LETTER

DATE: April 29, 2014
TO: Abdi Nur, MS
FROM: Indiana State University Institutional Review Board
STUDY TITLE: [593716-2] GLYCEMIC CONTROL AMONG TYPE 2 DIABETICS
SUBMISSION TYPE: Revision
ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: April 29, 2014
REVIEW CATEGORY: Exemption category # 2

Thank you for your submission of Revision materials for this research study. The Indiana State University Institutional Review Board has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations (45 CFR 46). You do not need to submit continuation requests or a completion report. Should you need to make modifications to your protocol or informed consent forms that do not fall within the exempt categories, you will have to reapply to the IRB for review of your modified study.

Informed Consent: All ISU faculty, staff, and students conducting human subjects research within the “exempt” category are still ethically bound to follow the basic ethical principles of the Belmont Report: a) respect for persons; b) beneficence; and c) justice. These three principles are best reflected in the practice of obtaining informed consent.

If you have any questions, please contact Dr. Kim Bodey within IRBNet by clicking on the study title on the "My Projects" screen and the "Send Project Mail" button on the left side of the "New Project Message" screen. I wish you well in completing your study.
APPENDIX B: QUESTIONNAIRE

Diabetes Questionnaire

By

Abdi H. Nur

The College of Graduate and Professional Studies

Department of Applied Health Sciences

Indiana State University

Terre Haute, Indiana

*The questions in this questionnaire were adopted from:*

Stanford University School of Medicine,

and University of Louisville’s Psychology Lab
Background

We need some basic information about you and your diabetes diagnosis.

1. How old are you? ____________ years old

2. Are you (check one)
   
   _____Female
   _____Male

3. What is your zip code number? ________________________

4. Ethnic origin (check only one):
   
   o White
   o Black or African American
   o Asian
   o Native Hawaiian or other Pacific Islander
   o American Indian or Alaskan Native
   o Other_____

5. Are you Hispanic/ Latino? _____Yes _____ No _______ Don’t know

6. What is your annual household income?
   
   o < $10.000
   o $10.001 – $20.000
   o $20.001 – $30.000
   o $30.001 – $40.000
   o $40.001 – $50.000
   o $50.001 – $60.000
   o $60.001 +

7. Please circle the highest year of school completed:
   
   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23+
   (primary) (high school) (college/university) (graduate school)

8. What is your current marital status? (please check only one)
53

- married
- separated
- single
- divorced

9. Do you have type 2 diabetes? (yes/no; if “no” you are done with this survey)

10. When were you diagnosed with type 2 diabetes? ________________

11. Have you visited a physician since being diagnosed with type 2 diabetes? _____ Yes _____ No

### General Health

1. In general, would you say your health is:

   (Circle one)

   - Excellent………………1
   - Very good………………2
   - Good……………………3
   - Fair……………………4
   - Poor……………………5

### Physical Activity Adherence

**Moderate-intensity**: a reasonable amount of energy and noticeably increases the heart rate (e.g., walking, dancing, gardening, housework and domestic, chores, traditional hunting and gathering, general building tasks, and carrying or moving moderate loads (< 20kg))

**Vigorous-intensity**: any exercise that requires an enormous amount of energy and causes rapid breathing and a significant rise in heart rate (e.g., running, fast cycling, aerobics, fast swimming, competitive sports (e.g., football and basketball), heavy shoveling or digging ditches, and carrying or moving heavy loads (> 20kg))

During the past week…

1. Did you perform at least 30 minutes of moderate to vigorous aerobic exercise (e.g., swimming, cycling, walking, and rowing) five days a week? ____No ____Yes ____Don’t know
2. What days did you work out? ____Monday ____Tuesday ___Wednesday ___Thursday  
_____Friday _____Saturday ____Sunday ____ I did not work out _____Don’t know
3. How much time did you spend working out? _________minutes

4. What level of intensity did you work out? ______ Moderate ______ Vigorous

5. Did you go more than two days in a row without exercising? _____No _____Yes  
 _____Don’t know

6. Did you do strength training activities (e.g., lifting light weights, resistance bands, heavy  
gardening, and free weight) at least twice? _____No _____Yes _____Don’t know

---

**Medication Adherence**

1. What has your doctor prescribed for your diabetes? (mark all that apply)
   
   _____ Insulin shots
   
   _____ Pills
   
   _____ Both pills and insulin shots
   
   _____ Diet and Exercise only

2. In the past week did you take pills for diabetes?..................No  
   If yes, please specify the name(s) of the diabetes pills you took:  
   ______________________________

   Yes       Don’t know

3. In the past week did you give yourself insulin injections?......No  

   Yes       Don’t know

4. In the past week did you take both pills and insulin shots?.....No  

   Yes       Don’t know

5. How often do you take pills for your diabetes?

   _____ I do not take pills for my diabetes

   _____ I never miss a dosage.

   _____ I miss a dose a couple times a month or less

   _____ I miss a dose once or twice a week

   _____ I miss a dose three to five times a week
____ I miss a dose almost every day
____ I never take my prescribed pills

6. How often are you supposed to take insulin?
   ____ I don’t take insulin
   ____ Occasionally, as needed
   ____ Once a day
   ____ Twice a day
   ____ Three or more times a day

9. How often do you take your insulin?
   ____ I have not been prescribed insulin for my diabetes
   ____ I never miss a shot
   ____ I miss a couple times a month
   ____ I miss once or twice a week
   ____ I miss three to five times a week
   ____ I miss almost every day
   ____ I never take my prescribed insulin

**Diabetes Self-Efficacy**

For each of the following questions, please *circle* the number that corresponds with your confidence that you can do the tasks regularly at the present time.

1. How confident do you feel that you can exercise for 30 minutes, 5 days a week? Not at all________________________Very confident
   confident 1 2 3 4 5 6 7 8 9 10

2. How confident do you feel that you can control your blood sugar with exercise and medication? Not at all________________________Very confident
   confident 1 2 3 4 5 6 7 8 9 10

3. How confident do you feel that you can spread your activity out over at least 3 days? Not at all________________________Very confident
   confident 1 2 3 4 5 6 7 8 9 10
4. How confident do you feel that you can try not to go more than two days in a row without exercising?

Not at all______________________________Very confident
confidence 1 2 3 4 5 6 7 8 9 10

5. How confident do you feel that you can perform strength training activities, such as lifting light weights, resistance bands, heavy gardening, and free weight at least twice a week?

Not at all______________________________Very confident
confidence 1 2 3 4 5 6 7 8 9 10

6. How confident do you feel that you can perform aerobic exercise, such as swimming, cycling, walking, and rowing five days a week?

Not at all______________________________Very confident
confidence 1 2 3 4 5 6 7 8 9 10

7. How confident do you feel that you can take your medication and follow treatment (i.e., exercise and diet) the way your doctor prescribed for your diabetes?

Not at all______________________________Very confident
confidence 1 2 3 4 5 6 7 8 9 10

Thank you for your help!