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HEALTH LITERACY, ILLNESS PERCEPTION, AND DIABETES SELF-MANAGEMENT IN KOREAN-SPEAKING IMMIGRANTS WITH DIABETES

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by

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DISSERTATION

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ABSTRACT

Health Literacy, Illness Perception, and Diabetes Self-Management in Korean-Speaking Immigrants with Diabetes

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Type 2 diabetes mellitus (DM) is becoming an increasingly common disease with aging. As the prevalence of DM increases, the need for self-management is emphasized as a way to control DM and prevent its complications. According to the common-sense model (CSM), DM self-management is explained as an illness-related coping behavior that is affected by an individual's illness perception (IP). No studies were found that evaluated IP in Korean adults with DM in the United States, or that evaluated the association of health literacy (HL) with their IP and DM self-management. The purpose of this study was to examine the relationships between HL, IP, and DM self-management, as well as to determine if HL moderates the relationship between IP and DM self-management, in Korean immigrants with DM.

A cross-sectional design was applied and a convenience sample of 52 Korean adults with self-reported DM was recruited at Korean churches in Dallas-Fort Worth areas. Participants were assessed on HL, IP, and DM self-management as well as sociodemographic data. Correlations and multiple linear regressions were performed to examine the relationships that were predicted by the research hypotheses. Of the 52 participants, more than half were male

(67.3%), employed (55.8%), living with family (92.3%), and educated at the college level or higher (76.9%). Interestingly, differences in DM self-management were found in sex and employment status. Compared with their counterparts, female participants were more likely to report better DM self-management (p = .012) and unemployed participants were as well (p = .005). The mean of HL was notably high (11.1, SD = 1.05). However, there were no statistically significant associations found between HL, IP, and DM self-management. Future research needs to be conducted with a large sample at different levels of HL.

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DEDICATION

I dedicate this achievement to my parents for their unwavering faith and support. Many people, including my family in Korea, helped and encouraged me to keep walking up to this final step. Without support from all, my achievement would not have been possible. Thank you and love you all for coming along this journey for me.

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CHAPTER I

INTRODUCTION

Type 2 diabetes mellitus (DM) is becoming an increasingly common disease with aging. Diabetes complications lead to an increase of medical costs which disadvantages minority populations as well as aging populations. Thus, various ways of preventing and managing DM have been studied and implemented. Chapter I includes a brief discussion of the significance of the problem of type 2 DM and the population of Korean immigrants with this disease. The brief background to support the need for a study of the relationships among health literacy (HL), illness perception (IP), and self-management in Korean immigrants with type 2 DM is also presented. Then a conceptual model to explain this study is presented, followed by a statement of a specific research problem and the purpose for this study.

Significance and Background of Diabetes

Type 2 DM is a significant worldwide health problem, and the DM epidemic has been continuously increasing everywhere (International Diabetes Federation [IDF], 2015; Kim, 2011). The global prevalence of DM in the adult population is 8.5% (World Health Organization [WHO], 2016), and the U.S. prevalence of DM is 12.2% (Centers for Disease Control and Prevention [CDC], 2017). Among the U.S. DM population, the proportion of minorities is higher than that for non-Hispanic Whites (CDC, 2017). Data about Korean Americans with DM are very limited, but the highest incidence of DM has been reported for Koreans among all Asian ethnic groups in northern California (Karter et al., 2013).

The prevalence of DM in Korea has increased significantly from 23.2% to 72.3% in the last decade (1998-2009; Kim, 2011). The DM population is estimated at 4.8 million (13.7%), and a quarter of Koreans are prediabetic (Korean Diabetes Association [KDA], 2016). More

than 30% of the DM population are aged 65 years or older, and the prevalence between men and women is not significantly different at age 60 years or older (60.3% and 57.9%, respectively). Thirty percent of the Korean DM population do not have an awareness of their condition, and 50% have comorbidities such as obesity, hypertension, or hypercholesterolemia (KDA, 2016). Even though the DM-specific information on Korean Americans is insufficient, these figures may represent the significance of DM in Koreans overall.

Diabetes is a major leading cause of morbidity and mortality in the United States (CDC, 2017) and in Korea (KDA, 2016), and incidences of heart attack and stroke in diabetics are higher than in non-diabetics (American Diabetes Association [ADA], 2017). In addition, average medical expenditures in the DM population are 2.3 times higher than in the non-DM population (ADA, 2017). Diabetes thus has major consequences for patients, families, healthcare, and society.

Diabetes and Self-Management in Korean Immigrants

Diabetes is a metabolic disorder resulting in hyperglycemia (Kumar et al., 2007). Uncontrolled chronic hyperglycemia leads to serious complications, such as end-stage renal disease, adult-onset blindness, and non-traumatic lower extremity amputations. It also increases the risk of cardiovascular disease and cerebrovascular disease (Kumar et al., 2007). Diabetes self-management thus has been strongly recommended for early diagnosis and prevention of DM complications. Diabetes self-management includes self-monitoring of blood glucose, foot exams, adherence to medications for lowering blood glucose levels, healthy diet, and physical activity (CDC, 2017).

Ethnic minorities are still in the center of health disparities even though healthcare providers and individuals have been aware of DM self-management (Han et al., 2007). It is not

known whether they are appropriately treated for this disease. For example, although the number of Korean immigrants in Texas is rapidly growing (Texas State Historical Association, 2017), their health seeking behaviors have not been well-explored. Their health status and health needs as well as their cultural beliefs about health are not well understood. They consider their health as good if symptom-free and thus do not seek healthcare (Han et al., 2007). Such beliefs and perceptions toward health prevention play a role as barriers in their healthcare seeking and self-care behaviors at the individual level (Han et al., 2007).

Diabetes complications are preventable by self-management that includes a combination of medication, diet, and physical activity (CDC, 2017). Self-management behaviors are influenced by environmental changes resulting from immigration. Immigration leads to drastic challenges in the social determinants of health. Limited access to health insurance, language barriers, and lack of health care access are particular concerns for Korean immigrants with DM (Joo & Lee, 2016). Individuals' abilities to perform effective self-management vary, and their abilities are influenced by multiple factors including HL, self-efficacy (Bohanny et al., 2013; Kim & Kosma, 2013), and IP (Searle et al., 2007) as well as their cultural beliefs. Therefore, it is important to study how Korean immigrants perceive and manage their illness.

Diabetes Self-Management and Health Literacy

Health literacy consists of knowledge, motivation, and competence to adequately utilize health information and health care services (WHO, 2013). Lack of HL may lead to ineffective decision-making that can result in less self-management and poorer health (WHO, 2013). Limited HL is an important predictor of poor health outcomes among older adults (Yamashita & Kart, 2011). Yamashita and Kart (2011) reported that older adults with a higher level of DM-specific HL had higher self-graded DM self-care ($\beta = 0.118$, SE = 0.010, $p < .001$). According to

Souza et al. (2014), those with limited functional HL were more likely to have poor control than those with adequate functional HL. A poor understanding of self-management was specified as a barrier negatively influencing DM self-management behaviors among older adult Koreans living in South Korea (Song et al., 2010). Health literacy was a significant predictor of physical and mental health along with self-efficacy in the older adult Korean population (Kim & Yu, 2010).

Disparities in HL are found among racial and ethnic minority groups who have different cultural backgrounds and do not speak English as a first language (Sentell & Braun, 2012). Additionally, HL is affected by cultural beliefs (Shaw et al., 2009). As known, culture affects how people communicate and understand health information, how people think and feel about their health, when and from whom people seek care, and how people respond to recommendations for lifestyle change and treatment. Thus, HL is an important factor influencing adherence and health outcomes of individuals with chronic disease in culturally and linguistically diverse groups.

Diabetes Self-Management and Illness Perception

The associations between IP and health-related behaviors are found in adults with chronic illness such as DM (Searle et al., 2007) or hypertension (Petrie et al., 2007). Individuals with DM have their own beliefs about the condition that are reflected in their IP. Differences in perceptions result in different coping strategies. Individuals who self-reported better understanding of DM had greater adherence to diet and fewer negative feelings associated with the disease (Grzywacz et al., 2011). Symptomatic patients or those with DM complications tend to engage more in exercise and foot care (van Pufffelen et al., 2015). Individuals who have positive perceptions about their DM are more likely to commit to a health plan (Abubakari et al.,

2011). There is also a negative association between threatening IP and medication adherence among English-speaking adults with DM (Shiyanbola et al., 2018).

Framework

The common-sense model of self-regulation (CSM) was used as a theoretical framework to guide this study (Cameron et al., 1993; Leventhal et al., 1984). Individuals construct their own illness representations of health threats, which influence their coping and health-seeking behavior that guides their self-management. According to the CSM (See Figure 1), individuals develop cognitive and emotional representations as a way to regain balance if their health status is threatened by illness. The developed cognitive and emotional representations of an illness or health threat influence their behaviors and actions in coping with and managing their illness. The outcomes of behaviors and actions are evaluated and apprised (Leventhal et al., 1984). The process of self-regulation is dynamic, in which coping efforts are developed by individual experience of illness, influenced by cognitive and emotional representations, and affect future coping efforts through the appraisal of health outcomes (Cameron et al., 1993).

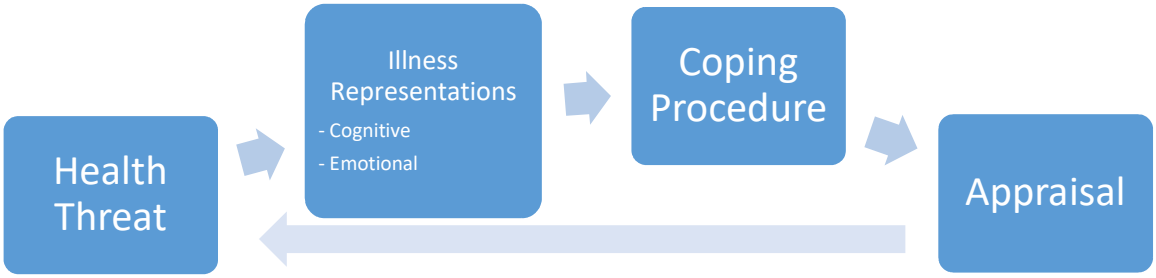

Figure 1. Common-sense model of self-regulation of health and illness by Cameron et al. (1993)

The study conceptual model that was supported by the CSM was focused on the following three concepts: IP, HL, and DM self-management. As seen in Figure 2, the perceived

symptoms of DM as health threats along with the common-sense beliefs of Korean immigrants with DM affect the formation of the representations of their illness. The developed representations (IP) contribute to coping strategies on how individuals cope with, adapt to, and respond to their DM. I hypothesize that HL may play a significant role in the process of selection and initiation of coping strategies, which can lead to variations in self-management. The CSM provided a framework to this study to explain DM self-management as patient health-related actions in response to a DM illness.

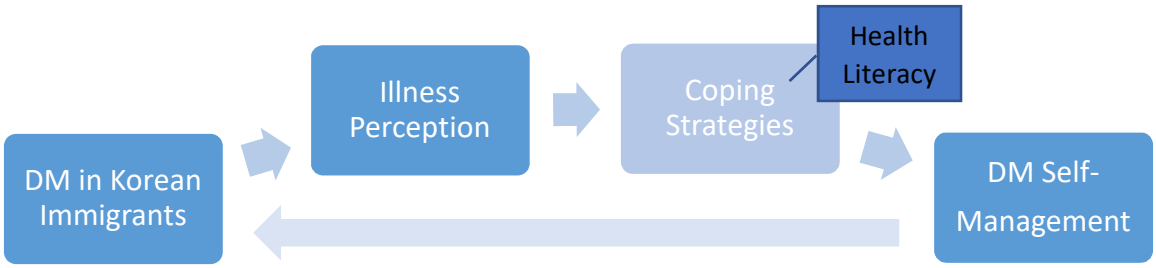

Figure 2. Conceptual model of the hypothesized relationships between IP, HL, & DM self-management in Korean immigrants with DM

Illness perception consists of emotional and cognitive representations of an individual's own illness (Leventhal et al., 1984). There are five domains of cognitive representations: identity (a label or name of the condition and/or symptoms), cause (the belief of why the condition exists, such as lack of sleep, exposure to a sick person), timeline (perceived time how long the condition will last), consequences (expected outcomes, such as physical disability), and personal and treatment control (the belief that the treatment can be effective). For an example of identity, if one experiences dizziness, sweating, and nervousness, the properties of the experience in interaction with one's health beliefs can create the representation of a hypoglycemia or of anxiety. Emotional representations include concern, emotion (feelings of anger, depression, or anxiety), and coherence (understanding of the illness), which arise following the diagnosis of an illness (Broadbent et al., 2006; Leventhal et al., 1984). Negative emotions such as depression or

anxiety have been demonstrated in individuals with low self-care confidence (Broadbent et al., 2006; Goodman et al., 2013). The formation of these representations is guided by individuals' cultural knowledge, current symptoms and previous experiences of the illness, and information from individuals' social environment (Leventhal et al., 1984).

Health literacy is defined as an individual's capacity for obtaining, communicating, processing, and understanding basic health information and services to make appropriate health decisions (U.S. Department of Health and Human Services, 2000). Health literacy is also considered as competencies of applying information (Sorensen et al., 2012). In Iranian adults with DM, HL was related to individuals' understanding about self-care in DM management (Inoue et al., 2013), and had a positive relationship with health promoting behaviors, including not only nutrition or physical activity but also spiritual growth (self-satisfaction, hope, or belief; Chahardah-Cherik et al., 2018). Limited HL was associated with reduced awareness of DM symptoms (Williams et al., 1998) and compliance with treatment (Kripalani et al., 2007).

Self-management is defined as health behaviors undertaken by an individual to cope with health problems or promote health status. If individuals approach coping, they increase certain behaviors such as taking medication, healthy diet, exercise, and disease-specific behaviors. Self-management in this study framework is considered a response to perceived threats (Leventhal et al., 1984), and directly influenced by coping strategies that arise from individual cognitive and emotional representations of illness. For example, self-management in individuals with DM includes initiating and maintaining physical activity, controlling average daily calorie intake, monitoring blood glucose levels, and adhering to treatment regimens. However, those with high levels of depression may take avoidance, withdrawal, or denial as coping strategies. Also, those without symptoms may take no action unless they perceive a need to do so.

The following propositions exist in the relationships between the three concepts:

1. Illness perception is a major factor influencing DM self-management behaviors.
2. More threatening view of the illness in individuals with DM does not mean better self-management because individual coping efforts vary (Broadbent et al., 2006). A negative emotion of the illness has a negative or no effect on self-management (Goodman et al., 2013; Hudson et al., 2016; Schmitt et al., 2017).
3. Positive perceptions in personal and treatment control, and coherence are associated with low serum glucose (Broadbent et al., 2015).
4. Health literacy employed by individuals can affect the direction and/or strength of the relationship between IP and DM self-management.
5. Self-management has a positive relation with glycemic control (Breland et al., 2013).

Using this conceptual model, I proposed that IP influences DM self-management. Instead of the use of the entire CSM, this study focused on the relationship between IP and self-management of Korean immigrants with DM. The CSM was useful for understanding the determinants of health behaviors and the mechanisms linking health and behavioral processes. It is important to study IP in culturally diverse populations to understand their health behavior. It is also important to study the role of HL in the relationship between IP and DM self-management because HL can be improved through education and practice.

Purpose

No studies were found that evaluated IP in Korean adults with DM in the United States, or that evaluated the association of HL with their IP and DM self-management. The purpose of this study was to examine the relationships between HL, IP, and DM self-management, as well

as to determine if HL moderates the relationship between IP and DM self-management, in Korean immigrants with DM.

Questions or Hypotheses

The research questions for this study were:

1. How are IP and DM self-management related in Korean-speaking immigrants with DM?
2. Does this relationship vary by level of HL?

The hypotheses of the study were:

1. Positive (optimistic) IP is positively correlated to DM self-management in Korean immigrants with DM.
2. Low HL has a negative effect on the relationship between IP and DM self-management in Korean immigrants with DM.

Summary

Diabetes, as a significant attributing cause of cardiovascular disease, globally receives more attention. As the prevalence of DM increases, the need for self-management is emphasized as a way to control DM and prevent its complications. According to the CSM, DM self-management is explained as an illness-related coping behavior that is affected by an individual's IP. The application of the CSM was useful for explaining how Korean immigrants with DM initiate and maintain their self-management. It was also useful for identifying factors affecting self-management and the relationship between the factors and self-management.

CHAPTER II

CRITICAL REVIEW OF RELEVANT LITERATURE

Diabetes Mellitus (DM) is a chronic disease, and 90-95% of all DM cases are adult-onset, type 2 DM. Literature related to Type 1 or juvenile DM and gestational DM was excluded from this study. Diabetes complications cause serious bodily loss or damage and lead to an increase in medical costs which disadvantages minority populations. Various ways of preventing and managing DM thus have been studied and implemented. In this chapter, relevant literature on DM and DM self-management is described to support the research questions and key concepts being studied.

Magnitude of Diabetes

Diabetes is a significant worldwide health problem, and the DM epidemic has been continuously increasing (IDF, 2017; Kim, 2011). The global prevalence of DM in the adult population is 8.5% (WHO, 2016), which means that one in 11 adults lives with DM (IDF, 2017). In the West Pacific region, the prevalence of DM was 8.6% in 2013, and it is predicted to rise to 11.1% by 2035. South Korea was ranked fourth among the top 10 countries of the region in terms of number of people affected by DM (Chan et al., 2014). According to the KDA (2016), the DM population in South Korea is estimated at 4.8 million (13.7%). In the United States, the number of adults with DM is 30.2 million, which is 12.2% of the U.S. adult population (CDC, 2017). This number means that one out of every eight U.S. adults lives with DM.

Diabetes by Age, Sex, and Level of Education

Diabetes has constantly increased in all age groups over the last two decades. According to the CDC (2017), the highest age-specific prevalence of DM is in adults aged 65 years or older (25.2%), followed by adults aged 45-64 years (17.0%), and 18-44 years (4.0%). In other words,

one in four older adults lives with DM. By sex, the DM prevalence between men and women is not significantly different (15.3 and 14.9 million, respectively). By education level, however, the DM prevalence decreases as education increases (negative relationship). Adults with less than a high school education (12.6%) have more diagnosed DM versus those with high school (9.5%) or more than high school education (7.2%; CDC, 2017).

Diabetes by Ethnicity

Among the U.S. DM population, the proportion of some Asian subgroups, including Koreans, diagnosed with DM is 8.5%, which is 1.1% higher than that for non-Hispanic Whites (CDC, 2017). In addition, the prevalence of undiagnosed DM was higher among Asian Americans (50.9%) and Hispanic Americans (40%) than all other minority groups (Menke et al., 2015). Even though it is reported that Koreans in northern California had the highest incidence of DM (20.3 cases per 1,000 person-years) among all ethnic groups, followed by Pacific Islanders, South Asians, and Filipinos (19.9, 17.2, and 14.7 cases per 1,000 person-years, respectively; Karter et al., 2013), data about Korean Americans with DM are very limited.

Diabetes in Korean Immigrants

Little is known about DM in Korean immigrants in the United States. The number of Korean immigrants was 1.4 million in 2010, which represented a 33.1% increase over 10 years, and the number of Korean older adults has also been increasing proportionately (U.S. Census Bureau, 2012). Older adult Korean immigrants are one of the fastest growing populations in the United States. From the patterns of high DM prevalence in U.S. older adults, the prevalence of DM among older adult Korean immigrants in the United States can also be expected to be high. The diabetic-specific data in Korean immigrants are, however, very limited compared to other populations in the nation. For this reason, more research in this population needs to be done.

Impact of Diabetes

Diabetes is a common chronic disease, and it is the seventh leading cause of death in the United States (CDC, 2017). Comorbid conditions with DM include hypertension, dyslipidemia, stroke, blindness, kidney disease, and amputations. In 2008, 4.2 million people had DM retinopathy. More than half of non-traumatic lower-limb amputations among adults were associated with DM. In 2009, about 6.4% of U.S. adults visited emergency departments for complications from DM. In 2010, hospitalization rates for heart attack and stroke were 1.8 and 1.5 times higher, respectively, among adults with DM than among adults without. In 2012, 71% of adults with DM had high blood pressure, and 65% had high cholesterol (CDC, 2017).

Adults with DM are also more likely to develop depression. In Korean immigrants, the prevalence of DM was significantly correlated with the prevalence of depressive symptoms, and their depression was highly correlated with the negative impact of DM on their quality of life (r = .438, p < .001; Choi & Reed, 2013). Older adults with DM were more likely to have functional impairment (OR = 1.65, 95% CI [1.51, 1.80]), cognitive impairment (OR=1.28, 95% CI [1.11, 1.48]), and depression (OR=1.35, 95% CI [1.25, 1.46]) than older adults without DM (Chau et al., 2011). In addition, higher depressive symptoms were correlated with lower DM self-management (p<.001), leading to poor glycemic control (Schmitt et al., 2017).

Families Living with Diabetes

Diabetes can be a burden to all family members because they may not only support diabetic individuals' self-management, but also help them access health care and share their medical costs (National Alliance for Caregiving [NAC], 2009). In other words, DM negatively influences family members supporting people with DM. Many family caregivers report that they perceive an emotional burden, negatively influencing their quality of life. Older spousal

caregivers who are experiencing stress and perceived burden while caring for an older adult with physical or mental health problems have a 63% higher mortality risk than non-caregiving older adults (Schulz & Beach, 1999). Family caregivers experience physical strain, emotional stress, and even financial burden (NAC, 2009).

Costs of Diabetes in Health Care Systems

The annual global health expenditures for DM in 2014 ranged from $612 billion to $1,099 billion (Da Rocha Fernandes et al., 2016). Among age groups, people aged 60 to 69 years old had the highest amount spent on DM. An individual with DM spends, on average, $1,583 annually on DM-related costs. The annual DM-related costs per person, specifically in the North American and Caribbean region, were the highest ($7,984) across world regions (Da Rocha Fernandes et al., 2016).

The total DM-attributable costs in the United States were $327 billion in 2017, an increase of 33% over five years (CDC, 2020). The costs in 2012 were $245 billion, which included $176 billion for direct medical costs and $69 billion for reduced productivity (CDC, 2017). Average medical expenditures in the DM population were 2.3 times higher than in the non-DM population. An annual estimated medical cost for DM in Texas was $23.7 billion (CDC, 2017). Diabetic individuals need to pay the high cost of DM care including regular visits to health care facilities, DM medications, DM monitoring devices, and insurance fees. DM imposes not only a health burden but also a financial burden on the health care system.

Diabetes Medical Management

Diabetes is “a group of metabolic disorders sharing the common underlying feature of hyperglycemia” (Kumar et al., 2007, p.775). Defects of insulin secretion from pancreatic β-cells and impairment of insulin action result in hyperglycemia (Kumar et al., 2007). Chronic

hyperglycemia leads to multiple organ damage, especially end-stage renal disease, adult-onset blindness, and non-traumatic lower extremity amputations. It also increases the risk of developing macrovascular complications such as cardiovascular disease and cerebrovascular disease (Kumar et al., 2007).

Glucose homeostasis is regulated by glucose production in the liver, glucose utilization by skeletal muscle, and actions of insulin and glucagon (Kumar et al., 2007). The metabolic action of insulin is to increase the rate of glucose transport into muscle cells, adipose tissue, and the liver in order to maintain glucose homeostasis. Failure of glucose homeostasis results in DM that is characterized by insulin resistance and β-cell dysfunction, leading to inadequate insulin secretion. The resistance to the effects of insulin on glucose uptake, metabolism, or storage results in hyperglycemia (Kumar et al., 2007). Decline of β-cell function increases with aging (Chang & Halter, 2003). For example, insulin levels responding to the oral glucose loading test significantly decline ($p < .01$) in advanced age (Muller et al., 1996). Obesity, especially visceral obesity, escalates insulin resistance (Kumar et al., 2007). Being sedentary is the most common risk factor for developing DM because limited physical activity contributes more to being obese. Other factors associated with developing DM include family history of DM, gestational DM, and race/ethnicity (CDC, 2017).

The treatment goal for DM is to maintain blood glucose levels within normal ranges (glycated hemoglobin [HbA1c] < 5.7%, fasting plasma glucose < 100 mg/dl, or oral glucose tolerance test < 140 mg/dl; ADA, 2017) to prevent DM complications (CDC, 2017). This can be accomplished by a combination of lifestyle changes and medical care. Adults with DM need to practice healthy eating, weight loss in the case of obesity, and regular physical activity. Medical

care includes not only pharmacologic approaches, but also comprehensive medical evaluation for managing comorbidities (ADA, 2017).

This study focused on self-management, excluding medical care. Even though pharmacologic approaches and comprehensive medical evaluation are part of DM control and management, individuals with limited access to medical care may not appropriately perform these medical aspects. According to ADA (2007), common challenges of DM are management like eating healthy, exercising, adhering to a treatment plan, and coping with the disease. Such behaviors are fundamental to DM self-management. Individuals can help lower their risk of developing other health problems or complications over time by performing self-management.

Diabetes Self-Management

Self-management has become a key component of DM care because chronic illnesses require active involvement of the person with the condition for treatments to be maximally effective (Grady & Gough, 2014). Actively performed self-management thus lowers the risks for complications and decreases the medical cost of DM by reducing hospital admissions and readmissions. Diabetes self-management means that people with DM monitor their blood glucose, do regular foot exams, and adhere to medications, diet, and exercise (CDC, 2017). It is thus essential to actively identify challenges to performance of their DM self-management.

Factors Related to Diabetes Self-Management

Social Determinants of Health

The socioeconomic environment is a well-known determinant of health behavior. Lack of social networks and social support, or insufficient financial resources, reduce self-management activities in older adults (Riekert et al., 2014). Kim and Kosma (2013) showed that physical activity was significantly correlated with both family support ($r = .26$, $p < .01$) and

friends' support in Korea (r =.13, p < .05). Limited economic resources negatively affect following a DM-appropriate diet, which is associated with poor glycemic control (OR=2, 95% CI [1.44-2.78]; Seligman et al., 2012). Healthier foods such as lean meats, fresh vegetables, and fruit are more expensive than low-cost energy-dense foods, and less available in low-income neighborhoods. Diabetic populations with low income tend to have lower educational levels, higher unemployment rates, and less DM self-management (Nwasuruba et al., 2009).

Race/Ethnicity

There are racial/ethnic differences in self-management behaviors (Harris et al., 1999; Nwasuruba et al., 2009; Thackeray et al., 2004). For example, Hispanics with DM, compared with Whites and Blacks with DM, showed poorer self-reported self-management, including home blood glucose testing (p < .01) and home foot examination (p < .05; Nwasuruba et al., 2009). The prevalence of adherence to physical activity also differed by race/ethnicity: Whites (56.4%), African-Americans (50%), Hispanics (49.5%), and Asians (44.9%; Berrigan et al., 2006). In general, ethnic minority populations perform poorer DM self-management which is correlated to poorer outcomes.

Immigration

Immigration leads to drastic challenges in culture, living conditions, socioeconomic status, language use, social networks, roles, and family structure and function (Joo & Lee, 2016). Limited access to health insurance, language barriers, and lack of health care access are particular concerns for Korean immigrants with DM (Joo & Lee, 2016; Nam et al., 2013). Korean immigrants prioritize financial survival over their health, which correlates with less access to health insurance and less efforts in DM self-management (Joo & Lee, 2016; Nam et al., 2013). Diet management is also a challenge for immigrants because limitations or changes in

food choices affect eating habits in their new country. Often Korean immigrants with DM lack family support due to migration, leaving extended family members behind in their country of origin (Joo & Lee, 2016). Family support, in particular, is an important factor for self-management intervention in Korean immigrants because family is traditionally the primary source of support in Korean culture. In conclusion, these cultural and environmental challenges related to migration affect people's thoughts and behaviors around DM (Bandura, 1986).

Lifestyle changes resulting from immigration influence health-related outcomes. For example, older adult Korean immigrants in the United States have a higher prevalence of DM than older adult Koreans living in Korea (34.1% vs 18.3%, $p = .01$). They also have more cardiovascular risk factors, even though they have better perceived health and life satisfaction in their new country (Sin et al., 2011). It may be that Western cultural influences change diet, activity levels, and socialization patterns for immigrants. Choi and Reed (2013) reported that Korean immigrants with DM were more likely to experience depressive symptoms (56.1%). Stressful situations, such as limited resources and language barriers to managing disease, play a role in the development of depressive symptoms which are negatively related to health behaviors (Choi & Reed, 2013; Choi et al., 2013; Shin et al., 2007).

Illness Perception

Illness perception is defined as emotional and cognitive representations of an individual's own illness, which is a significant predictor of health promoting and disease preventing behaviors, including self-management (Nie et al., 2018). Cognitive representations reflect personal beliefs about the illness including the symptoms, causes, the timeline of the condition, outcomes, and personal and treatment control (Broadbent et al., 2006). Thus, individuals determine what to do for their condition according to their perception about their illness. In

asthma patients, for example, IP which reflects personal control over the illness are associated with a positive health outcome (Kaptein et al., 2010). Previous researchers have reported the importance of IP in self-management of chronic disease, but not many studies have been conducted in DM populations (Keogh et al., 2007; Nie et al., 2018).

Illness perceptions and self-management vary according to ethnic, cultural, and social differences or contexts (Abubakari et al., 2011; Diefenbach & Leventhal, 1996). For example, considerable misperceptions exist in Chinese DM self-management when compared to traditional Western medicine (Lai et al., 2005). In Korean immigrants, health and IP affect their health-seeking behaviors (Chung et al., 2018). Understanding IP in specific populations is needed to plan effective interventions. However, little is known about Korean immigrants with DM, their IP, and its relationship to self-management.

Health Literacy

Health literacy consists of knowledge, motivation, and competence to adequately utilize health information and health care services (WHO, 2013). Limited HL may influence decision making in health care by causing miscommunication or misunderstanding, resulting in less self-management (Kripalani et al., 2007; WHO, 2013). In one study, older adults with a higher level of DM-specific HL reported higher self-graded DM self-care ($\beta = .118$, SE = .010, $p < .001$; Yamashita & Kart, 2011). According to Souza et al. (2014), adequate functional HL was significantly demonstrated in highly educated, high-income Whites with higher DM knowledge, among participants living in southeastern Brazil.

Limited HL is an important predictor of poor health outcomes among older adults (Yamashita & Kart, 2011). For example, in one study limited functional HL was related to poorer glycemic control compared to those with adequate functional HL (OR = 4.76, 95% Cl

[1.36, 16.63]; Souza et al., 2014). Song et al. (2010) identified that a poor understanding of self-management negatively influenced DM self-management behaviors among older adult Koreans living in South Korea. Health literacy was also a significant positive predictor of physical (β = .67, SE = .29, p = .02) and mental health (β = .58, SE = .23, p = .01; Kim & Yu, 2010). However, researchers studying possible mechanisms that might connect HL and self-management have found that knowledge is not sufficient; people's beliefs are equally important. Interestingly, high levels of HL have been related to medication non-adherence, which could be intentional (Ostini & Kairuz, 2014).

Diabetes Self-Management Interventions

Researchers have intervened with DM self-management programs to improve self-management behaviors, glycemic control, lipids, blood pressure, or some combination of these outcomes (Sherifali et al., 2015). These studies have been conducted in adults, with a mean age over 50 years, and with more female samples than male. They have been attempted in the United States, Germany, South Korea, Taiwan, Iran, and Austria. The duration of the interventions has lasted from five days to 12 months, and follow-ups have varied from immediate post-intervention to 5 years post-intervention. The interval of each session of intervention also varied. For example, Brokaw at al. (2015) improved self-management and glycemic control ($p < .001$) with 16 weekly core sessions and 6 monthly post-core sessions over 10 months total.

Sherifali et al. (2015) conducted a meta-analysis of 13 intervention studies in older adults with DM from 1980 to 2013, focusing on self-management. Tailored interventions focusing on customized, individual needs (-0.2%; 95% CI -0.4 to -0.1) and interventions having psychological supports for depression or coping (-0.2%; 95% CI -0.4 to -0.8) were most effective

in decreasing blood glucose (HbA1c). Using a group setting, such as with a group of diabetic adults, or including feedback or a review process produced no significant decrease in blood glucose. Additionally, the length of the intervention, more or less than three months long, did not produce significant differences in blood sugar.

Gaps in Knowledge for Self-Management Interventions

From this meta-analysis, researchers now know to focus on individual, tailored interventions with psychological support. They should avoid group interventions and feedback such as education. Researchers still do not know the optimal length of time needed for an intervention to gain and maintain reduced blood sugars. Even more important was the very small change in blood sugar (HbA1c) of 0.2%, even when such an improvement was achieved. This reduction may not be clinically important enough to spend the money on self-management interventions. Clearly there is still much work to be done on testing self-management interventions, and newer approaches are still needed.

Not many studies have measured IP and their relationship with DM self-management. One intervention was pilot tested to change IP and improve illness outcomes in adults with DM (Keogh et al., 2007). However, the intervention was designed to examine the importance of family influence on self-management. In addition, the outcome of the study was not measured because of the small sample size (n = 9; Keogh et al., 2007). Illness perceptions may be useful as an adjunct to already tested self-management interventions.

Only a few self-management interventions have been conducted in Korean immigrants with DM (Choi & Rush, 2012; Kim et al., 2009; Kim et al., 2015). In those studies, community-based behavioral interventions demonstrated a significant reduction in blood glucose (HbA1c, $p <= .01$). The interventions were mostly composed of 12 hours of education, and 10 to 25

minutes of monthly counseling over 30 weeks (Kim et al., 2009) or 12 months (Kim et al., 2015). The effectiveness of the interventions was found in significant glycemic control and improved self-efficacy. Interestingly, Kim et al. (2016) found the intervention group, counseled by trained community health workers who were bilingual and bicultural, demonstrated better blood glucose reduction than the nurse-counseled group (b = -0.07; SE = 0.01; $p < .001$) or the control group *(b* = -0.05; SE = 0.01; $p < .001$). However, no study focused on participants' IP.

Summary

Self-management is currently considered an important aspect in DM outcomes (Kim et al., 2015). Developing best strategies to improve self-management should be prioritized. People with limited HL have difficulty following recommended health behaviors. Illness perception is considered a critical predictor in motivating individuals with chronic disease to commit the required self-management. However, no study has been found to identify IP and its association with DM self-management in Korean-speaking immigrants with DM. Thus, it is important to know whether they have appropriate IP and how the IP affect their self-management behavior, which can be strongly related to health outcomes.

Understanding pathways in which IP interact with HL and influence an individual's self-management behaviors is crucial for the development of more effective interventions to improve blood glucose. Although a few studies have been conducted to examine their relationship on DM self-management, none of the studies were focused on the impact of HL on the relationship between IP and DM self-management in Korean immigrants. Therefore, the purpose of this study was to examine the relationships between HL, IP, and DM self-management, as well as to determine if HL moderates the relationship between IP and DM self-management, in Korean immigrants with DM.

The research questions were the following:

1. How are IP and DM self-management related in Korean-speaking immigrants with DM?
2. Does this relationship vary by level of HL?

CHAPTER III

METHODS AND PROCEDURES

The purpose of the study was to examine the relationships between health literacy (HL), illness perception (IP), and diabetes (DM) self-management in Korean-speaking immigrants with DM, as well as to determine if their HL moderates the relationship between IP and DM self-management. In the previous chapters, DM and its significance were thoroughly described to support the study's aim and questions. This chapter covers the methods that were used for this study.

Research Design

A cross-sectional, associational design was applied to the examination of the relationships among HL, IP, and DM self-management in Korean immigrants. Associational study designs are commonly used to examine the type and degree of the relationships between two or more research variables (Grove et al., 2013). Similarly, researchers have used an associational approach to examine relationships of HL, IP, and/or healthy behaviors, such as medication adherence or DM self-management in other populations (Abubakari et al., 2011; Nie et al., 2018; Shiyanbola et al., 2018). This study had no treatment or intervention, and data were obtained once from a single group.

In associational designs, there are predictor and outcome variables. Thus, it cannot be concluded that one causes the other, although a strong relationship may exist between them (Gliner et al., 2017). Although associations cannot support cause and effect statements, the strengths of associational design are that it is easier to conduct than a study with an experimental design, and no treatment or intervention needs to be planned. In this study, the predictor variables were IP and HL, and the outcome variable was DM self-management.

Additionally, this was a pilot study to test the measurement tools in a Korean-speaking population. There were no studies found that have correlated these three variables, so this is a new idea that needs testing. However, a fully powered study is beyond the scope of dissertation research.

Sample

A convenience sample of 120 Korean adults with self-reported DM was planned to recruit for this study, which was determined by a priori power analysis using G*Power 3.1 (Faul et al., 2007) on an alpha of .05, a power of .80, an effect size of $R^2 = .108$, and six predictors (income, education, years with DM, years in the United States, IP, and HL). Convenience sampling, when subject recruitment is difficult, is less costly, provides easier accessibility, and saves time on acquiring subjects compared to random sampling (Grove et al., 2013). In general, convenience sampling enables researchers to obtain a sufficient number of subjects in a limited timeframe even though it has less control for biases. On the other hand, no attrition is noted during the study because data are collected at one time. However, recruitment was stopped at 52 because churches and communities went into lockdown to control the spread of COVID-19 during the pandemic. As a pilot study, a sample of 52 participants was recruited. A post-hoc analysis was performed for power calculation. Using G*Power 3.1 (Faul et al., 2007), the statistical power of the study was 34% based on $R^2 = .092$, a sample size of 52, an alpha of .05, and five predictor variables (education, years with DM, years in the United States, IP, and HL).

Extraneous variables can be controlled using sociodemographic data or sample criteria, which is one way to decrease the threat to internal validity (Grove et al., 2013). For example, some researchers have shown that level of education was positively associated with DM knowledge, but not with HL (Coffman et al., 2012). Receiving DM education has been

positively related to self-efficacy and with self-care behaviors (Bohanny et al., 2013). Level of education and experiences of DM education thus were controlled in this study, as Kim and Yu (2010) recommended.

Inclusion sampling criteria for this study were (a) Korean immigrants [born in Korea and migrated to the U.S.], (b) having a diagnosis of type 2 DM for at least one year, (c) aged 18 years or older, and (d) proficient in reading and speaking Korean. Individuals were excluded from the study if they were blind or had a severe vision problem not correctable with glasses, or did not show appropriate orientation to time, place, and person. Inclusion and exclusion were determined by self-reporting.

Setting

Because the target population was Korean-speaking adults with DM living in the community, a convenience sample was recruited from Korean community churches in north Texas (Dallas-Fort Worth area). The number of Koreans living in north Texas is 33,000 and is ranked one of the top ten U.S. metropolitan areas by the Korean population (Pew Research Center, 2019). This would have been a sufficiently large population from which to plan to recruit a sample of 120 adults.

Measurement Methods

Sociodemographic Data

In order to describe the population of this study sample, the following sociodemographic characteristics were assessed: sex, age, size of family living together, income, employment status, education, years with DM, experience with DM education, and years in the United States (See Appendix A). These sociodemographic variables were measured with a questionnaire

which was developed by the principal investigator (PI). In many studies, these variables have been assessed as factors influencing HL (Sarkar et al., 2006; Souza et al., 2014).

Health Literacy

Health literacy, in this study, was conceptually defined as an individual's capacity for obtaining, communicating, processing, and understanding basic health information and services to make appropriate health decisions (U.S. Department of Health and Human Services, 2000). It was operationally defined as an individual's capacity for obtaining, communicating, processing, and understanding basic health information and services to make appropriate health decisions, as measured by the short form of the Korean Health Literacy scale (S-KHLS; Lee & Kang, 2013; See Appendix B). The original KHLS is a 24-item, self-administered questionnaire developed by Lee et al. (2009) to measure the level of HL for Korean older adults in Korea. The shorter form, the S-KHLS, is composed of 12 items; 7 comprehension and numeracy questions and 5 health-related questions. Each item is scored dichotomously (1 = *correct*, 0 = *incorrect or non-response*; Lee & Kang, 2013). Thus, the total score of the S-KHLS ranges from 0 to 12, and higher scores reflect higher HL. This scale is a pencil and paper instrument which does not require any special equipment or the presence of a researcher. It is practical for administering this questionnaire and interpreting scores, but the test of text readability of the English version is not performed at this point.

The S-KHLS is a short but reliable test of HL skills of Korean-speaking adults, with an internal consistency of .80 (Lee & Kang, 2013). As a newly developed instrument in Korea, it has not been supported with concurrent validities; whereas, content and construct validities are established using factor and Rasch analyses (Lee & Kang, 2013).

Illness Perception

Illness perception, in this study, was conceptually defined as emotional and cognitive representations of an individual's own illness (Leventhal et al., 2016). It was operationally defined as emotional and cognitive representations of an individual's own illness, as measured by a 9-item Brief Illness Perception Questionnaire (B-IPQ; Broadbent et al., 2006), which was translated and revised to a Korean version of the B-IPQ for DM (See Appendix C). The B-IPQ, which is an alternative form of the original IPQ and the Revised IPQ, is composed of eight items with a 10-point Likert scale, and one open-ended item, asking about multiple dimensions of IP: consequences, timeline, personal control, treatment control, identity, concern, coherence, emotional representation, and causes (Broadbent et al., 2006). For example, the responses to the concern about illness range from 0 anchored by *not at all concerned* to 10 *extremely concerned*. In this study, higher scores indicated that an individual has stronger perception of the illness in each dimension. The possible sum scores ranged from 0 to 80, and the items for personal control, treatment control, and coherence were reversely scored and added to the sum (Broadbent et al., 2006; Broadbent et al., 2015). Higher sum scores indicated more negative (pessimistic) perceptions of the illness; whereas, lower scores indicated more positive (optimistic) perceptions. This scale is a short pencil and paper questionnaire with nine items and is available for free access in English online. Questions are easy for participants to understand, and scores are readily understandable to researchers. The Korean version of the B-IPQ had the same format, and the open-ended item asking the causes of DM was briefly described as additional information.

The B-IPQ was translated into Korean for this study by one experienced, qualified bilingual translator who has a doctorate in nursing. After that, the back-translation to English

was performed by another bilingual professional who had no knowledge of the original instrument. The back-translated instrument was compared with the original one, and items were edited for congruence. At the final step of translation, the word *illness* in the Korean version of the B-IPQ was replaced by *diabetes*.

Reliability and validity of the B-IPQ were evaluated by Broadbent et al. (2006) and Broadbent et al. (2015). The reported psychometric properties of the B-IPQ are the following: good test-retest reliability (r = .42 to .75; Broadbent et al., 2006) and validity with relevant measures (r = .25 to .49 for consequences, identity, and emotional representations; r = -.12 to -.27 for personal control; Broadbent et al., 2015). In this study, the Cronbach's alpha was .77. Text readability of the English version scale (B-IPQ) was calculated with the formula of Flesch-Kincaid in the Microsoft Word program. The Flesch-Kincaid Grade Level of the scale was 4.4; the Flesch Reading Ease score was 80.3%.

Self-Management

Self-management, in this study, was conceptually defined as health behaviors undertaken by a person to cope with health problems or promote health status. For this study DM self-management included diet control, physical activity, blood glucose test, and foot exam. Although self-management was commonly used as a self-management program or self-management education, it was hard to find its definition in the literature. It was operationally defined as health behaviors undertaken by oneself to cope with health problems or promote health status, as measured by the Korean version of the Summary of Diabetes Self-Care Activities scale (SDSCA-K; Choi et al., 2011; See Appendix D).

The original Summary of Diabetes Self-Care Activities scale is an English language questionnaire with 11 items asking frequency of DM self-care activities. The Korean version

(SDSCA-K) was translated to Korean and modified to a 9-item questionnaire to measure DM self-management in Korean adults (Choi et al., 2011). A 7-point Likert scale is used, with the components ranging from 0 = *none* to 7 = *daily*. The possible sum score ranges from 0 to 63, and the mean score ranges from 0 to 7. A higher score indicates better DM self-management (Choi et al., 2011).

Reliability and validity of the SDSCA-K are evaluated by Choi et al. (2011). The instrument's internal consistency is moderate (Cronbach's alpha = .69), and it is positively correlated with the DM management self-efficacy scale ($r = .43$, $p < .001$; Choi et al., 2011). In this study, the Cronbach's alpha was .78. A pencil and paper form of the SDSCA-K is practical because it is short and easy to administer. The scores and interpretation are also simple to comprehend. Its text readability with nine items in the English version shows the Flesch-Kincaid Grade Level of 8 with 73% in the Flesch Reading Ease score.

Procedures

For the protection of human subjects, the PI received an approval for the study from the University of Texas at Arlington Institutional Review Board prior to collecting data. After the institutional approval was obtained, recruitment of study participants was initiated and continued until the unprecedented circumstance of the pandemic occurred.

The PI explained the purpose of the study to directors of community centers and churches, where potential participants were recruited, and received written consent to approach Korean-speaking adults. Data were collected by the PI and a trained research assistant who was fluent in Korean and could read Korean. The PI trained the research assistant, in Korean, in how to ask all the questions in the data collection instruments and record the answers. The research assistant passed the human subjects protection training in English required of all ethical research.

However, he did not need to speak or write in English to collect data for the study since all data collection was in Korean.

The PI and the research assistant approached Korean adults at the Korean community centers and churches listed above. Individuals were screened for age, race, and diagnosis eligibilities (See recruitment text; Appendix E). Their vision and cognitive orientation, in addition to their willingness to participate in the study, was also assessed by self-reporting.

Participants who voluntarily agreed to participate in the study were assured of confidentiality and anonymity. After eligible individuals agreed to participate, they received the four written questionnaires to complete. The recruited participants were able to complete the surveys in a private room where they were recruited. Returning the tools with their answers were considered as consent. If they did not feel comfortable completing the measures themselves, the PI or the trained research assistant read each item to them. Completion of the surveys took normally 20-30 minutes but did not exceed one hour.

Human Subjects Protections

This study used self-reported questionnaires for collecting data. The study procedures were approved by the University of Texas at Arlington (UTA) Institutional Review Board (Protocol # 2020-0145) prior to collecting data, and all participants were informed of the purpose of the study and potential risks and benefits.

There was a potential risk for loss of confidentiality. Confidentiality was protected to the extent that was allowed by law. An arbitrarily assigned code, not the participant's individual name, was used on all four measurement tools. Participants were not asked for names, addresses, telephone numbers, or any other identifying information, once they met the inclusion criteria. The completed paper-pencil questionnaires were immediately contained in an envelope,

compiled together, and analyzed as a group. The PI ensured the security of all the research data collected from this study by saving them in a password-protected database and a locked file cabinet in the investigator's UTA office. Only the PI was able to access them until the study was finished. After completion of the study, the research data would be stored for three years and then destroyed. For the purpose of publication, only the aggregated data would be reported to scientific journals.

Another potential risk was physical discomfort. Participants were told that they could stop and rest at any time or might reschedule in 1-2 hours if they were too tired to continue. However, no one reported to have experienced physical discomfort such as fatigue from filling out forms. Study involvement was completely voluntary, and participants allowed to withdraw from the study at any time. On the other hand, there was no potential benefit to the participants. Although the PI offered to mail the result of the study to them in Korean, no one has requested.

Data Analysis

The research questions for this study were:

1. How are IP and DM self-management related in Korean-speaking immigrants with DM?
2. Does this relationship vary by level of HL?

The hypotheses of the study were:

1. Positive (optimistic) IP is positively correlated to DM self-management in Korean immigrants with DM.
2. Low HL has a negative effect on the relationship between IP and DM self-management in Korean immigrants with DM.

The study variables were analyzed using the Statistical Package for the Social Sciences (SPSS, version 25.0), with statistical significance set at $\alpha < .05$. Descriptive statistics, including

frequency distribution, percentages, and different types of central tendency were used for the analysis of sociodemographic data based on the level of measurement (See Table 1). The summary of the sample characteristics was performed through descriptive statistics.

When the ordered levels of variables are used in measurement, researchers should use a nonparametric statistic (Gliner et al., 2017). However, the values obtained from each item in the Likert-type scales are summed and treated as interval-level data (Grove & Cipher, 2020). A parametric statistic was selected to analyze the relationships because the sum of the scores, which was continuous, was used as data even though Likert-type scales were used for measuring the key study variables in the study.

Table 1.

Level of Measurement of Sociodemographic Variables

Variables	Level of Measurement	Descriptive Statistical Procedures
Age	Interval/ratio	Frequency, percent, mode, median, range, mean, standard deviation
Sex	Nominal/dichotomous	Frequency, percent, mode
Family size	Nominal	Frequency, percent, mode
Income	Interval/ratio	Frequency, percent, mode, median, range, mean, standard deviation
Employment status	Nominal/dichotomous	Frequency, percent, mode
Education	Ordinal	Frequency, percent, mode, median, range
Years with diabetes	Interval/ratio	Frequency, percent, mode, median, range, mean, standard deviation
Experience of DM education	Ordinal	Frequency, percent, mode, median, range
Years in the United States	Interval/ratio	Frequency, percent, mode, median, range, mean, standard deviation

To fulfill the purpose of the study, the Pearson's product-moment correlation was calculated at the beginning, along with the Spearman's rank-order correlation, and the relationship between variables were identified in a correlation matrix. To avoid multicollinearity

(Field, 2013; Grove & Cipher, 2020), the correlation matrix of the predictor variables were scanned to see if correlations of above .80 existed. Also, the variance inflation factor (VIF) and the tolerance statistics were calculated. Then a series of regression analyses were performed to examine the relationships that were predicted by the research hypotheses. In the first step, four sociodemographic variables were entered as extraneous variables for DM self-management in order to control confounding effects (Pourhoseingholi et al., 2012). In the second and third steps, IP and HL were added, respectively. To test whether the relationship between IP and DM self-management was moderated by HL, DM self-management was regressed to the interaction of IP and HL after the second and third steps with IP and HL (Baron & Kenny, 1986; Field, 2013; See Figure 3).

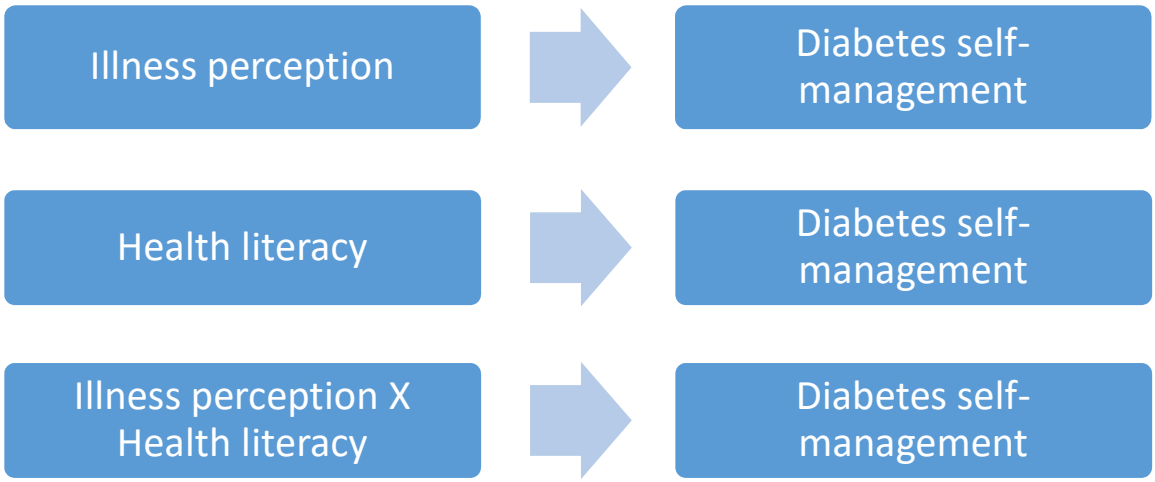

Figure 3. Diagram of the statistical model of the moderating effects of health literacy on the relationship between illness perception and diabetes self-management

Delimitations

There are always limitations in research. First, as it is a non-experimental study, causal relationships between IP, HL, and DM self-management would not be established. Second, this study was conducted at Korean community-based centers and churches in north Texas (Dallas-

Fort Worth area), and a nonprobability sampling was performed. Sampling bias thus was introduced which affected generalizability. In other words, the study results might not generalize to other settings or populations. Third, the data collection methods utilized self-reported questionnaires. If the participants failed to respond to all questions or guessed answers to questions, the validity of the instrument might be threatened. Lastly, multicollinearity could occur when independent variables were strongly correlated with each other. In nursing studies, multicollinearity is a common issue which affects generalizability (Grove & Cipher, 2020). To identify multicollinearity, the correlations between independent variables were performed prior to conducting the regression analyses. It was considered that a multicollinearity problem existed if a bivariate correlation was greater than .80, the largest VIF was greater than 10, the average VIF was substantially greater than 1, and/or the tolerance (1/VIF) was below .10 or .20 (Field, 2013; Grove & Cipher, 2020). The degree of multicollinearity was examined in the data as part of the analysis procedure and reported this information in chapter IV.

This study had delimitations as follows. Using the participant inclusion and exclusion criteria to conduct the study in Korean immigrants with DM, the population of interest would be delimitated. Recruiting participants via a convenience sampling technique, a planned sample size would be obtained in a timely manner. The use of a cross-sectional associational design was suitable to examine the relationships among the three study variables and the likelihood of the moderating effect of HL. The research questions would be answered analyzing data with correlations and multiple regression. Additionally, the research findings of the relationships between IP, HL, and DM self-management could be used to derive interventions to improve DM self-management in Korean immigrants.

Summary

The purpose of this study was to examine the relationships between IP, HL, and DM self-management as well as to determine if HL moderates the relationship between IP and DM self-management. Although some weaknesses existed in a cross-sectional, non-experimental associational design, the use of this design with convenience sampling would be appropriate to test the hypotheses of the study:

1. Positive (optimistic) IP is positively correlated to DM self-management in Korean immigrants with DM.
2. Low HL has a negative effect on the relationship between IP and DM self-management in Korean immigrants with DM.

A convenience sample of Korean-speaking adults with self-reported DM was recruited in north Texas, who were Korean immigrants, having a diagnosis of DM for at least one year, aged 18 years or older, and proficient in reading and speaking Korean. Data were attained from a research packet that included a sociodemographic questionnaire, the S-KHLS, a Korean version of the B-IPQ, and the SDSCA-K. Descriptive statistics and correlation and multiple regression analyses were performed to examine the relationships that were predicted by the research hypotheses. The relationships analyzed could be used to understand DM self-management in Korean immigrants with DM and to develop effective health education programs for them.

CHAPTER IV

FINDINGS

The purpose of the study was to examine the relationships between health literacy (HL), illness perception (IP), and diabetes (DM) self-management in Korean-speaking immigrants with DM, as well as to determine if their HL moderates the relationship between IP and DM self-management. The following hypotheses were tested, and the results are reported in this chapter:

1. Positive (optimistic) IP is positively correlated with DM self-management in Korean immigrants with DM.
2. Low HL has a negative effect on the relationship between IP and DM self-management in Korean immigrants with DM.

This chapter begins with the steps in statistical analysis after data collection, which also includes descriptive statistics and inferential statistics that answer the study's research questions.

Data Management

Data collected from 52 participants were entered in the SPSS version 25.0. Prior to analysis, the data were checked with the original data sheets to avoid errors in inputting data and examined for missing answers to clean the data. However, the missing data in the study was found only in the variable of income, and 14 out of 52 participants did not answer (27%). Those who hesitated to answer the question of monthly income skipped that item in the survey during the interview. Thus, income was discarded from the list of variables.

Before any further data analysis was performed, exploratory data analysis was conducted to assess for central tendency, distribution, and homoscedasticity. The measures of central tendency and distribution of three variables including the mean, median, mode, skewness, and kurtosis were built in Table 2. The histograms of the variables were formed to evaluate the

assumption of normality. Then a logarithmic transformation was performed to improve skew and kurtosis values as well as outliers. The values for skewness and kurtosis between -2 and +2 are considered acceptable, and zero indicates a normal distribution (Laerd Statistics, 2015).

Table 2

Descriptive Data of Three Study Variables

Measure	Illness Perception	Health Literacy	Transformed Health Literacy with log	Diabetes Self-Management
Mean (SD)	36.94 (9.89)	11.10 (1.05)	.22 (.23)	29.94 (12.00)
Median	38.00	11.00	.30	29.00
Mode	41	12		30
Range	14-59	8-12		9-60
Skewness	-.35	-1.04	.39	.60
Std error of skewness	.33	.33	.33	.33
Kurtosis	-.09	.35	-1.24	.15
Std error of Kurtosis	.65	.65	.65	.65

Additionally, the Shapiro-Wilk test was performed to evaluate normal distribution of variables. The results of the tests on the variables had the following *p* values: IP ($p = .465$), HL ($p < .001$), and DM self-management ($p = .100$). With the Shapiro-Wilk test, the assumption of normal distribution was met for the two variables of DM self-management and IP, but not for HL and transformed HL ($p < .001$). Therefore, the original HL data were analyzed instead of the transformed HL.

Using multiple regression, data should meet the following eight assumptions (Laerd statistics, 2015):

- The data met assumption 1; the study has one continuous dependent variable.
- The data met assumption 2; this study has more than one independent variables.

- The data met assumption 3; the observations were not related. There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.87. The Durbin-Watson statistic between 1.5 and 2.5 means no autocorrelation in the residuals from a statistical regression analysis (Laerd Statistics, 2015).
- The data met assumption 4; a linear relationship exists between the dependent variable and each of the independent variables, and the dependent variable and the independent variables collectively.
- The data met assumption 5; the residuals were equal for all values of the predicted dependent variable (homoscedasticity). The spread of the residuals did not increase or decrease as the predicted values were moved. The residuals in the data appeared randomly scattered. On this basis it would appear that the assumption of homoscedasticity was met. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values.
- The data met assumption 6; multicollinearity did not exist. None of the independent variables had correlations greater than 0.7 (Table 3). As the tolerance value was greater than 0.1–which was a VIF of less than 10–there was no collinearity problem. All the tolerance values were greater than 0.1 (the lowest was 0.68) and VIF values ranged from 1.06 to 1.46, so this data set did not have a problem with collinearity (Laerd Statistics, 2015).

Table 3

Pearson's Product-Moment Correlation r (p) of Study Variables (N=52)

	Education	Years with DM diagnosis	Years in the U.S.	Illness Perception	Health Literacy	DM Self-Management
Education	1					
Years of DM diagnosis	.15 (.275)	1				
Years in the U.S.	-.16 (.262)	.39 (.004)	1			
Illness Perception	.02 (.881)	.20 (.158)	-.02 (.889)	1		
Health Literacy	-.02 (.888)	.33 (.016)	.18 (.213)	-.04 (.784)	1	
DM Self-Management	-.22 (.122)	.15 (.306)	.16 (.259)	-.01 (.925)	.23 (.101)	1

- The data met assumption 7; there were no significant outliers. The raw data were checked for outliers and some were found. However, no extreme outliers existed. Using the casewise diagnostics in SPSS, there was no case of which standardized residual is greater than $\pm$3 standard deviations detected. Examining the studentized deleted residual, any values greater than $\pm$3 standard deviations need to be investigated to determine to discard. There were no values greater than $\pm$3 detected. A value of greater than $\pm$3 is a common cut-off criterion used to define whether a particular residual might be representative of an outlier or not (Laerd statistics, 2015). Examining the leverage value, a general rule of thumb is to consider less than 0.2 as safe, 0.2 to less than 0.5 as risky, and 0.5 and above as dangerous (Huber, 1981). By inspecting the leverage values, all values were within the safe value of 0.2, except two of which were 0.21 and 0.20. Examining the cook's distance, which is a measure of influence of each observation for predictor variables, any values above 1 need to be

investigated (Laerd Statistics, 2015). As the largest value was 0.10, there were no cases that were influential. Thus, all data sets were used without any deletion of cases.

- The data met assumption 8; the residuals are approximately normally distributed.

This study has one dependent variable that is measured at the continuous level and normally distributed, and more than one independent variable. Among sociodemographic variables, income was removed from the list of independent variables due to 27% missing data, and education measured with non-continuous levels is recoded to dichotomous levels for multiple regression analysis.

As described above, the assumptions of linearity, homoscedasticity, and multicollinearity were all met, and normality was partially violated in HL and some sociodemographic variables. Although the evaluation of assumptions for parametric tests was not successfully met by data, using a multiple regression to analyze the data is not invalidated because such parametric tests are more robust and have more power than the nonparametric tests. Alternatively, Spearman's rank-order correlation was additionally conducted (Table 4) to investigate the following research question: How are IP and DM self-management related in Korean-speaking immigrants with DM? In comparison with the results obtained from Pearson's Product-Moment Correlation (Table 3), no significant differences were found in the relationships between the variables. Therefore, Pearson's correlation matrix was used in future descriptions.

Table 4

Spearman's Rank-order Correlation ρ (p) of Study Variables (N=52)

	Education	Years with DM diagnosis	Years in the U.S.	Illness Perception	Health Literacy	DM Self-Management
Education	1					
Years of DM diagnosis	.15 (.278)	1				
Years in the U.S.	-.08 (.570)	.39 (.004)	1			
Illness Perception	.03 (.839)	.19 (.167)	-.01 (.952)	1		
Health Literacy	.01 (.947)	.37 (.007)	.13 (.350)	.05 (.741)	1	
DM Self-Management	-.19 (.170)	.15 (.300)	.19 (.179)	-.07 (.615)	.23 (.107)	1

Participant Characteristics

A convenience sample of 52 Korean-speaking adults with self-reported DM, living in north Texas, voluntarily participated in the study. The sociodemographic characteristics of the sample are displayed in Table 5. Participants were mainly males (67.3%, n = 35), employed (55.8%, n = 29), and living with family (92.3%, n = 48). The majority of the participants completed college or higher education (76.9%, n = 40) and the mean monthly income of 38 respondents was $2,573 (SD = $1,793, range $0-$8,000). The mean age of the participants was 63.13 years (SD = 11.97, range = 35-90), and the mean length of time of immigration in the United States was 23.29 years (SD = 12.48, range = 1-50). The mean length of time with a diagnosis of type 2 DM was 9.4 years (SD = 8.11, range = 1-35) and 33 participants had not attended any diabetic education (63.5%).

Table 5

Sociodemographic Characteristics (N=52)

Characteristic		n (%)	Mean (SD)
Male		35 (67.3)	
Age, y			63.13 (11.97)
Employed		29 (55.8)	
Education			
	Never completed school	2 (3.8)	
	Elementary	0	
	Middle school	3 (5.8)	
	High school	7 (13.5)	
	College or higher	40 (76.9)	
Monthly individual income < $2,573		20 (52.6)*	
Family size			
	Living alone	4 (7.7)	
	Living with spouse	28 (53.8)	
	Living with 2 generations	18 (34.6)	
	Living with 3 or more generations	2 (3.8)	
Years in the U.S.			23.29 (12.48)
Years with DM diagnosis			9.4 (8.11)
Experience of DM education			
	Never attend	33 (63.5)	
	1-2 times	13 (25.0)	
	3-4 times	5 (9.6)	
	5 or more	1 (1.9)	

*N=38

Research Question #1: Relationships among Sociodemographics, Illness Perception, Health Literacy, and DM Self-Management

The IP scores of participants ranged from 14 to 59, with a mean 36.94 (SD = 9.89). As shown in Table 6, the highest mean score was on the timeline dimension, and the lowest was on treatment control. In general, the participants tended to regard their illness as a chronic condition and felt that their illness could be controlled both personally and through treatment. They also reported understanding their condition which proves they gained coherence. They moderately perceived that their illness had negative consequences and caused negative emotions. They reported experiences of moderately negative symptoms of their illness and moderately negative concerns. In the sum of the scores, there was no statistically significant association found between IP and DM self-management (r = -.01, p = .925; see Table 3).

The mean score of HL was 11.1 $\pm$ 1.05 (range = 8-12), and 47 (90.4%) of the participants answered correctly 10 out of total 12 items. Of the participants, 49 (94.2%) answered all five items correctly in health-related terms, and 39 (75%) answered correctly six out of the seven comprehension and numeracy items. In relation to sociodemographic variables, HL was significantly related to the length of time with a diagnosis of type 2 DM (r = .33, p = .016). As shown in Table 3, the length of time with a diagnosis of DM was also significantly related to the length of time with immigration in the United States (r = .39, p = .004).

Table 6

Scores of Illness Perception, Health Literacy, and DM Self-Management

Variable	Mean	SD	Range
Summary of Illness Perception	36.94	9.89	14-59
Consequence	5.44	2.73	1-10
Timeline	9.10	2.04	1-10
Personal control *	2.73	2.34	0-9
Treatment control *	2.54	2.36	0-9
Identity	4.50	2.88	0-10
Concern	5.73	2.75	1-10
Coherence *	2.58	2.27	0-8
Emotional representation	4.33	2.87	1-10
Summary of Health Literacy	11.10	1.05	8-12
Health-related terms	4.92	.33	3-5
Comprehension and numeracy	6.17	.94	4-7
Summary of DM Self-Management	29.94	12.00	9-60
Diet, general	4.21	1.60	0-7
Diet, DM specific	4.08	1.87	0-7
Diet, vegetable specific	4.35	1.67	0-7
Exercise, general	4.02	1.99	0-7
Exercise, specific	3.17	2.42	0-7
Self-monitoring blood glucose, general	3.21	2.78	0-7
Self-monitoring blood glucose, specific	3.10	2.72	0-7
Foot care, general	2.38	2.49	0-7
Foot care, specific	1.42	2.16	0-7

*Variable is reverse scored.

The mean score of DM self-management was 29.94 (SD = 12, range = 9-60). The mean scores for the three diets and general exercise were 4.21 $\pm$ 1.60, 4.08 $\pm$ 1.87, 4.35 $\pm$ 1.67, and 4.02 $\pm$ 1.99, respectively, indicating that participants performed most of the self-management in diet and general exercise about four days a week during the previous week (see Table 6). On average, participants performed self-monitoring blood glucose three days a week, general foot care two days a week, and specific foot care one day a week. While examining the association of socio-demographics, IP, and HL on DM self-management, there was no statistically significant association found between any variables and DM self-management (see Table 3). Neither IP nor HL had an association with DM self-management.

Research Question #2: Relationships between Illness Perception and DM Self-Management with Health Literacy

To test the hypothesis that the low HL has a negative effect on the relationship between IP and DM self-management in Korean immigrants with DM, a hierarchical multiple regression analysis was conducted (see Table 7). The interaction term between IP and HL was calculated by multiplying the z-scores of IP and HL and added to the model to evaluate its moderating effect on the relationship between IP and DM self-management. The assumptions of a multiple regression were reevaluated after the new variable the interaction between IP and HL. Linearity was observed. Independence of observation was checked with a Durbin-Watson statistic of 2.40. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals against the unstandardized predicted values. There was no evidence of multicollinearity, as assessed by correlation coefficients and tolerance/VIF values. The normal distribution of the residuals was assessed by visual inspection of a histogram.

A hierarchical multiple regression was performed to assess the statistical significance of the interaction between IP and HL. Each regression model, including the full model of all variables to predict DM self-management, is described in Table 7. In the first step, three sociodemographic variables were entered (model 1), followed by two variables: IP (model 2) and HL (model 3). For moderator analysis, the interaction between IP and HL was entered last (model 4). The addition of IP and HL to the prediction of DM self-management (model 3) did not lead to a statistically significant increase in R^2 of .092, F (5, 46) = .93, p = .471. The addition of the interaction between IP and HL to the prediction of DM self-management (model 4) also did not lead to a statistically significant increase in R^2 of .093, F (6, 45) = .77, p = .597. The second research question was “Does the relationship between IP and DM self-management

vary by level of HL?" Examination of the interaction did not show any significant effect of increasing DM self-management as IP and HL increased.

In conclusion, HL did not moderate the effect of IP on DM self-management, as evidenced by an increase in total variation explained of 9.3%, which was not statistically significant (F (6, 45) = .77, p = .597). Additionally, DM self-management was not significantly predicted by any variables. There was no statistically significant linear relationship (-.04 $\pm$ .17, p = .811) between IP and DM self-management (see model 2) regardless of the addition of the interaction between IP and HL (model 3 or 4).

Table 7

Hierarchical Regression Analysis to Determine the Moderator Effect of Health Literacy on the Relationship between Illness Perception and DM Self-Management

	Unstandardized coefficients B	Standardized coefficients β	t-values	Sig. (p-values)
Model 1				
Years of DM diagnosis	.21	.14	.90	.375
Years in the U.S.	.80	.09	.58	.565
Education	-4.69	-.17	-1.15	.256
Model 2				
Years of DM diagnosis	.22	.15	.92	.363
Years in the U.S.	.80	.09	.54	.589
Education	-4.71	-.17	-1.14	.259
Illness Perception	-.04	-.04	-.24	.811
Model 3				
Years of DM diagnosis	.12	.08	.49	.630
Years in the U.S.	.08	.08	.51	.613
Education	-4.44	-.16	-1.08	.286
Illness Perception	-.02	-.02	-.10	.920
Health Literacy	2.16	.19	1.26	.215
Model 4				
Years of DM diagnosis	.11	.08	.45	.656
Years in the U.S.	.07	.08	.48	.637
Education	-4.42	-.16	-1.07	.292
Illness Perception	-.02	-.02	-.13	.898
Health Literacy	2.12	.19	1.22	.228
Interaction (IP and HL)	.48	.04	.26	.791

Summary

In this chapter, data analyses were described. The purpose of the study was to examine the relationships between IP, HL, and DM self-management as well as to determine if HL moderates the relationship between IP and DM self-management. Following data collection, data obtained from 52 participants were entered in the SPSS version 25.0. The data were checked at the entry and rechecked prior to analysis to handle missing values and outliers. Assumptions of normality, linearity, homoscedasticity, and multicollinearity were evaluated prior to performing correlation and regression analysis. Descriptive statistics were conducted to describe participants' socio-demographics. Although no statistically significant associations were found between the variables in the results, the PI continued to complete the analysis of moderation to answer the research questions of the study. In conclusion, the hierarchical multiple regression analysis determined that the effect of IP on DM self-management was not different at different values of HL.

CHAPTER V

DISCUSSION

Diabetes (DM) is a major leading cause of morbidity and mortality and is associated with high incidences of heart attack and stroke. Individual self-management behaviors are considered one of the most important methods to improve symptoms and outcomes, and to prevent serious complications of DM. Finances, education, family or community supports, and race/ethnicity all influence individual self-management behaviors. Individual beliefs and perceptions toward health and illness also play a role as barriers or facilitators in healthcare seeking and self-care behaviors. Using the common-sense model as a theoretical framework, individuals construct their own illness perception (IP) of DM and develop coping strategies to regain balance between healthy living and DM. Individual experiences with DM as well as other factors, such as individual abilities to afford, understand, and/or utilize resources, influence coping procedures and DM self-management. Therefore, this study was designed and conducted to investigate the relationship between IP and DM self-management and the role of health literacy (HL) in that relationship among Korean speaking immigrants with DM. Findings from data analysis of the 52 participants indicated that there were no statistically significant associations between HL, IP and DM self-management. Interpretations of the study findings are presented in this chapter, followed by limitations of the study, implications for practice, and implications for future research.

Interpretation of Findings

The analyses of the sociodemographic and research variables indicated several interesting points. According to the CDC (2020), the prevalence of DM varies significantly by education level. The lower the level of education, the higher the prevalence of DM. However, the study

participants showed the opposite trend: 76.9% of the sample had more than a high school education, 13.5% with a high school education, and 9.6% with less than a high school education. This may be due to a highly educated Korean immigrant population in the United States. Sin et al. (2011) reported that Korean older adult immigrants have a higher rate of college or graduate education than Korean older adults ($p < .01$). Korean immigrants were more likely to be urban, college-educated, and white-collar workers (Yoon, 1997).

In addition to the education level, the HL mean in the current sample was notably higher (11.1, SD = 1.05) than adults in Korea. Among Korean adults, 60.5% had inadequate HL as measured by the Newest Vital Sign, a nutrition label containing six questions (Jeong & Kim, 2016). Lee and Park (2018) reported a mean score on the S-KHLS, used to measure HL, of 8.58 (SD = 3.06) among Koreans aged 65 and 92 with heart failure. Although there were no comparable studies on HL-related self-management for Korean-speaking immigrants with DM, the participants in the current study had higher levels of HL than expected, as well as education. Health literacy to understand and manage their illness might be an issue for Korean-speaking immigrants, but language barriers go beyond that.

One of the aims of the study was to determine whether HL moderated the relationship between IP and DM self-management. HL was not a moderator of IP on DM self-management. For managing chronic conditions, an individual's ongoing self-management is an important factor and adequacy of HL is considered an important predictor of self-management. Specifically, inadequate or limited HL has been related to poor glycemic control (Souza et al., 2014) and poor self-management (Kang & Park, 2020). Thus, the results of this study might not show that there was a statistically significant effect of HL on the relationship between IP and DM self-management because most of the participants in the study had adequate HL and even

the standard deviation was very close to the mean. It may be necessary to conduct future studies with participants from different HL levels.

Limited English proficiency needs to be considered as another barrier for Korean-speaking immigrants who have adequate HL. Disparities in HL are found in ethnic groups who do not speak English as their first language (Sentell & Braun, 2012). However, the finding of HL in the current study is inconsistent with the majority of the HL literature that showed that ethnic immigrants who had language barriers tended to have low HL. Unlike other studies using a short version of the Test of Functional Health Literacy in Adults (S-TOPHLA) or the Rapid Estimate of Adult Literacy in Medicine (REALM), the PI used the S-KHLS to measure HL for the participants in consideration of their language barriers. The S-KHLS was developed in South Korea with Korean culture and health systems. According to Han et al. (2011), the S-TOPHLA or the REALM did not lead to a valid assessment of HL in Korean immigrant women. Overall, some people have difficulties in understanding written and verbal health information to take appropriate health-related actions.

Health literacy studies with DM populations have often used general HL measures such as the S-TOPHLA (Bohanny et al., 2013) or the REALM. Like these instruments, the S-KHLS does not focus on a specific disease or condition, and information obtained by the S-KHLS may not be suitable to translate for specific use with targeted DM prevention. Health literacy measures developed specifically for the DM population should address pertinent content to DM management. Health literacy in a specific domain, such as diet, and particularly the ability to understand and interpret nutrition labels, is essential to the management of obesity and for the populations who indicate their dietary habits are the main cause of DM. Some indicated family history and stress for the cause of their DM, but the majority of participants believed their dietary

habits caused their DM, including overeating or excessive carbohydrates intake and a lack of physical exercise. Since the majority of participants in the current study were aware of the importance of a DM diet, diet-specific HL could be a meaningful measure for future studies.

Differences in perceptions result in different coping strategies which lead to self-care behaviors. For example, an individual's higher perceived understanding or control beliefs of DM have been related to better dietary adherence (Grzywacz et al., 2011). Such a positive perception of the disease made individuals more likely to engage in health-related behaviors (Abubakari et al., 2011). Contrariwise, negative perceptions of the disease increased non-adherence with medication (Shiyanbola et al., 2018). Unlike previous studies, the current study did not support an association between an individual's perceptions and self-management. Regarding the result, there is one thing to consider in the current study. The current study used the overall IP scores for data analysis, unlike previous studies that analyzed individual items of the B-IPQ.

Using the overall IP scores might defeat the different pattern of correlates of each dimension with DM self-management. For example, higher personal control was related to better blood glucose control, while higher treatment control was related to poorer blood glucose control in adults with DM (Broadbent et al., 2006). By adding the values of these two dimensions and dividing by two, the overall scores neutralized the specific pattern. This study, using the overall IP scores, did not show an association with DM self-management while health related behaviors and outcomes in various chronic conditions have been predicted by each dimension of IP, such as consequences, personal control, coherence, or emotional representation (Searle et al., 2007). Therefore, the PI recommends carefully interpreting the results of the scale in future studies. It is also suggested that each dimension of IP—consequences, timeline,

personal control, treatment control, identity, concern, coherence, and emotional representation, as well as the overall IP—should be investigated if the study is replicated. As in previous research, investigating the correlation of each item/dimension to self-management behaviors may yield more meaningful results.

Interestingly, differences in DM self-management were found in sex and employment status. Compared with their counterparts, female participants were more likely to report better DM self-management (p = .012) and unemployed participants were as well (p = .005). Unemployed females had the highest mean scores in DM self-management (mean = 39.50, SD = 15.28). This is similar to other studies that reported a lack of available time as a significant barrier to exercise and foot care (Song et al., 2010) because it could be considered that the availability of unemployment-related time might influence self-management in this study. It is necessary for immigrants to invest time and effort to balance their jobs and health.

The overall findings are different from what the PI expected. Potential reasons for the results going against expectations may be due to the unique nature of the participants who were well-educated and were overcoming or had overcome challenges caused by immigration regardless of the presence of language barriers. It is meaningful to find that Korean-speaking immigrants with DM showed unique characteristics even though the relationships among IP, HL and DM self-management were not found.

Study Limitations

This was a cross-sectional study using a convenience sample of self-reported DM patients. Causal relationships among variables are difficult to establish through cross-sectional observational data. The study included 52 participants from community-based churches located in the DFW metropolitan areas, via non-probability sampling. Recruitment was completed in

one geographical area, so interpretation of findings is limited to individuals living in rural areas or small towns that have very limited community resources. In addition, the participants in the study showed unique characteristics. Therefore, the results of the study cannot be generalized to all diabetic patients and the conclusions and recommendations may not be applicable as well.

Another limitation is that the research measures used in this study were self-reported measures, which might lead to an overestimation or underestimation of behaviors due to social desirability and recall biases. The study relied on the participants' self-reporting and no confirmation was obtained from other sources. Future studies need to use objective measures such as HbA1c along with self-reported DM self-management.

Sample size is an important consideration for research. A small sample size increases the likelihood of a Type II error, which decreases the power of the study (Grove & Cipher, 2020). It also affects the reliability of the survey results because it leads to a higher variability, which may lead to bias (Grove & Cipher, 2020). However, the PI started analyzing data obtained from 52 participants with permission from the dissertation committee due to this unprecedented circumstance despite the small sample size. This study was designed for in-person and close interaction with participants during surveys in data collection. Inevitably, recruitment was stopped during the pandemic because churches and communities went into lockdown to control the spread of COVID-19 in March 2020. Therefore, the PI undertook a pilot study of 52 participants with recruitment over two months. The relatively small sample size limits the generalizability of the study's findings.

This study is a pilot study undertaking hypothesis tests even though some argue against carrying out hypothesis tests from pilot studies. Pilot studies can be used to estimate the recruitment and retention rates and population variance and to provide preliminary evidence of

efficacy potential in clinical research (Leon et al., 2010). However, estimation is poor because the small sample size of a pilot makes estimation uncertain, so caution must be exercised.

Conclusions

Despite the limitations of the study conducted with Korean-speaking immigrants with DM, the study is invaluable in that it provides fundamental information about this population. Limited information is available about DM in Korean immigrants in the United States, and the diabetic-specific data of Korean immigrants are also limited compared to other populations in the nation. Thus, the study findings would help researchers and healthcare providers understand Korean immigrants with DM, including demographic, socioeconomic status, and the means of HL, IP, and DM self-management.

Implications for Practice

The sociodemographic characteristics described in the study have important implications for developing and modifying education programs for Korean-speaking immigrants with DM. Communication issues due to language barriers might inhibit individuals to access health care or perform self-management. At many times, language barriers are considered a literacy issue, but HL and limited English proficiency must be approached differently. Language and HL should be improved, but the language barrier itself does not mean that HL is inadequate as the current study shows. Healthcare providers or nurse educators should be aware of the need for nursing interventions that fully integrate not only HL but also language.

The study findings showed that optimistic IP or HL itself does not automatically result in better self-management. Other relative factors should be considered when designing and testing future interventions for improving DM self-management among Korean-speaking immigrants with DM. New and innovative approaches, such as mobile phone-based video messages (Bell et

al., 2012), may be necessary to meet the needs and preferences of culturally and linguistically diverse people from ethnic minorities accessing health care.

Providing culturally and linguistically appropriate language services may improve the delivery and receipt of care. Training medical interpreters and improving immigrants' HL through strategies such as community based educational outreach should be considered. In these strategies, self-management-oriented approaches should be designed to allow participants to spend time on exercise instead of gaining knowledge during training hours. Healthcare providers should consider this more demanding position when consulting with individuals having a lack of time as a barrier to self-management. More practical strategies that incorporate exercise into the daily lives of those who have a lack of time should be considered, such as walking instead of taking the bus or taking the stairs instead of taking elevators. Community centers providing regular exercise programs need to tailor their programs to help individuals form the habit of exercise in their daily lives.

Implications for Future Research

Although this is a pilot study, the reliability of a Korean-translated version of the B-IPQ was calculated and the Cronbach's alpha for the current study was .77. The Cronbach's alpha of the SDSCA-K was .78 in this study. However, rigorous tests of the psychometric properties of the S- KHLS could not be performed. In addition, the HL of the participants could not be compared with other literature on Korean immigrants or those of other ethnic groups because no studies have used the S-KHLS. Similar studies of this nature are not available for comparison, but this is an important finding to note because of the increase of evidence that HL is important in adhering to health-related behaviors (Shiyanbola et al., 2018). Further studies with larger numbers of participants are needed to clarify the predictors of this population using a prospective

study design. It is also suggested to measure biological risk factors such as blood pressure, height, weight, waist and hip circumferences, finger-stick blood test, and HbA1c along with self-reporting questionnaires.

Although associations between IP, HL, and DM self-management have been identified in previous studies (Shiyanbola et al., 2018), this current study did not find the effects of IP and the moderating effects of HL on DM self-management among well-educated Korean-speaking immigrants with DM. Thus, this finding could be interpreted as an indication that adequate HL is not a factor but inadequate or limited HL. It may be necessary to conduct future studies with participants at different levels of HL along with further studies to support the concurrent validity of the S-KHLS.

An interesting question for further studies would be whether interventions with other settings (Koreans in South Korea vs. Korean immigrants in the United States; community-based vs. hospital-based; urban or suburban vs. rural) would result in similar patterns. It is suggested that longitudinal and experimental studies need to be conducted in different settings to investigate the causal role of IP in relation to the CSM. Data focusing on participants' language skills are needed to effectively address language-related barriers to timely, high-quality healthcare.

Summary

This study was conducted to examine the relationships between HL, IP, and DM self-management in Korean-speaking immigrants with DM, as well as to determine if their HL moderates the relationship between IP and DM self-management. Interestingly, the participants in the study had higher levels of HL than expected, as well as education. Although no associations were found between HL, IP, and DM self-management, healthcare providers and

researchers may benefit in understanding possible barriers to or facilitators for improvement of individuals' health-related behaviors by assessing existing IP, HL, and self-management among Korean-speaking immigrants with DM. This study has several limitations including a cross-sectional, non-experimental study design, the use of a convenience sample, a small sample size, and the data collection with only self-reported questionnaires. Based on the findings of the study, the initial recommendation for future studies is to propose replicating the current study with larger numbers of participants to elucidate the mechanisms in relation to the CSM.

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APPENDIX **A**

Sociodemographic Questionnaire

_____ Participant Number

Sociodemographic Questionnaire: English Version

We are conducting a study to examine if there are relationships between illness perception, health literacy, and self-management in Korean immigrants with diabetes mellitus. Your information is very valuable and will be kept confidential. Thank you for agreeing to participate in this study.

INSTRUCTIONS: Answer each question in the most proper manner.

1. How old are you? _____years old (to nearest year)

2. What is your sex?
   ○ Male ○ Female

3. Who do you live with?
   - Alone
   - Spouse
   - Two generations
   - Three generations or more

4. What is your individual monthly income? $ _____(average)

5. Do you work on a regular basis?
   - Yes
   - No

6. What is the highest level of education you have completed?
   - None
   - Elementary school
   - Middle school
   - High school
   - College or more

7. How long have you been diagnosed with type 2 diabetes mellitus? _____years _____months

8. Have you attended any educational class for diabetes?
   - None
   - 1-2
   - 3-4
   - 5 or more

9. How long have you been living in the United States? _____years (to nearest year)

_____ 참가자 번호

Sociodemographic Questionnaire: Korean Version

설문지

우리는 당뇨병을 앓고있는 한인 이민자들에게서 질병 인식, 건강 문해력, 그리고 당뇨병 자가 관리 사이에 관계가 있는지 조사하기 위해 연구를 수행하고 있습니다. 귀하의 정보는 매우 귀중하며 기밀로 유지됩니다. 이 연구에 참여해 주셔서 감사합니다.

지시 사항 : 각 질문에 가장 적절한 방식으로 대답하십시오.

1. 당신은 몇살입니까? (나이: ___ 살)

2. 성별은 무엇입니까?
    a. 남성
    b. 여성

3. 누구와 함께 살고 있습니까?
    a. 혼자
    b. 배우자
    c. 배우자와 자녀들 또는 부모님과 배우자
    d. 배우자, 자녀들, 그리고 손주들 또는 부모님, 배우자, 그리고 자녀들

4. 당신의 한달 평균수입은 얼마입니까? ($ _____)

5. 현재 일을 하고 있습니까?
    a. 네
    b. 아니오

6. 당신의 최고 교육수준은 무엇입니까?
    a. 무학력
    b. 초등학교
    c. 중학교
    d. 고등학교
    e. 대학교 이상

7. 당신은 당뇨병 진단을 받으신지 얼마나 오래 되셨습니까? (____ 년___개월)

8. 당뇨 질환 관리를 위한 교육에 참석한 경험이 있으십니까?
    a. 없음
    b. 1-2 번
    c. 3-4 번
    d. 5 번 이상

9. 당신은 미국에 얼마나 오래 살았습니까? (___년)

APPENDIX B

The Short Form of the Korean Health Literacy Scale (S-KHLS)

The Short Form of the Korean Health Literacy Scale (S-KHLS)

건강 관련 용어 측정

※ 다음 내용을 읽고 밑줄 친 곳에 들어갈 적절한 말을 찾아 ○표 하십시오.

예문) 노약자, 임산부, 고열환자 및 중증 _____ 환자는 사우나 이용에 주의가 필요합니다. ① 심전도 ② 심장병 (정답: 2)

1. _____을 마신 지 2시간 이내인 자는 사우나 이용에 주의가 필요합니다.
① 술 ② 암

2. 다음은 어린이 과체중에 대한 설명입니다.

2-1. 과체중은 _____이라고도 하며,
① 빈혈 ② 비만

2-2. 이것은 많은 _____ 의 원인이 됩니다.
① 질병 ② 독감

2-3. 비만 어린이들은 혈압이 올라가는 _____ 과
① 저혈압 ② 고혈압

2-4. 인슐린 분비에 장애가 있는 당뇨병과 같은 _____에
① 알코올 중독 ② 생활습관병
걸릴 수 있습니다.

이해 및 수리 영역 측정

※ 다음 지문을 읽고 적절한 답을 찾아 해당 번호에 ○표 하십시오.

1. 1,000㎖ 의 물을 일반 물컵(용량: 200ml)을 사용할 경우, 하루에 몇 잔을 마셔야 합니까? 정답: _____

① 2잔　　② 5잔

③ 7잔　　④ 10잔

※ 다음은 귀하의 병원 이용에 대한 설명입니다. 아래의 <진료 안내문>을 읽고 해당 질문에 적합한 답을 직접 기록해 주시기 바랍니다.

진료안내문　　심장혈관병원

등록번호: 1234567　　주치의: 허준
성　　명: 홍길동　　일　자: 2007-09-08

진료 예약일　2007년　10월 8일 오전 10시 30분

다음 방문시 가져야 할 곳	2층 심전도 검사실(√)
	1층 심초음파실(　　) 운동부하 검사실(　　)
	1층 입원 수속: 원무과 7번 창구 (　　)

※ (　)안에 √ 표시를 한 곳으로 가셔야 합니다.

2. 위의 진료안내문에서 진료 예약일은 언제입니까?

_____년　　_____월　　_____일

※ 다음과 같은 <외래 진료 시간표>가 있습니다. 아래 질문에 적합한 답을 선택해 주시기 바랍니다.

< 외래 진료 시간표 >

진료과	진료 의사	진료 분야	월	화	수	목	금
내과	이순신	소화기질환				●	
	김보람	호흡기질환	●		●		●
외과	황 희	위, 간, 담도	●		●		●
소아청소년과	임선희	소아질환	●	●	●	●	●
안과	오진주	백내장, 녹내장			●		
피부과	정보배	피부염		●		●	

3. 귀하께서 백내장 증상으로 진료를 받으시려면 진료과는 무엇입니까?

정답: _____

① 소아청소년과 ② 안과

③ 피부과 ④ 외과

※다음 약 처방전을 읽고 질문에 적합한 답을 선택해 주시기 바랍니다.

홍길동 종양학과 조제일: 2007-09-08
등록번호: 1234567 연령:37세

1회에 1알씩 하루에 3번 8시간마다 복용하십시오.

< 약품명 >
페니실린 250mg/1T 3일분

4. 위의 처방전에 따라 아침 6시에 약을 드셨다면 다음은 몇 시에 드셔야 합니까? 정답: _____

① 오전 10시 ② 오전 12시

③ 오후 2시 ④ 오후 4시

※ 다음은 <2005년도 건강검진 유질환자 현황>에 관한 그래프입니다.

5. 건강 검진 후 가장 많이 나타난 질환은 무엇입니까? 정답:_____

① 고혈압 ② 간장질환

③ 당뇨질환 ④ 고지혈

※다음은 약품 설명서입니다. 아래 지문을 읽고 질문에 적합한 답을 선택해 주십시오.

[용법·용량] : 이 약은 1회 10~15㎎/㎏의 용량을 4~6시간 간격으로 필요 시 복용하며, 1일 최대 5회(75㎎/㎏)를 넘지 않습니다.
1회의 용량은 몸무게 또는 나이에 따라 다음과 같습니다.

연령	몸무게	1회 용량
4~11개월	7.0~9.9㎏	2.5㎖
12~23개월	10.0~11.9㎏	3.5㎖
만2~3세	12.0~15.9㎏	5㎖
만4~5세	16.0~20.9㎏	7.5㎖
만6~8세	21.0~29.9㎏	10㎖
만9~10세	30.0~37.9㎏	12.5㎖

6. 만약 귀하께서 8세 어린이에게 약을 먹이려면, 1회에 몇 ㎖를 먹여야 합니까? 정답:_____

① 5㎖ ② 7.5㎖

③ 10㎖ ④ 12.5㎖

※ 다음은 라면 봉지에 있는 영양정보 표시입니다. 표를 읽고 아래 질문에 적절한 답을 선택해 주시기 바랍니다.

영 양 성 분

1회 분량 1봉지 (120g) 1회 분량 당 함량		총1회 분량 % 영양소기준치
열 량	450Kcal	
탄수화물	66g	20%
단 백 질	9g	15%
지 방	18g	36%
나 트 륨	1100mg	31%
칼 슘	1600mg	23%

*% 영양소기준치

7. 만약 귀하께서 고혈압 질환을 가지고 있다면 싱겁게 먹는 것이 좋습니다. 영양성분표에서 무엇(성분)을 참고해야 합니까?
정답: _____

① 칼슘 ② 지방
③ 단백질 ④ 나트륨

= 감사합니다 =

The Short Form of the Korean Health Literacy Scale (S-KHLS):

English Version (12 items with a blue dot chosen from the KHLS)

※ Please choose an appropriate word in the space given below. Mark(√) the number chosen. (Questions #1~3)

1. < Notice for Sauna customers : Special attention needed for following people. >

1-1. People with systolic _____over 180mmHg .

① blood pressure ② pain

1-2. Elderly, pregnant women, people with high fever and people with serious _____.

① electrocardiogram ② heart diseases

1-3. People who had _____within 2 hours.

① alcohol ② cancer

1-4. People with excessive _____.

① bleeding ② menopause

2. <Overweight child>

2-1. Overweight is also called _____ , and

① anemia ② obesity

this causes numerous _____.

① diseases ② flu

2-2. Overweight children can have high blood pressure called _____ , and diabetes.

① hypotension ② hypertension

2-3. Both diseases are _____.

① alcohol addiction ② lifestyle diseases

3. <Cancer check-up information >

3-1. Adults over 40years old should have _____check-up through gastroscopy every two years.

①stomach cancer ②kidney cancer

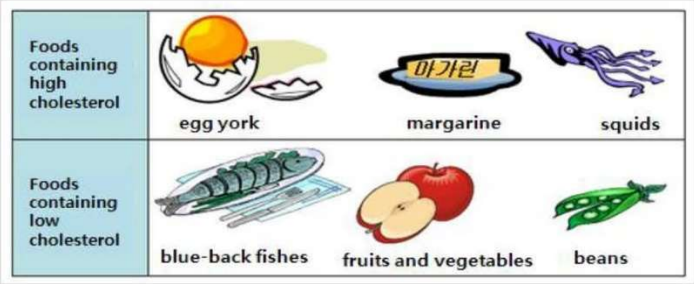
_____is one of our major _____organs.

①stomach ②kidney ① digestive ②respiratory

4

※ Please read instructions in the box below, and choose an appropriate answer. Mark(√) the number chosen.

Excessive low density cholesterol slows blood flow to the heart.
People with heart diseases should not take food containing high cholesterol more than 2-3 times per week.

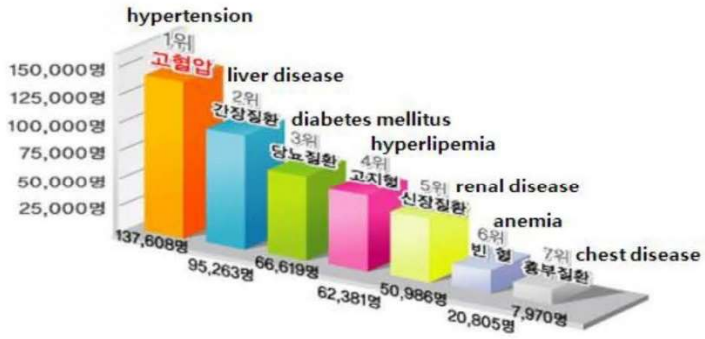


4-1. If you have heart diseases, which food should you consume **less** according to the box?

① egg yolk ② beans

③ blue-backed fishes ④ fruits and vegetables

※ The following is the graph about <the diseases found on physical exams in 2005>.



5-1. What disease is found most on the physical exams?

① Hypertension ② liver diseases

③ Diabetes related diseases ④ hyperlipemia

5

※ Please read the following prescription and choose an appropriate answer for each question.

Hong, Gil-Dong	oncology department	date:09-08-07
Registration number:1234567	age: 37	
I **Take one tablet three times a day, every 8 hours**		
< name of the medication >		
Penicillin	250mg/1T	for three days

6-1. If you took the medication at 6AM, what time should you take the next dose?

① 10 AM ② 12 AM

③ 2 PM ④ 4 PM

Hong, Gil-Dong	Oncology department	date:09-08-07
Registration number: 1234567	age :37	
Take one tablet once a day.		
Take an hour before a meal or two hours after a meal.		
<name of the medication>		
Doxycycline	100mg/1T	for 5 days

6-2. If you eat lunch at noon, what time should you take your medication?

① 10 AM ② 11 AM

③ 4 PM ④ 1 PM

7. How many glasses of water should you drink if you are using a regular cup(200ml) to drink 1,000 ㎖?

① 2 glasses ② 5 glasses

③ 7 glasses ④ 10 glasses

6

※. The following is the directions for drug use. Please read the box below and choose an appropriate answer.

[usage- dosage]

A dose(10-15mg/kg) can be given every 4-6 hours as necessary, but do not exceed more than 5 doses(75mg/kg) in 24 hours. A dose is shown in the chart below.

age	weight	dosage
4 ~ 11mos	7.0~9.9kg	2.5㎖
12 ~ 23mos	10.0~11.9kg	3.5㎖
2 ~ 3 yrs	12.0~15.9kg	5㎖
4 ~ 5 yrs	16.0~20.9kg	7.5㎖
6 ~ 8 yrs	21.0~29.9kg	10㎖
9 ~ 10 yrs	30.0~37.9kg	12.5㎖

8. If you are giving this medication to a 8 years old child, how many ㎖ should you give to a child at once?

① 5 ㎖ ② 7.5 ㎖

③ 10 ㎖ ④ 12.5 ㎖

※ The following is nutrition facts on the cover of Ramen. Please read this chart and choose an appropriate answer or write on the space given.

Nutrition Components		
serving size 1 pack (120g)		
Amount per Serving		% Daily Value
Calories	450Kcal	
Total carbohydrate	66g	20%
Protein	9g	15%
Total fat	18g	36%
Sodium	1100mg	31%
Calcium	1600mg	23%

*% Daily Value

9-1. How many calories will you consume from one pack of Ramen? _____

9-2. If you have high blood pressure, you should eat less salt. What components would you refer to in Nutrition Facts?

① Calcium ② Total fat

③ protein ④ Sodium

7

10. You have received a hospital bill as shown below. Please read the bill and find out how much you have to pay. Choose an appropriate answer.

department	neurology	patient name	H o n g , Gil-Dong	Patient ID No.	1234567	Insurance	national health insurance
room number		payment period	2007-09-08			Issued date	2007-09-08

Item		Insurance coverage ①+②	No insurance coverage	Total Amount ④	
Mandatory	Physician consultation fee	12,670	0	(① + ②+ ③)	42,670
	Room charge	0	0	Patient total Charges ⑤ (① + ③)	35,068
	Meals	0	0		
	Medication	0	0	Previous payment	0
	Injection	0	0		
	Anesthesia	0	0		
elective	Diagnostic test: CT	0	0	Total charges	35,068
	Diagnostic test: MRI	0	0		
	Diagnostic test: Ultrasound	0	30,000	Unpaid	0
	Denture, orthodontics	0	0	Prescription number	9055
subtotal		12,670	30,000		
Patient charges ①		5,068	0		
Insurance charges ②		7,602	0		

① 35,068 won ② 42,670 won

③ 5,068 won ④ 30,000 won

※. The following is the copy of your next appointment slip. Please read the box below and choose an appropriate answer or fill out the blank.

Follow-up appointment Cardiovascular hospital

Registration numbers: 1234567 Attending: Huh, Joon

Name: Hong, Gil-Dong Date: 09-08-2007

Appointment date October 8th, 2007 at 10:30 AM

Location	2nd floor: EKG Examination Room(√)
	1st floor: Radiology Department( )
	Exercise Examination Room( )
	1st floor Registration Desk: Window 7 ( )

※ You must report to the place marked(√).

11-1. When is your next appointment? (mm/dd/yyyy)

_____

11-2. Where should you go?

① 1st floor: registration desk ② Exercise Examination Room

③ Out-patient pharmacy ④ EKG examination room

※ The following is the clinic schedule. Please choose an appropriate answer.

< CLINIC SCHEDULE >

Department	Doctor	Field	Mon	Tue	Wed	Thu	Fri
Internal Medicine	Lee, Soon	Digestive system				●	
	Kim, Bo	Respiratory system	●		●		●
Surgery	Hwang, Hee	Stomach, liver, biliary	●		●		●
Pediatrics	Lim, Sun	Children illness	●	●	●	●	●
Ophthalmology	Oh, Jin	Cataract, glaucoma			●		
Dermatology	Chung, Bo	Dermatitis		●		●	

12-1. If you have a cataract, what department should you go?

① Pediatrics ② Ophthalmology

③ Dermatology ④ Surgery

12-2. Who will be your doctor?

① Dr. Lee, Soon ② Dr. Chung, Bo

③ Dr. Hwang, Hee ④ Dr. Oh, Jin

12-3. What day of the week do you have to visit your doctor?

① Monday ② Tuesday

③ Wednesday ④ Friday

APPENDIX C

The Brief Illness Perception Questionnaire (B-IPQ)

The Brief Illness Perception Questionnaire (B-IPQ): English Version

For the following questions, please circle the number that best corresponds to your views:

How much does your illness affect your life?										
0 no affect at all	1	2	3	4	5	6	7	8	9	10 severely affects my life
How long do you think your illness will continue?										
0 a very short time	1	2	3	4	5	6	7	8	9	10 forever
How much control do you feel you have over your illness?										
0 absolutely no control	1	2	3	4	5	6	7	8	9	10 extreme amount of control
How much do you think your treatment can help your illness?										
0 not at all	1	2	3	4	5	6	7	8	9	10 extremely helpful
How much do you experience symptoms from your illness?										
0 no symptoms at all	1	2	3	4	5	6	7	8	9	10 many severe symptoms
How concerned are you about your illness?										
0 not at all concerned	1	2	3	4	5	6	7	8	9	10 extremely concerned
How well do you feel you understand your illness?										
0 don't understand at all	1	2	3	4	5	6	7	8	9	10 understand very clearly
How much does your illness affect you emotionally? (e.g. does it make you angry, scared, upset or depressed?										
0 not at all affected emotionally	1	2	3	4	5	6	7	8	9	10 extremely affected emotionally

Please list in rank-order the three most important factors that you believe caused <u>your illness</u>. *The most important causes for me:-*

1. _____

2. _____

3. _____

The Brief Illness Perception Questionnaire (B-IPQ): Korean Version for DM

당뇨병 인식 설문지

다음 질문에 대해, **본인의 당뇨병과 관련해서** 가장 적합하다고 생각하는 숫자에 동그라미(O)로 표시해 주세요.

당뇨병이 당신의 삶에 얼마나 영향을 끼치고 있습니까?

0 1 2 3 4 5 6 7 8 9 10
전혀 매우 심각하게

당뇨병이 얼마나 계속될 것이라고 생각하고 있습니까?

0 1 2 3 4 5 6 7 8 9 10
매우 짧은 시간 동안 평생

당뇨병을 얼마나 조절하고 있다고 느끼고 있습니까?

0 1 2 3 4 5 6 7 8 9 10
전혀 매우 잘

당신의 치료가 당뇨병에 얼마나 도움이 될 수있다고 생각하고 있습니까?

0 1 2 3 4 5 6 7 8 9 10
전혀 매우 많이

당뇨병의 증상을 얼마나 경험하고 있습니까?

0 1 2 3 4 5 6 7 8 9 10
전혀 매우 많이,심각하게

당뇨병에 대해 얼마나 걱정을 하고 있습니까?

0 1 2 3 4 5 6 7 8 9 10
전혀 매우 많이

당뇨병을 얼마나 잘 이해하고 있다고 느끼고 있습니까?

0 1 2 3 4 5 6 7 8 9 10
전혀 매우 명확하게

당뇨병이 당신에게 얼마나 정서적으로 영향을 끼치고 있습니까?
(예: 당뇨병 때문에 화가 납니까, 두렵습니까, 불행합니까, 또는 우울합니까?)

0 1 2 3 4 5 6 7 8 9 10
전혀 매우 많이

당뇨병을 일으켰다고 믿고있는 가장 중요한 요소 3 가지를, 중요한 순서대로 서술해 주세요.

1. _____
2. _____
3. _____

Translated into Korean and revised with permission from lizbroadbent@clear.net.nz

APPENDIX D

The Revised Summary of Diabetes Self-Care Activities (SDSCA)

The Revised Summary of Diabetes Self-Care Activities (9 items chosen for Korean version)

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

Diet

How many of the last SEVEN DAYS have you followed a healthful eating plan?

0 1 2 3 4 5 6 7

On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?

0 1 2 3 4 5 6 7

On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?

0 1 2 3 4 5 6 7

Exercise

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

0 1 2 3 4 5 6 7

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

0 1 2 3 4 5 6 7

Blood Sugar Testing

On how many of the last SEVEN DAYS did you test your blood sugar?

0 1 2 3 4 5 6 7

On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider?

0 1 2 3 4 5 6 7

Foot Care

On how many of the last SEVEN DAYS did you check your feet?

0 1 2 3 4 5 6 7

On how many of the last SEVEN DAYS did you inspect the inside of your shoes?

0 1 2 3 4 5 6 7

The Korean Version of the Summary of Diabetes Self–Care Activities

한국형 당뇨 자가 관리 행위 측정도구 (SDSCA-K)

※다음 질문들은 지난 7일 동안 귀하의 당뇨병 자가 관리 행위를 측정하는 문항들입니다. 만약 지난 7일 동안 아프신 적이 있었다면, 아프지 않았던 그 전 7일 동안에 어떻게 자가 관리를 하셨는지 응답하시면 됩니다. 각 항목당 **해당 일수**(숫자)에 V표 해 주십시오.

항목	내 용
식이	지난 **7 일** 동안 며칠 정도 건강한 식습관을 지키셨습니까? 0 1 2 3 4 5 6 7
	지난 1 달 동안 **일주일에 평균 며칠** 정도 당뇨식단을 지키셨습니까? 0 1 2 3 4 5 6 7
	지난 **7 일** 동안 며칠 정도 충분한 야채(김치를 포함하여 매끼 2 종류 이상의 야채 반찬을 작은 접시 3 개 정도의 양)를 드셨습니까? 0 1 2 3 4 5 6 7
운동	지난 **7 일** 동안 며칠 정도 적어도 30 분 이상 신체 활동 (걷기를 포함하여 한 번 할 때 30 분 이상)을 하셨습니까? 0 1 2 3 4 5 6 7
	지난 **7 일** 동안 며칠 정도 특별한 운동 프로그램 (예를 들어 수영, 자전거 타기, 조깅 등, 집 주위 걷기; 직업과 관련된 신체활동은 제외) 에 참여하셨습니까? 0 1 2 3 4 5 6 7
혈당 검사	지난 **7 일** 동안 며칠 정도 혈당 검사를 하셨습니까? 0 1 2 3 4 5 6 7
	지난 **7 일** 동안 며칠 정도 담당 의사가 권유한 횟수만큼 혈당 검사를 하셨습니까? 0 1 2 3 4 5 6 7
발관리	지난 **7 일** 동안 며칠 정도 귀하의 발을 검사하셨습니까? 0 1 2 3 4 5 6 7
	지난 **7 일** 동안 며칠 정도 귀하의 신발 안을 확인하셨습니까? 0 1 2 3 4 5 6 7

Appendix E

Recruitment Text

Recruitment Text

The purpose of this study is to find out if there are relationships between illness perception, health literacy, and self-management in Korean-speaking immigrants with diabetes mellitus. You are invited to participate in this study because you are a Korean immigrant living in north Texas, have had a diagnosis of DM for at least one year, are 18 years old or older, and can read and speak Korean.

This survey consists of a total of 39 questions that may take 20-30 minutes to complete but will not exceed one hour. Your participation in this study is voluntary, and you will not get paid. You have the right to withdraw from participation at any time by returning an incomplete research packet. Withdrawal will not affect your relationship with this research personnel.

If you have any questions about this study, send an email to suwon.park@uta.edu.

Your information is very valuable and will be kept confidential. Thank you for participating.

Recruitment Text: Korean Version

연구 참가자 모집

본 연구의 목적은 당뇨병이 있는 한인 이민자들의 질병 인식, 건강 문해력, 및 자기 관리 간의 관계를 조사하는 데 있습니다. 당신은 북 텍사스에 거주하는 한인 이민자이며, 적어도 1 년 전에 당뇨병으로 진단 받았고, 18 세 이상으로, 한국어를 읽고 통역 할 수 있기 때문에 이 연구에 참여하도록 초대되었습니다.

설문 조사는 총 39 개의 질문으로 구성되며, 완료하는 데 20-30 분이 걸릴 수 있지만 1 시간을 초과하지는 않습니다. 이 연구에 참여하는 것은 자발적이며 금전적 보상은 없습니다. 귀하는 완료되지 않은 설문지를 반환함으로써 언제든지 귀하의 참여를 철회 할 권리가 있습니다. 당신은 이것 때문에 불이익이나 어떤 영향을 받지 않습니다.

이 연구에 대해 질문이 있으시면 suwon.park@uta.edu 로 전자 메일을 보내주십시오.

귀하의 정보는 매우 귀중하며 기밀로 유지됩니다. 참여해 주셔서 감사합니다.