EVALUATING THE EFFECTIVENESS OF THE PERSONAL DIABETES QUESTIONNAIRE IN THE PRIMARY CARE SETTING

By

Carolyn Wisco

Staci Urbanosky

Roger Fisher

A capstone project submitted to the St. David's School of Nursing at
Texas State University in partial fulfillment
of the requirements for the degree of
Master of Science in Nursing
May 2019

Supervising Faculty:

Dr. Viola Benavente

FAIR USE AND AUTHOR'S PERMISSION STATEMENT

Fair Use

Duplication Permission

Abstract

Type 2 diabetes mellitus (T2DM) is a chronic illness managed daily by patients themselves. Poorly controlled diabetes is associated with micro- and macrovascular complications leading to increased morbidity. The Personal Diabetes Questionnaire (PDQ) is a reliable and valid tool that has not been tested in primary care and provides a comprehensive evaluation of knowledge, perceived barriers, and motivational aspects in T2DM self-management. The study aims were to evaluate T2DM self-management of patients in primary care as measured by the PDQ and explore the relationships between perceived barriers and readiness to change and patient self-reported glycated hemoglobin values (HbA1c). A cross-sectional, pilot study was conducted in a convenience sample from south central Texas, N=11. The PDQ assesses four behavioral domains by 13 subscales: blood glucose control, diet, medications, and physical activity. The SPSS software was used for statistical analysis and correlation coefficient techniques were applied to determine significant associations between study variables. Overall, subscales demonstrated good internal consistency (Cronbach's α=0.56-0.82). No statistically significant correlations existed between HbA1c and participant perceived barriers or readiness to change. Participants were reportedly preparing or actively trying to lose weight and perceived few barriers to completing self-care activities. While participants reported well managed diabetes, their self-management was suboptimal regarding diet behaviors, glucose monitoring, and physical activity. Participants reported optimal diabetes medication adherence. The PDQ remains a valuable tool that can be used by primary care providers to facilitate optimal, patient-centered self-management evaluation and education and minimize diabetes complications

Keywords: Diabetes, Self-Management, Personal Diabetes Questionnaire

Evaluating the Effectiveness of the Personal Diabetes Questionnaire in the Primary Care Setting

Type two diabetes mellitus (T2DM) affects approximately 382 million adults worldwide, and complications related to diabetes account for approximately $174 billion in healthcare costs nationwide (Thomas, Iyer, & Collins, 2014). Poorly controlled diabetes leads to complications including coronary artery disease, stroke, retinopathy, neuropathy, nephropathy and lower extremity amputations (American Association of Diabetes Education [AADE], 2009). Appropriate diabetes management requires lifestyle modifications, strict medication compliance, and blood glucose monitoring that relies heavily on patient self-management for optimal control of the disease. Proper self-management education including a comprehensive dietary and nutritional review has been linked to a reduction in hospitalizations, emergency room visits, outpatient visits, and overall health decline in patients with chronic illnesses including diabetes (Thomas et al., 2014).

An individual's average blood glucose level of the previous two to three months can be measured through a simple lab test, known as the hemoglobin A1c (HbA1c). The normal range for HbA1c level for adults without a diagnosis of diabetes mellitus is between 4% and 5.6%. Values greater than or equal to 6.5% meet the diagnostic threshold set by the American Diabetes Association for a diagnosis of T2DM. In people with diabetes, HbA1c levels can be used to measure the success of blood glucose control and disease management. Diabetes is considered well controlled when a patient's HbA1c is maintained under 7%. Poorly controlled diabetes leads to complications including coronary artery disease, stroke, retinopathy, neuropathy, nephropathy and lower extremity amputations (American Diabetes Association, 2014).

Approximately 90% of diabetes care is delivered by primary care providers, many of whom are family nurse practitioners, often without the involvement of a qualified diabetes

educator. Although diabetes self-management education is recognized as a crucial component in diabetes care, many patients never receive formal training. On average, only 14.3% of all diabetes-related primary care visits include diet or nutrition counseling, 10% include exercise counseling, and 3.6% include weight reduction counseling. More diabetes self-management education needs to be taking place in the primary care setting to increase self-management behaviors of this patient population and decrease complications and poor clinical outcomes of this disease (AADE, 2009). Specific barriers to self-management must also be evaluated appropriately in the primary care setting to address the individual needs of this population so more effective diabetes self-management education can take place.

American Association of Diabetes Education (AADE) Guidelines

Diabetes education, also referred to as self-management training, is a collaborative process through which people with or are at-risk for diabetes gain the knowledge and skills needed to modify behavior and successfully self-manage the disease and its related conditions. Effective education can help patients achieve optimum health status and better quality of life, while reducing healthcare costs from preventable complications of the disease. According to the AADE, diabetes education should focus on seven patient-centered self-care behaviors that have shown to be essential for improved health status. Specifically, these behaviors include healthy eating, being active, glucose monitoring, medication adherence, problem solving, healthy coping, and reducing risks (Tomky et al., 2008). In addition, the educator should assess each patient's understanding of these key behaviors on a regular basis, identify potential barriers to success, and assist in creating patient-centered self-management goals, as well as periodically monitor the patients' progress in completing these behaviors (AADE, 2009). The responsibility of diabetes education is a collaborative process involving many healthcare professionals; however, primary

care providers have the unique opportunity to observe patients at all stages of the disease process and can complete continuous follow-up with patients while monitoring individual struggles and successes. Therefore, as primary care providers, family nurse practitioners are ideally positioned to educate patients about T2DM self-management, assess for barriers, and continuously evaluate their self-management behaviors. In doing so, patients can have better control of their diabetes and feel confident in their abilities to do so (Tomky et al., 2008).

To facilitate improved clinical outcomes, family nurse practitioners must rely on tools to optimize self-management evaluation and education. An important need exists for more reliable, valid tools to better evaluate diabetes self-management in a patient-centered way in the primary care setting. Current diabetes self-management tools are available for family nurse practitioners and their benefits and shortcomings will be discussed at length.

Literature Review

A thorough literature review highlights four commonly used published tools for diabetes self-management: (1) Summary of Diabetes Self-Care, (2) Diabetes Self-Management Questionnaire, (3) Perceived Diabetes Self-Management Scale, and (4) Personal Diabetes Questionnaire. Each tool was designed with purpose and intent, but the Personal Diabetes Questionnaire (PDQ) is the only tool that assesses perceived barriers and readiness to make behavior changes for better diabetes self-management. Appendix A contains a scholarly article grid delineating the relevant findings that support this literature review.

Summary of Diabetes Self-Care (SDSCA)

Several tools have been created, validated, and utilized in numerous patient care settings that can assess a patient's overall self-management practices for diabetes care. One of the most widely used self-management tools is the Summary of Diabetes Self-Care Activities (SDSCA)

assessment. This tool is a brief, 14-item self-report diabetes self-management questionnaire that assesses the following aspects of the self-care regimen: general diet (adherence to a healthy diet), specific diet (adherence to eating fruits and vegetables), exercise, medication taking, blood glucose monitoring, foot care, and smoking (Toobert, Hampson, & Glasgow, 2000).

A study by Toobert et al. (2000) reviewed the reliability, validity, and normative data from seven different studies involving a total of 1,988 people with diabetes. Researchers found inter-item correlations within the subscales were high (mean=0.47), demonstrating internal consistency for the tool's subscales. Inter-item correlations were chosen to evaluate internal consistency rather than Cronbach's α, as Cronbach's α is influenced by both the number of items as well as the relationship among items, and authors preferred to use an index independent of the number of items, as SDSCA scales had different numbers of items. They also found strong correlations among the SDSCA subscales and other criterion measurements for diet and exercise, including food frequency questionnaires and the Physical Activity Scale for the Elderly, demonstrating criterion validity (mean=0.23). Test-retest correlations among the subscales were moderate (mean=0.04), demonstrating reliability of the tool (Toobert et al., 2000). The tool's brevity makes it ideal for application in fast-paced clinical environments. However, its' brevity limits the in-depth examination of each self-care behavior it evaluates, and also does not address the patient's attitude and perception of barriers in completing self-care activities.

Diabetes Self-Management Questionnaire (DSMQ).

Another tool, known as the Diabetes Self-Management Questionnaire (DSMQ), has been compared to the SDSCA, and was studied among 430 participants with both type one and type two diabetes recruited from a diabetes referral clinic in Germany (Schmitt et al., 2016). The DSMQ consists of 16 items addressing five different subscales of diabetes self-management:

dietary control, medication adherence, blood glucose monitoring, physical activity, and physician contact. Both the SDSCA and DSMQ instruments measure aspects of self-management, including adherence to a specific diet, exercise, and blood sugar monitoring; however, several differences exist between the two tools. One difference is the time frame during which patients are asked to recall certain aspects of self-management. The SDSCA assesses the frequency of behaviors performed in a one-week period while, the DSMQ assesses the patient's self-reported behaviors over the last eight weeks. The DSMQ also assesses medication adherence and compliance with doctor visits, while the SDSCA assesses behaviors, such as foot care and smoking (Schmitt et al., 2016)

The DSMQ's subscales showed a significant negative association with HbA1c (r=-0.46; p<0.001) for people with T2DM, indicating that higher self-management, determined by higher DSMQ score, correlated with lower HbA1c (Schmitt et al., 2016). The subscales of the DSMQ also had Cronbach's α ranging from 0.72-0.83, demonstrating good internal consistency. Significantly stronger associations were found between the DSMQ self-management scores and HbA1c levels compared to those of the SDSCA for both type one and type two diabetes (both p<0.001) (Schmitt et al., 2016). These results indicate that the DSMQ tool can more effectively predict glycemic control than the SDSCA. However, the study had some limitations. For example, utilizing patients enrolled in a referral center limits the study's generalizability to patients receiving diabetes care in other clinical settings, including primary care. The DSMQ also does not measure barriers to completing the self-care behaviors or assess the patient's appraisal of their self-management activities.

Perceived Diabetes Self-Management Scale (PDSMS)

The Perceived Diabetes Self-Management Scale (PDSMS) is a tool designed to measure self-efficacy as it applies to diabetes management. A cross-sectional study tested the validity and reliability of the tool in four different sites, utilizing a Likert-type scale survey (Wallston, Rothman, & Cherrington, 2007). Cronbach's α of the PDSMS was 0.83, indicating good internal consistency. Results demonstrated that increased patient adherence to treatment recommendations correlated with increased confidence and competence to manage their diabetes, including diet, exercise blood glucose testing, and medication taking (Wallston et al., 2007). Increased patient confidence in self-management, represented by high PDSMS scores, also significantly correlated with lower HbA1c levels ($r = -.30$, $p < .001$), demonstrating construct validity of the tool (Wallston et al., 2007). However, one threat to the tool's internal validity could be that the study did not consider any self-management interventions that may have occurred in individuals prior to enrolling in the study. The brief, 8-item questionnaire makes for a patient-friendly tool, but the brevity of the tool may limit the depth of examination found in more comprehensive assessment tools. The PDSMS also only addresses patients' personal confidence in treating diabetes to the exclusion of barriers that may impede self-care goals and the knowledge and skills needed for success.

Evaluating Perceived Barriers in Diabetes Self-Management

The role of perceived barriers in diabetes self-management has been well investigated. A study by Schlundt et al. (1994a) investigated barriers involved in adhering to a diabetic diet among 20 adolescents with type one diabetes. This qualitative study conducted structured interviews, and from those interviews, a hierarchical content analysis was used to identify 10 categories of obstacles to dietary adherence. The categories of obstacles to adherence included being tempted to stop trying, negative emotional eating, facing forbidden foods, peer or

interpersonal conflict, competing priorities, eating at school, social events and holidays, food cravings, snacking when at home alone or bored, and social pressure to eat (Schlundt et al., 1994a). Although this study was completed on type one adolescents with diabetes, it can be implied that many of these obstacles are applicable to T2DM adults as well. However, the target population does limit the generalizability to adults with T2DM.

Another qualitative study by Schlundt, Rea, Kline, & Pichert (1994b) explored barriers faced by adults with both insulin dependent and non-insulin dependent diabetes. Structured interviews among a convenience sample of 12 adults with insulin dependence and 14 with non-insulin dependence were completed, comprised of 23% African American and 77% Caucasian. A content analysis identified 12 obstacles faced among these participants: negative emotions (i.e., participants tend to eat or overeat to cope with negative emotions), resisting temptation, eating out, feeling deprived, time constraints (i.e., time pressure makes eating healthy difficult), tempted to relapse, planning (i.e., not having time to plan healthy meals), competing priorities, social events, family support (i.e., having lack of family support), food refusal (i.e., guilt associated with not accepting inappropriate food when offered), and friends' support (i.e., friends are less supportive) (Schlundt et al., 1994b). This study identified major situational obstacles faced by those with diabetes among African Americans and Caucasians; however, other ethnic populations commonly affected by diabetes, including Hispanics, were not evaluated. Furthermore, participants were recruited from an outpatient diabetes clinic, so this limits the study's generalizability to the primary care setting.

Though both qualitative studies illuminated many of the obstacles that people with diabetes face with dietary adherence, they failed to include other obstacles of self-management, including barriers to medication adherence, monitoring blood glucose levels, or engaging in

physical exercise. These studies also did not address other motivational factors, such as patients' readiness to complete self-management activities. These unaddressed items are considered crucial factors in evaluating a patient's self-management for diabetes care (Stetson et al., 2011).

Evaluating Readiness to Change in Diabetes Self-Management

Several studies have evaluated patients' motivation to change in adults with diabetes. One study by Peterson & Hughes (2002) recruited 50 patients from a diabetes educational center with HbA1c levels greater than 9.0, which is considered poorly controlled diabetes, and asked them questions to determine their level of readiness to change prior to entering a diabetes intervention program. Patients were categorized into three stages of change as described in the Transtheoretical or Stages of Change model based on their responses: (1) *precontemplation-contemplation* or beginning to think about change; (2) *preparation* or preparing to change; and (3) *action* or actively making changes. Intensive diabetes education was offered to all participants, then HbA1c levels were measured for 24 months after the educational program. The study found that participants in the preparation and action stages achieved a significantly larger reduction in HbA1c levels in a shorter amount of time than patients in the precontemplation-contemplation stage. These results demonstrated that increased readiness to change is associated with clinical improvement in HbA1c levels (Peterson & Hughes, 2002). One's readiness to change is clearly an important predictor of better diabetes self-management and should, therefore, be evaluated in the clinical setting prior to initiating diabetes education.

The Personal Diabetes Questionnaire (PDQ)

An identified gap in the literature was a tool that assessed people's readiness to change as well as the barriers faced by diabetic patients in completing the self-management behaviors recommended by the AADE. Therefore, Stetson et al. (2011) developed the Personal Diabetes

Questionnaire (PDQ) to assess the barriers and motivational factors involved in nutritional management, medication adherences, blood glucose monitoring, and physical activity. Researchers utilized the findings on common barriers determined by Schlundt et al. (1994a) and Schlundt et al. (1994b) to create questions that address these specific barriers in self-management. Their tool included assessments of barriers to all aspects of self-management, not just diet adherence. The research team also applied the findings from Peterson & Hughes (2002) to include questions that assessed patients' readiness to change, as this was determined to be a predictive factor for self-management that corresponded with the Transtheoretical or Stages of Change model, which will be further discussed in this proposal (Stetson et al., 2011).

To establish content validity, the tool was reviewed by multidisciplinary diabetes care providers and items were subsequently revised until the tool thoroughly covered the diabetes care domains using as few items as possible (Stetson et al., 2011). The validity of the tool was further evaluated utilizing a cross-sectional study of 790 adults consisting of 205 with type one and 585 with type two who were recruited from a Midwestern outpatient diabetes clinic while waiting for their appointments. The subscales of the tool demonstrated good internal consistency with a Cronbach's α=0.65-0.83 and satisfactory criterion validity through significant associations with HbA1c levels and basal metabolic indexes (BMI) of participants ($p \leq 0.001$) (Stetson et al., 2011). This tool was validated among patients managing their diabetes in an outpatient diabetes clinic, which limits the study findings' generalizability to patients receiving care in the primary care setting. Furthermore, the participants used in this study were primarily Caucasian. Diverse patient populations of varying ethnic backgrounds and socioeconomic status were also not included in the study. Hispanic and lower income participants were not represented (Stetson et al., 2011). Self-management practices and perceived barriers may vary considerably across

cultures, socioeconomic status, regions, and organizational settings. Therefore, future studies evaluating the PDQ should include participants of varying geographical regions, socioeconomic status, and ethnic backgrounds to enhance the PDQ's generalizability.

The PDQ was also utilized in a study by Cooper et al. (2015) that examined the role of physical activity in adults with T2DM. Using three self-report measures, the International Physical Activity Questionnaire Short Form (IPAQ-SF), the Summary of Diabetes Self-Care Activities measure (SDSCA), and the Personal Diabetes Questionnaire (PDQ), the study sought to compare rates of physical activity among the three and explore perceived barriers. Although the PDQ was not found to be a significant predictor of participant BMI among the three tools, the study confirmed the PDQ's usefulness in revealing specific barriers to physical exercise (Cooper et al., 2015). This study utilized a more diverse sample population than the original PDQ validation study, as it included African American and Caucasian participants; however, only physical activity responses were analyzed, not other self-management activities. Furthermore, participants were recruited from community diabetes education programs and a university medical clinic, but it did not specify in which clinical settings participants visited regularly to manage their diabetes. Therefore, more studies need to be completed analyzing all domains of the PDQ utilizing a diverse participant population who manage their diabetes care specifically in the primary care setting, which is an identified gap in the literature and addressed in the Capstone Project study proposal.

Capstone Project Proposal

Study Aims

The purpose of this Capstone Project proposal was to conduct a pilot study utilizing the PDQ to evaluate self-management perceptions and practices of ethnically and socioeconomically

diverse patient populations managing their diabetes care in the primary care setting, and to explore the relationships between perceived barriers and readiness to partake in T2DM self-management with patient self-reported HbA1c level. It was hypothesized that there would be a positive correlation between HbA1c and patient perceived barriers (H_1) and a negative correlation between HbA1c and patient perceived readiness to change (H_2). It was expected that there would be a significant positive correlation between HbA1c and self-management barriers, as this was demonstrated in the original PDQ validation research (Stetson et al., 2011). It was hypothesized that there would be a significant negative correlation between HbA1c and readiness to change, as past research demonstrated improved HbA1c levels in those with increased readiness to partake in diabetes self-management activities (Peterson & Hughes, 2002).

The underlying theoretical framework used in the development of the PDQ, the Transtheoretical Model, also called the Stages of Change Model, served as the basis for hypothesis development in this study. This theory assesses an individual's readiness to act on a new, healthier behavior and provides strategies or processes of change to guide the individual (Prochaska, Wright, & Velicer, 2008). Interviews with diabetes educators suggest utilizing the Stages of Change model in diabetes self-management (Stetson et al., 2011). Evaluating a patient's readiness to change and their motivation for completing stages of change are key factors to help determine their potential for success in self-management (Stetson et al., 2011).

The PDQ assesses a patient's knowledge, readiness to change, and the barriers regarding self-management, making it arguably the most comprehensive diabetes self-management tool available. Findings from this Capstone Project study can provide insight into the barriers and management characteristics of the patient population receiving diabetes care in the primary care setting and can lend support for the PDQ's mainstream utilization in this type of clinical setting.

Methods

Design

This Capstone Project was a pilot study using a cross-sectional design with a total sample size of 11 participants. The study aimed to determine the relationships between current T2DM self-management in adults as measured by the PDQ with patient self-reported HbA1c values. For H_1, a significant positive correlation between participant reported HbA1C levels and perceived barriers, represented by barrier subscale scores of the PDQ, was expected. For H_2, a significant negative correlation between HbA1c and patient perceived readiness to change, represented by readiness to change subscale scores of the PDQ, was expected. The null hypotheses would be that there are no significant relationships between HbA1c and participant perceived barriers nor between HbA1c and participant readiness to change.

Sampling

Convenience sampling was utilized in this study, and 11 participants were enlisted from community-sponsored diabetes education programs and through word-of-mouth in south central Texas. Inclusion criteria were that participants must be 18 years of age or older, had T2DM that had been diagnosed for 3 months or more, were able to read the survey questions written in English at a sixth-grade reading level, and were currently managing their diabetes in the primary care setting. Participants also had to be able to recall their most recent HbA1c to participate. Those with type one diabetes, blindness, significant neurological deficits, severe mental illness, terminal illness with anticipated life expectancy less than two years, and those who did not know their most current HbA1c range were excluded from this study.

Instruments

The only instrument utilized in this study was the PDQ because of its comprehensiveness that also included a section on demographic information; refer to Appendix B. The tool is then divided into 13 subsets with a total of 78 questions asked at a sixth-grade reading level. Researchers reformatted the original PDQ tool to shorten survey length to minimize completion time, but none of the questions within the subscales were altered beyond minor syntax changes from the original PDQ.

Researchers also included five additional questions within the demographic portion of the original PDQ for a total of 10 items. The five original demographic questions in the PDQ assessed participants' age, gender, weight, ideal weight, and height. Researchers also included questions in the demographic section that assessed patients' ethnicity, education, marital status, annual income, and most recent HbA1c level. The original PDQ did not assess for marital status or annual income, these demographic questions were unique to this current study. These items were included to gain additional insight regarding the sample population and help explain research findings. The original PDQ also assessed for ethnicity and education, but these were not included within the survey. The original PDQ study also assessed for Body Mass Index (BMI), other comorbidities, smoking status, and T2DM duration; however, these aspects were not assessed in this current study.

The second part of the PDQ consists of the following subscales labeled alphabetically beginning with "A" through "M": "A" *Perceived Blood Glucose Control*, "B" *Weight Change Readiness*, "C" *Dietary Knowledge and Skills*, "D" *Diet Change Readiness*, "E" *Diet Decision Making*, "F" *Eating Problems*, "G" *Diet Barriers*, "H" *Medication Use*, "I" *Medication Barriers*, "J" *Blood Glucose Monitoring*, "K" *Blood Glucose Monitoring Barriers*, "L" *Physical Activity*, and "M" *Exercise Barriers* (Stetson et al., 2011). The primary focus of the PDQ is on four

domains of diabetes self-care behaviors, consisting of diet, medication, blood glucose monitoring, and exercise (Stetson et al., 2011). One subscale of note assesses patients' readiness to change, an important motivational factor to assess with the target patient population. Other subscales assess barriers to diabetes management adherence, also determined by past research to be necessary to assess among this patient population (Stetson et al., 2011). All subsets have demonstrated good internal consistency (Cronbach α = 0.650-0.834) and have demonstrated significant associations with BMI and HbA1c levels (p <0.001) (Stetson et al., 2011). The length of the questionnaire and time required to complete was a recognized barrier to participation; thus, reformatting of the survey was done. Prior studies have shown that the time taken to complete the survey was on average less than 30 minutes (Stetson et al., 2011).

Data Collection Procedures

Data collection for the pilot study began November 2018 and was completed December 2018. Data collection was conducted at two primary care clinics affiliated with Community Health Centers of South-Central Texas. These clinics offer a variety of treatments and education for adults with T2DM and their caregivers/support systems. Upon clinic approval, flyers containing information regarding the study were posted in the waiting rooms for patients to consider and increase awareness. An incentive for participation was also included on the flyers, which consisted of either a calorie-counting book or a portion control plate; the patient could choose one. To be eligible for participation, patients had to meet all inclusion criteria. Researchers also enlisted the help healthcare providers working at the clinic to locate patients fitting the inclusion criteria. Despite these efforts, no participants were successfully recruited, as no patients fit all study criteria.

Two participants were recruited from community-offered diabetes education classes in south central Texas. The remaining 9 participants were recruited through word-of-mouth. Consent to participate in the study was obtained from interested participants fitting inclusion criteria, and participants completed the printed questionnaires privately while researchers remained present throughout the data collection process, enabling participants to ask questions. A small sample of 11 participants was sufficient to test proof of concept for this pilot study.

Data Analysis

Data management included all components associated with collection, coding, cleaning, analyzing, and interpreting. Each item of the PDQ was coded in a codebook and participant data was placed into an excel spreadsheet to prepare for the analysis phase. The SPSS software was utilized to analyze data, and this took place in January 2019. After this phase, researchers interpreted the data from February to March 2019. Data analysis of individual items on the PDQ included descriptive statistics to summarize the data.

Correlation analysis was performed using scatter plots comparing each barrier subscale, "G," I," "K," and "M," to HbA1c level. Each readiness to change subscale, "B" and "D," were also compared to HbA1c level. Significance was set at $p < 0.05$. Significant associations between these variables were investigated. Pearson's *r* was calculated comparing each barrier and readiness to change subscale score (independent variables) to HbA1c level (dependent variable) to evaluate the magnitude and direction of their relationship (Polit and Beck, 2017). It was hypothesized (H_1) that there would be a significant positive correlation between participant reported HbA1C levels and perceived barriers, represented by barrier subscale scores of the PDQ, and (H_2) a significant negative correlation between HbA1c and patient perceived readiness to change, represented by readiness to change subscale scores of the PDQ. The null hypotheses

indicated no significant correlations existed between HbA1c and perceived barriers to diabetes management or readiness to change. Patient demographics were also analyzed and reported in aggregate format to maintain anonymity.

Ethical Considerations

The safeguarding of participants' human rights was of utmost importance in this study, and every effort was made to ensure participant anonymity. Beneficence and justice for participants was strongly enforced in this study. Approaching potential study participants in the primary care clinic setting presented some important ethical considerations that were thoroughly addressed. Prior to enlisting study subjects, consent was obtained after full disclosure was given regarding study objectives. Discussions with each participant were conducted privately with discretion to protect privacy.

Disclosure began by explaining that the research was being conducted by family nurse practitioner students as part of their course requirements through Texas State University. Researcher contact information was provided to all study participants as well. The researchers ensured all potential subjects were able to fully understand their role and ability to opt out without risk of retribution. The purpose, goals, risks and benefits of this study were discussed with each participant. Study subjects were told that they may not receive any health benefit from the study but that others may benefit from the research in the future. They were also notified that they were committing to a one-time survey that would take about thirty-minutes or less to complete and that researchers would not be contacting them again for follow-up.

Data collection was explained, and researchers informed participants that individual, identifiable results would not be published or made available to their providers but rather data would be reported as aggregate results. No interviews were conducted, nor any names recorded;

therefore, questionnaires remained confidential and had a numeric code for de-identification of personal information and tracking. Realizing some survey responses may have been sensitive information for disclosure, an emphasis was placed on the consent form to ensure participants that their personal information would not be shared or exploited. All measures were taken to ensure confidentiality. Participants were told that no data would be discussed or shared beyond those directly involved in the research. Participants were informed that paper surveys would be kept for a required minimum of three years in a secure and locked office with entry permitted by a keyless card mechanism; no scanned or digital copies of the surveys would be made.

All participants received a portion control plate or calorie-counting book as an incentive and thank you for participating. Participants were made aware that their participation was completely optional, and they had the right to opt out at any time. They were told that if they decided to opt out, there would be no penalty. Respect was given to all participants' beliefs, backgrounds, lifestyles and cultures. Using a credible, valid and reliable questionnaire helped to ensure the questions were not more intrusive than necessary, and privacy was maintained throughout the entire process for all participants (Polit & Beck, 2017). The proposal was submitted to the Texas State University Institutional Review Board (IRB) to ensure the rights and welfare of human research subjects were not jeopardized. The study qualified for an expedited review by the Texas State University IRB as it did not involve completing any interventions and posed minimal risk to participants (Polit & Beck, 2017).

Results

Questionnaire Completion and Participant Characteristics

The PDQ demonstrated acceptable internal consistency (Cronbach α=0.56-0.82) and there was a 100% completion rate with no skipped items. It took participants only 10-15 minutes

to complete the questionnaire. Table 1 describes sample population characteristics and percentages. Results indicated that most participants were male (81.8%), the rest were female (18.2%). Most participants were between the ages of 36 and 50 years old (45.5%). About half of the participants were between 5'7" and 5'11" (54.5%) and weighed between 151 and 200 pounds (45.5%). However, a little over a third (27.3%) weighed between 200 and 250 pounds. A majority reported a desired weight between 151 and 200 pounds (72.7%). While most were non-Hispanic white (45.5%), other ethnicities were recruited, including Hispanics (27.3%), African Americans (9.1%), Asians (9.1%) and other ethnicities (9.1%). Less than half of the participants also had an undergraduate education (45.5%) and made average annual incomes between $55,000 and $100,000 (36.4%). However, a little over a third of the sample population (27.3%) brought in incomes of $10,000 to $35,000 annually. Most participants were married (81.1%) and had a HbA1c between 6 and 8% (72.7%).

Perceived Barriers

Pearson's *r* calculation indicated no statistically significant correlations between HbA1c and participant perceived barriers in all self-management domains, measured by subscales "G," "I," "K," and "M." Therefore, H_1 was rejected and the null hypothesis, that there is no relationship between the two variables, was accepted. Subscales "G," "I," "K," and "M" were analyzed as sum of scores and interpreted accordingly in this section. Table 3 provides the sum of scores and Cronbach's α of each subscale.

Subscale "G" assessed certain diet barriers. These barriers were eating problems due to food cravings, feelings of stress, depression, anger, or boredom, deprivation, unsupportive social support, eating outside the home (i.e., fast food, restaurants, potlucks), schedule conflicts, inconsistency of home routines, discouragement from lack of results, and being too busy with

other obligations. Results determined most participants encountered diet barriers one time per month or less, indicating an overall low frequency of perceived diet barriers.

Subscale “I” assessed barriers regarding taking medications. These barriers were feelings of stress, depression, anger, or boredom, unsupportive social support, schedule conflicts, inconsistency of home routines, being too busy with other obligations, feelings of discouragement due to lack of results, medication side effects, and medication being too expensive. Results indicated most participants encountered these barriers one time a month or less, indicating an overall low frequency of encountered medication barriers.

Subscale “K” assessed blood glucose monitoring barriers. These barriers were feelings of stress, depression, anger, or boredom, unsupportive social support, schedule conflicts, inconsistency of home routines, being too busy with other obligations, feelings of discouragement due to lack of results (i.e., high blood sugars or no weight loss), testing supplies being too expensive, and not wanting to stick themselves. Most participants reported encountering these barriers one time or less a month, indicating an overall low frequency of encountered blood glucose monitoring barriers.

The last barrier subscale “M” assessed exercise barriers. These barriers were feelings of stress, depression, anger, or boredom, unsupportive social support, schedule conflicts, inconsistency of home routines, being too busy with other obligations, feelings of discouragement due to lack of results (i.e. no weight loss, high blood sugars), and exercise causing pain or discomfort. Results showed that most participants reported they encountered barriers two to three times a month or less, indicating an overall low frequency of perceived barriers, but higher compared to barriers reported in the other self-management domains.

Readiness to Change

Pearson's *r* calculation demonstrated no statistically significant relationship between HbA1c and participant perceived readiness to complete healthy lifestyle behaviors that supported optimal diabetes self-management, measured by PDQ subscales "B" and "D." Therefore, researchers rejected the H_2 and accepted the null hypothesis, that there was no relationship between the two variables. Subscales "B" and "D" were individually scored; refer to Table 2 for each individually scored item's mean, standard deviation, and Cronbach's α rating.

Subscale "B" assessed weight change readiness. These questions asked participants if they were currently trying to lose weight or if they had plans to lose weight. Most participants reported that they were either trying to lose weight or trying to keep from gaining weight. Among those who reported they were not currently trying to lose weight, most planned to start trying to lose weight or avoid gaining weight within the next one to six months.

Subscale "D" assessed diet change readiness. These questions asked about the patient's current diet, or plans to begin a diet, and what diet they were using. Results showed that most patients were either currently following a diet or were conscious of how food affected their blood sugar and were utilizing carbohydrate counting as their main diet type. Those not following a diet reported that they planned on starting within the next one to six months.

Diet

Diet behaviors were assessed with scales "C," "E," and "F;" refer to Table 3 for sum of scores and Cronbach's α for each subscale. Subscale "C" measured dietary knowledge and behaviors by assessing how often over the past three months participants used the information regarding number of calories, carbs, grams of fat to make diet decisions. It also assessed if participants deliberately skipped meals or snacks, took smaller portion sizes, used low-calorie or reduced/no fat products, or reduced sugar/sugar free products to cut calories, resisted temptation

to eat high fat, sugar, or caloric products, and used a written diet or meal plan to decide what foods to eat. Results showed that participants demonstrated these behaviors two to three times a month or less, which is considered suboptimal dietary knowledge and behavior.

Subscale "E" evaluated how often over the past three months had participants eaten meals and snacks at the same time each day, chose portion sizes, used the exchange system or information about carbs in foods to make food decisions or decide how much insulin to take, and deliberately eaten more or less food to adjust for a change in their usual exercise or physical activity. Results showed that those on insulin were only using these diet strategies two to three times a month or less to control diabetes. While those not on insulin were using these diet strategies two to three times per week.

Subscale "F" evaluated diet problems. These questions asked how often in the past three months participants had reported overeating, eating unplanned snacks, or making poor food choices. Results showed that on average participants were only having these eating problems once a month or less.

Blood Sugar Monitoring

PDQ Subscales "A" and "J" assessed aspects of blood sugar monitoring of participants; refer to Table 2 for each individually scored item's mean, standard deviation, and Cronbach's α. Subscale "A" assessed participants' perceived blood glucose control, asking whether they were satisfied with their blood sugars, if they had a target blood sugar range, and their frequency of having high or low blood sugars. Most participants believed they had "pretty good" or "good" blood glucose control. Most reported they had a target range, reported high blood sugars once or twice a week, and reported having low blood sugars only a couple times a month or less.

Subscale "J" assessed how often participants had been told by their provider to check their sugars and how often they actually tested their blood sugars. Most participants reported they had been told to check their sugars once a day by their providers, but only checked their sugars three to six times per week.

Medications

Subscale "H" assessed medication-taking behaviors; refer to Table 2 for individually scored items' mean, standard deviation, and Cronbach's α rating. This subscale assessed whether participants had been prescribed oral medications or insulin and whether they were taking their medications or using insulin as prescribed. Results showed that participants prescribed oral medications took their medications daily as prescribed. Participants on prescribed insulin reported their insulin was only prescribed as needed, and they reported using it as prescribed.

Exercise

PDQ subscale "L" assessed physical exercise behaviors; refer to Table 2 for individually scored item's mean, standard deviation, and Cronbach's α. It assessed whether participants' providers had advised them to get more exercise, how active their daily routine is, and how often they set aside time to exercise. Most participants reported their doctor advised them to get more exercise, but they only completed a little activity daily, and set aside time to exercise only a couple times a week.

Discussion

Research Accomplishments

Although research hypotheses were not supported, results of the study provided much insight regarding self-management characteristics of a diverse patient population receiving care in the primary care setting. The patient population in this study was ethnically diverse,

encompassing Caucasian, Hispanic, African American, Asian, and other ethnicities; a far more diverse patient population than that utilized in the original PDQ validation research (Stetson et al., 2011). The following self-management characteristics demonstrated by this patient population will be discussed at length; refer to Table 4 for a summary of self-management activities.

Perceived Barriers

Results demonstrated no statistically significant relationship between participant reported HbA1c and perceived barriers, which suggests that increased patient reported barriers were not strongly linked to poorer diabetes management, or higher hbA1c levels. These findings are somewhat contradictory from prior research. Past research utilizing the PDQ demonstrated a significant positive relationship between barrier subscale "G," or *Diet Barriers*, and HbA1c (r = .144, $p \leq 0.01$), as well as subscale "I," or *Medication Barriers*, and HbA1c (r = .152, $p \leq 0.01$) among the T2DM population not taking insulin (Stetson et al., 2011). Among participants taking insulin, there was a significant positive relationship between subscale "K," or *Blood Glucose Monitoring Barriers*, and HbA1c (r = .767, $p \leq 0.05$) (Stetson et al., 2011). Subscale "M," or *Exercise Barriers*, did not have a significant relationship with HbA1c in prior research, and this coincides with the lack of relationship determined among these variables in this current study as well (Stetson et al., 2011).

In this current study, the patient population reported an overall low frequency of barriers in all self-management domains, which may explain the lack of relationships between barriers and HbA1c levels. Because the study sample did not perceive many barriers in each barrier subscale, it was more challenging for researchers to deduce a significant relationship between HbA1c and perceived barriers. Most participants had well-managed diabetes, as represented by

their HbA1c levels ranging between 6 and 8 %. Therefore, it is suggested that individuals with more controlled diabetes would have less reported barriers. Similar findings were found in prior research with the PDQ; participants had reported a lower frequency of barriers in all self-care domains and had HbA1cs less than 9% (Stetson et al., 2011). It is difficult to reason why prior research found significant correlations between several of the barrier subscales and HbA1c and this study did not, as participants in both studies reported a low frequency of barriers (Stetson et al., 2011).

Participants in this study were also well educated, with most having completed undergraduate level education. Participants in past research also were fairly educated, having high school education or higher (Stetson et al., 2011). Therefore, it can be argued that patients having higher education would be more inclined to seek and/or understand preventive education regarding managing their diabetes and have less barriers to self-management overall. Most participants were also married, so it can be speculated that they would have better support systems and, therefore, less barriers to complete self-care activities as well. This assertion cannot be compared to previous findings, however, as prior research had not assessed marital status. Lastly, most individuals had incomes ranging from $55,000 to $100,000 per year. So, it is suggested that these individuals would have less perceived barriers to self-management activities, as they would have far more resources and money for oral medications, insulin, blood sugar monitoring supplies, primary care visits, etc., than those earning far less or those living in poverty. This assumption is unique to this study, however, as annual income was not assessed among participants in prior research utilizing the PDQ (Stetson et al., 2011).

Readiness to Complete Self-Management Activities

Results showed no statistically significant correlation between reported HbA1c levels and participant perceived readiness to complete healthy lifestyle behaviors that support optimal diabetes self-management. Correlation analysis was not completed between readiness scales and HbA1c in previous research utilizing the PDQ, so this is a unique finding for this current study. Most participants in this study reported they were on a diet plan or were conscious of how food affects their blood sugar and were trying to lose or maintain weight. However, these reports were not strongly linked with their HbA1c values, and participants had reportedly suboptimal diet knowledge and behaviors. Previous research also demonstrated suboptimal dietary knowledge and behaviors among T2DM participants who were reportedly either already using a diet plan or were conscious of how food affected their blood sugar (Stetson et al., 2011). Findings from both studies may indicate that perhaps patients with T2DM need better education regarding how to more optimally manage their weight through diet modifications. Most participants in this study also identified carbohydrate counting as their means of meal planning. Teaching proper and accurate carbohydrate counting can be complex and takes time to teach effectively, which might explain the suboptimal diet knowledge and decision making among patients with T2DM.

Most participants were in the preparation and action stages of the Transtheoretical Model and were found to have adequately controlled HbA1c levels. Therefore, even though there was no significant relationship found between HbA1c and participant perceived readiness to complete self-management activities, these results still support the Transtheoretical Model, as prior research has demonstrated that those in preparation and action stages of change tend to exhibit improved clinical outcomes (Peterson & Hughes, 2002) while also showing proof of concept.

Diet

As previously mentioned, most participants in this study were reportedly already adhering to or planning to start a diet plan, but their dietary knowledge and behaviors were suboptimal. Dietary barriers were reportedly low among participants in this study as well, with the most commonly identified barriers being eating away from home (fast food, restaurants, relatives, potlucks, etc.) and eating because of hunger and food cravings. Insulin dependent participants were using less effective diet strategies to control their blood sugars than those taking oral antihyperglycemic medications. This was a contradictory finding to what has been demonstrated in prior research utilizing the PDQ, which found that participants with T2DM on insulin used more effective diet strategies than T2DM individuals not taking insulin (Stetson et al., 2011).

Blood Sugar Monitoring

Most study participants had defined goals, or target ranges, for where they wanted their blood sugars to be and believed that they had achieved good control over their blood glucose levels. In prior research with the PDQ, it was found that perceived blood glucose control was significantly correlated with HbA1c (T2DM participants using insulin $r = .458$, $p < .001$; T2DM participants not on insulin $r = .475$, $p < .001$) (Stetson et al., 2011). Meaning, the more controlled participants believed their glucose control was, the more controlled their HbA1c would be. Although no correlation analysis was performed in this current study to demonstrate a similar relationship, it was found that most participants believed they had good control of their blood glucose and they also had well controlled HbA1c, ranging between 6-8 %.

Even though self-reported barriers to blood glucose monitoring were infrequent, many participants did not check their blood glucose as often as they were instructed to do so by their providers. Being too busy with other responsibilities and being away from home were the most

commonly cited barriers to consistent testing of blood sugars. Since participants believed they had good control over their blood glucose it is suspected that blood glucose monitoring was less frequent as a result.

Medications

Medication compliance was not identified as a problem for most participants. Oral antihyperglycemics were reported as being taken daily as prescribed and those on insulin were administering it as needed, as prescribed. It is suggested that participants were compliant with their diabetes medications as this requires a lower level of skill or lifestyle change than modifying one's diet, sticking oneself to measure blood glucose, or incorporating physical activity into one's daily life. Mood (feeling anxious, stressed, depressed, angry or bored) and being too busy with other responsibilities were identified as most common barriers to medication adherence. Lack of financial means and lack of support among family and friends were less frequently encountered barriers to medication compliance. This is likely attributable to our population demographics containing mostly married men with above average incomes. This assertion is unique to this study, as prior research utilizing the PDQ did not assess annual income or marital status (Stetson et al., 2011).

Exercise

Most study participants had been instructed by their primary care provider to increase physical activity levels and get more exercise. Despite having a low frequency of barriers to physical activity, most participants reported only participating in little activity during the day and were only setting aside time one to two days per week for physical activity. This was a similar finding in the original PDQ research; participants reported overall low frequency of barriers to exercise but were reportedly only completing a little activity during the day (Stetson et al., 2011).

However, contrary to the participants in this current study, most participants from the original PDQ study were reportedly completing the United States Department of Health and Human Services' (USDHHS) recommended weekly exercise (Stetson et al., 2011), which includes completing physical exercise at least three to five days a week (USDHHS & USDA, 2015).

The difference in activity levels between sample populations in this current study and previous PDQ research cannot be easily explained and may be attributable to varying participant demographics, like gender and ethnicity, or differences in geographical settings among the two studies. Prior research with the PDQ included a more equal gender representation of male and female participants who were mostly Caucasian and residing in the Midwest (Stetson et al., 2011). Differences in where participants were receiving diabetes care may also be a contributing factor to the differences observed in physical activity among participants in past research and this current study. In prior PDQ research, participants were receiving care at a diabetes clinic (Stetson et al., 2011). Here, participants may have been given more exercise education or resources versus that which is provided in the primary care setting.

Discomfort and being too busy with other responsibilities were the top reasons cited for lack of compliance in getting regular exercise in this current study. With a primarily married, middle to upper class sample of participants, it is assumed that participants would have the social support and resources to participate in many forms of physical activity but the demands of work, family, and other responsibilities are perhaps being prioritized over a regular exercise routine. This is a unique assumption of this current study, however, as marital status and annual income were not assessed in prior PDQ research (Stetson et al., 2011).

Implications for Practice in Primary Care

Although the hypotheses of the study were not supported, proof of concept was validated and shown to be an effective method to pursue a larger scale investigation. Moreover, the PDQ can still offer family nurse practitioners a wealth of information regarding their diabetic patients' self-management perceptions and practices. The PDQ has the potential to improve the current model of diabetes care in the primary care setting, as it allows providers to comprehensively evaluate a patient's diabetic self-management by assessing specific barriers and motivational characteristics involved in completing self-care. This, in turn, can help patients more effectively manage their diabetes for an improved clinical outcomes and quality of life. Other researchers and clinicians can use the results of this study or replicate it on a larger scale to further support the mainstream utilization of this tool in primary care. More studies the PDQ use in the primary care setting can promote knowledge and awareness of this tool and its capacity for a comprehensive diabetes self-management evaluation that can create more individualized plans of care for these patients.

Research Limitations and Suggestions for Future Research

There are several limitations to this study. First, the study is cross-sectional, which limited the capacity to draw conclusions regarding a causal relationship between HbA1c and patient perception of barriers and motivational factors. The study also included 81.8% male and 18.2% female participants. This created a gender imbalance between the number of men and women participating in the research and is an overrepresentation of men. Researchers were also unable to recruit from more than two clinics. The clinics used in the study were government funded, community healthcare clinics where there is limited consistent patient follow-up with primary care providers. Furthermore, they serve many vulnerable patient populations, including the mentally and cognitively impaired individuals, children, and pregnant women, all whom

could not be considered for participation. It is recommended for replicate studies to utilize a variety of primary care clinics to compensate for these vulnerable populations, as well as expand data collection time to obtain a larger sample size. This would allow researchers to gain a wide range of patient populations with varying HbA1c levels, incomes, education levels, and ethnicities, as these could have an impact on self-management knowledge and behaviors, barriers encountered, and readiness to complete self-management activities.

Another huge problem and limitation were finding eligible participants that spoke English. In the areas of South-Central Texas and designated study sites, a large percentage of the patient population is Spanish-speaking only. Therefore, it is recommended for future research to have the PDQ translated and validated in Spanish. Having Spanish-speaking participants would help identify other barriers that may be specific to the Spanish-speaking population.

Future research could also be conducted to determine other potential reasons why patients with diabetes do not partake in optimum self-care activity. This pilot study demonstrated that despite participants reporting a low frequency of encountered barriers, most were not fully engaged in completing diet behaviors, blood glucose monitoring, or physical exercise. Future studies could investigate other influencing factors that prevent patients from optimal diabetes self-management. Lack of education or consistent follow-up and support from their primary care providers are plausible contributing factors that warrant further investigated on a larger scale.

Conclusion

Although study hypotheses were rejected, findings yielded valuable characteristics about this patient population receiving diabetes care in the primary care setting. For example, participants were motivated to complete diabetes self-management activities by planning or actively trying to lose or maintain their weight. Although participants reported overall good

control of their diabetes and few barriers to self-care, it was discovered that their diabetes self-management was suboptimal regarding diet behaviors, blood glucose monitoring, and physical activity. However, oral medication and insulin adherence as prescribed by their providers were optimal. Utilizing the PDQ in the primary care setting, family nurse practitioners can provide more effective, patient-centered self-management education for patients with diabetes, as well as help them set more realistic, personalized goals. Assessing behaviors, perceived barriers, and motivational aspects of self-care allows the provider to customize education and treatment plans to enhance their patients' quality of life. By creating awareness of strategies that can help reduce poor clinical outcomes, people living with T2DM may be more inclined and empowered to engage in effective self-management diabetes care. Society at-large will benefit from this increased awareness by reducing morbidity in this patient population and easing financial burden that poorly-controlled T2DM adds to the healthcare system.

References

American Association of Diabetes Education. (2009). AADE Guidelines for the practice of diabetes self-management education and training (DSME/T). *The Diabetes Educator*, *35*(supplement 3), 85S-107S.

American Diabetes Association (2014). Diagnosis and classification of diabetes mellitus. *Diabetes Care*, *37*(supplement 1), S81-S90.

Cooper, J., Stetson, B., Bonner, J., Spille, S., Krishnasamy, S., & Mokshagundam, S. (2015). Self-reported physical activity in medically underserved adults with type 2 diabetes in clinical and community settings. *Journal of Physical Activity & Health*, *12*(7), 968-975.

Peterson, K.A. & Hughes, M. (2002). Readiness to change and clinical success in a diabetes educational program. *The Journal of the American Board of Family Practice*, *15*(4), 266-271.

Polit, D. F., & Beck, C. T. (2017). *Nursing research: Generating and assessing evidence for nursing practice* (10th ed.). Philadelphia: Wolters Kluwer.

Prochaska, J. O., Wright, J. A., & Velicer, W. F. (2008). Evaluating theories of health behavior change: a hierarchy of criteria applied to the transtheoretical model. *Applied Psychology, 57*(4), 561-588.

Schlundt, D. G., Pichert, J. W., Rea, M. R., Puryear, W., Penha, M. L., & Kline, S. S. (1994a). Situational obstacles to adherence for adolescents with diabetes. *The Diabetes Educator*, *20*(3), 207-211.

Schlundt, D. G., Rea, M. R., Kline, S. S., & Pichert, J. W. (1994b). Situational obstacles to dietary adherence for adults with diabetes. *Journal of the American Dietetic Association*, *94*(8), 874-879.

Schmitt, A., Reimer, A., Hermanns, N., Huber, J., Ehrmann, D., Schall, S., & Kulzer, B. (2016). Assessing diabetes self-management with the diabetes self-management questionnaire (DSMQ) can help analyze behavioral problems related to reduced glycemic Control. *PLOS ONE*, *11*(3), 1-12.

Stetson, B., Schlundt, D., Rothschild, C., Floyd, J. E., Rogers, W., & Mokshagundam, S. P. (2011). Development and validation of The Personal Diabetes Questionnaire (PDQ): A measure of diabetes self-care behaviors, perceptions and barriers. *Diabetes Research and Clinical Practice*, *91*(3), 321-332.

Thomas, J., Iyer, N., & Collins, W. B. (2014). Associations between perceived chronic care quality, perceived patient centeredness, and illness representations among personal with diabetes. *Journal for Healthcare Quality: Official Publication of the National Association for Healthcare Quality*, *36*(5), 50-59.

Tomky, D., Cypress, M., Dang, D., Maryniuk, M., Peyrot, M., & Mensing, C. (2008). AADE position statement. *The Diabetes Educator*, *34*(3), 445-449.

Toobert, D. J., Hampson, S. E., & Glasgow, R. E. (2000). The summary of diabetes self-care activities measure: Results from 7 studies and a revised scale. *Diabetes Care*, *23*(7), 943-950.

U.S. Department of Health and Human Services (USDHHS) and U.S. Department of Agriculture (USDA). (2015). *2015-2020 Dietary Guidelines for Americans (8th ed.)*. Retrieved at https://health.gov/dietaryguidelines/2015/guidelines/.

Wallston, K., Rothman, R., & Cherrington, A. (2007). Psychometric properties of the Perceived Diabetes Self-Management Scale (PDSMS). *Journal of Behavioral Medicine*, *30*(5), 395-401.

Table 1. Sample Characteristics (*N*=11)

		n (%)	(cumulative %)
Sex	Male	9 (81.8)	(81.8)
	Female	2(18.2)	(100)
Age	36-50	5 (45.5)	(45.5)
	51-75	4 (36.4)	(81.8)
	76 and older	2 (18.2)	(100)
Height	5’1”-5’6”	3 (27.3)	(27.3)
	5’7”-5’11”	6 (54.5)	(81.1)
	6’0”-6’4”	1 (9.1)	(90.9)
	6’5”-7’0”	1 (9.1)	(100)
Weight	151-200	5 (45.5)	(45.5)
	201-250	3 (27.3)	(72.7)
	251-300	1 (9.1)	(81.8)
	301 and greater	2 (18.2)	(100)
Desired Weight	101-150	2 (18.2)	(18.2)
	151-200	8 (72.7)	(90.9)
	201-250	1 (9.1)	(100)
Ethnicity	Non-Hispanic White	5 (45.5)	(45.5)
	Hispanic	3 (27.3)	(72.7)
	African American	1 (9.1)	(81.8)
	Asian	1 (9.1)	(90.9)
	Other	1 (9.1)	(100)

Education	High School/GED	3 (27.3)	(27.3)
	Undergraduate	5 (45.5)	(72.7)
	Graduate	2 (18.2)	(90.9)
	Doctorate	1 (9.1)	(100)
Income	10,000-35,000	3 (27.3)	(30)
	35,001-55,000	2 (18.2)	(50)
	55,001-100,000	4 (36.4)	(90)
	100,000 or more	1 (9.1)	(100)
Marital Status	Yes	9 (81.8)	(81.1)
	No	2 (18.2)	(100)
HbA1c	$\leq$ = 6%	1 (9.1)	(9.1)
	< 6, $\leq$ = 8%	8 (72.7)	(81.8)
	>8, $\leq$ = 10%	2 (18.2)	(100)

Table 2. Individually Scored PDQ Subscales and Cronbach's α

Subscales	M±SD For each item of the Subscale	Cronbach's α
A. Perceived Blood Glucose Control	1) 2.8±0.98 2) 1.4±0.81 3) 3.3±1.27 4) 1.8±1.25	0.79
B. Weight Change and Readiness	1) 1.5±0.52 2) 2.5±1.29	0.44
D. Diet Change Readiness	1) 1.6±0.50 2) 1.9±1.22 3) 2.5±1.44	0.75
H. Medication Use	1) 1.3±0.47 2) 3.2±1.40 3) 1.9±0.70 4) 1.6±0.50 5) 2.3±1.79 6) 1.6±1.03	0.71
J. Blood Glucose Monitoring	1) 5.9±2.26 2) 5.2±2.23	0.85
L. Physical Activity Individually Scored	1) 1.0±0.00 2) 3.1±1.51 3) 2.8±1.33	0.56

Note. M, Mean; SD, standard deviation

Table 3. Sum of Scores PDQ Subscales and Cronbach's *α*

Subscales	Sum of Scores	Range	Cronbach's α
C. Dietary Knowledge and Skills	337	220-495	0.68
E. Diet Decision Making	Using insulin: 211 Not using insulin: 190	66-385 55-319	0.56
F. Eating Problems	109	66-176	0.82
G. Diet Barriers	227	99-385	0.84
I. Medication Barriers	140	88-297	0.82
K. Blood Glucose Monitoring Barriers	134	88-231	0.71
M. Exercise Barriers	198	81-352	0.70

Table 4. Summary of Sample Population's Self-Management Activities

Blood Glucose Monitoring	**Physical Activity**
▪ Most reported pretty good or good blood glucose control ▪ Most were advised to check blood glucose daily by PCP but only checked 3-6 times per week ▪ Most experienced high blood glucose levels once or twice a week, and experienced low blood glucose levels a couple times a month ▪ Most reported barriers once a month or less	▪ Most were advised to get more exercise by their PCP ▪ Most only completed little activity daily and set aside time to exercise a couple times a week, despite reporting low frequency of barriers ▪ Most reported barriers 2-3 times a month (slightly more than in any other activity)
Diet	**Medications**
▪ On insulin: used diet strategies 2-3 times per month. ▪ Not on insulin: used diet strategies 2-3 times per week ▪ Most made poor meal or snack choices once a month or less ▪ Most reported barriers once a month or less	▪ Most were compliant with taking daily medications as prescribed ▪ Those taking insulin were only prescribed as needed, and reported compliance with this regimen ▪ Most reported barriers once a month or less

Appendix A: Scholarly Grid

Citation	**Purpose/topic of research**	**Design/ Level of Evidence**	**Sample**	**Measurement**	**Results/ Conclusions**	**Ranking/ Strength of Recommendation**
Toobert, D. J., Hampson, S. E., & Glasgow, R. E. (2000). The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. *Diabetes Care*, *23*(7), 943-950.	To review reliability, validity, and normative data from 7 different studies, and provide a revised version of the Summary of Diabetes Self-Care Activities (SDSCA) measure.	Study involved meta-analysis of 5 RCTs and 2 observational studies; Level of Evidence: A	N= 1,988 people with type II diabetes; age ranging from 45-67; having type 2 diabetes for a number of years (6-13 years), with a slight prevalence of women.	SDSCA; 14 items that evaluate 7 subscales of self-care including: general diet (adherence to a healthy diet), specific diet (i.e., adherence to eating fruits and vegetables), exercise, medication taking, blood glucose monitoring, foot care, and smoking. Amount of questions per subscale varies between subscales. Higher sub scores indicate increased self-management.	The average inter-item correlations within scales were high (mean = 0.47), except for specific diet; test-retest correlations were moderate (mean = 0.40). Correlations with other measures of diet and exercise generally supported the validity of the SDSCA subscales (mean = 0.23).	Recommendation 1; poses little to no harm to individuals.
Schmitt, A., Reimer, A., Hermanns, N., Huber, J., Ehrmann, D.,	To determine a one-time assessment of participants'	Cross sectional study;	N= 430 patients with diabetes type 1 and 2 from a referral	SDSCA: 10-items total that assess patients' adherence to recommended	Diabetes self-management, as operationalized by the DSMQ's	Recommendation 1; poses little to no harm to individuals.

Schall, S., & Kulzer, B. (2016). Assessing diabetes self-management with the diabetes self-management questionnaire (DSMQ) can help analyze behavioral problems related to reduced glycemic control. *PLOS ONE, 11*(3), 1-12.	average adherence to self-management behaviors comparing the two different tools. Comparing the data from the two instruments in relation to patient HbA1c, the most widely accepted indicator of glycemic control, was ideal to include in the study to determine which tool had more predictive power for glycemic control.	Level of Evidence: B	center in Germany	diabetes self-care activities, including general diet (2 items), specific diet (2 items), exercise (2 items), blood glucose testing (2 items), and foot care (2 items). DSMQ: 16 items total covering 5 subscales: dietary control (4 items), medication adherence (2 items), blood glucose monitoring (3 items), physical activity (3 items), and physician contact (3 items). For both scales, higher scores indicate better self-management.	behavioral scales showed a significant negative association with HgbA1C amounting to -0.46 ($P<0.001$) for people with type 2 diabetes. DSMQ behaviors most associated with glycemic control were blood glucose monitoring, medication adherence, and dietary adherence for type 2 type diabetes. Physician contact and physical activity had less relevance to glycemic control. Diabetes self-management operationalized by SDSCA's behaviors scales showed a significant negative association with HgbA1C (-0.31; $P=0.003$) for type 2 diabetes. Like the	

					findings with the DSMQ, behaviors assessed in the SDSCA most associated with glycemic control were diet adherence and blood glucose monitoring, and less associated with exercise adherence.	
Wallston, K., Rothman, R., & Cherrington, A. (2007). Psychometric properties of the Perceived Diabetes Self-Management Scale (PDSMS). *Journal of Behavioral Medicine*, *30*(5), 395-401.	To describe the initial psychometric properties of a diabetes-specific version of the PMCSMS as utilized with a sample of patients with type 1 and type 2 diabetes mellitus who were enrolled in a study of diabetes-related literacy and numeracy skills	Cross-sectional survey; Level of Evidence: B	N = 398; Type I diabetes participants n = 57 and type II n =341	Perceived Diabetes Self-Management Scale (PDSMS) - created by replacing the word ‘‘condition’’ with “diabetes’’ in each item of the Perceived Medical-Condition Self-Management Scale (PMCSMS). The PMCSMS was adapted from the Perceived Health Competence Scale (PHCS), an instrument that has been shown to be reliable and valid in numerous	Results showed the PDSMS to be a reliable and valid measure. Most demographic variables in the study had either no association with PDSMS scores or only weak associations. Results also showed the lack of a correlation between self-efficacy and low educational level. The strongest evidence for validation comes from the negative	Recommendation is 1. No specific recommendation is made for clinical use. However, the tool poses little to no threat to participants. Validity of tool is supported and supports its use as an efficient summary measure to be used in designing interventions. Does not account for varying degrees of

				investigations Summary of Diabetes Self-Care Activities (SDSCA) - brief, reliable and valid, self-report measure of diabetes self-management activities	correlation with BMI and blood glucose levels.	diabetes treatment complexity.
Schlundt, D. G., Pichert, J. W., Rea, M. R., Puryear, W., Penha, M. L., & Kline, S. S. (1994a). Situational obstacles to adherence for adolescents with diabetes. *The Diabetes Educator*, *20*(3), 207-211.	To identify, describe, and classify the kinds of everyday eating situations that are considered challenging by a sample of adolescents with diabetes.	Qualitative; Level of Evidence: B	N = 20 insulin dependent adolescents (aged 13-19)	Structured interviews	A hierarchical cluster analysis was used to identify 10 relatively homogeneous categories of obstacles to dietary adherence: being tempted to stop trying; negative emotional eating; facing forbidden foods; peer interpersonal conflict; competing priorities; eating at school; social events and holidays; food cravings; snacking when home, alone, or bored; and social pressure to eat.	Recommendation 1; poses little to no harm to individuals.

Schlundt, D. G., Rea, M. R., Kline, S. S., & Pichert, J. W. (1994b). Situational obstacles to dietary adherence for adults with diabetes. *Journal of the American Dietetic Association*, *94*(8), 874-879.	To identify major situational obstacles that adults with diabetes face when trying to adhere to therapeutic diets.	Qualitative; Level of Evidence: B	N = 26; n = 12 adults with insulin-dependent diabetes and n = 14 adults with non-insulin - dependent diabetes; 10 were men and 16 were women; mean age = 45 years; 23% Black and 77% white. Mean duration of diabetes was 9 years (range=2 months to 25 years). Mean body mass index was 28.3 (SD=6.8; range=20 to 46). Convenience	Semi-structured interviews	A cluster analysis was completed that identified 12 obstacles faced among these participants and they were as follows: negative emotions (i.e., participants tend to eat or overeat to cope with negative emotions), resisting temptation, eating out, feeling deprived, time constraints (i.e., time pressure makes eating healthy difficult), tempted to relapse, planning (i.e., not having time to plan healthy meals), competing priorities, social events, family support (i.e., having lack of family support), food refusal (i.e., someone offers participant an	Recommendation 1; poses little to no harm to individuals.

			sample-consecutive patients recruited from an outpatient diabetes clinic were asked to participate in an interview before or after their scheduled appointment;		inappropriate food makes it hard to turn it down without hurting that person's feelings), and friends' support (i.e., participants' friends are less supportive)	
Peterson, K.A. & Hughes, M. (2002). Readiness to change and clinical success in a diabetes educational program. *The Journal of the American Board of Family Practice,15*(4), 266-271.	To determine whether a simple tool characterizing readiness to change among patients before participating in a diabetes educational intervention successfully screens for patients who will achieve	Single prospective cohort study; Level of Evidence: B	N = 50 patients from a diabetes educational center with HbA1c greater than 9 (considered uncontrolled)	HbA1c was measured at baseline, and after 3 months and 12 months (post educational intervention)	Results: Patients in preparation and actions stages achieved a significantly larger reduction in hbA1c levels in a shorter time than patients in the combined precontemplation-contemplation stage. Average change in HbA1c levels at 12 months was 1.06-1.80 (P .17) for the	Recommendation 1; poses little to no harm to individuals.

	satisfactory clinical improvement.				precontemplation-contemplation stage, 1.82-1.84 (P .006) for the preparation stage, and 2.56- 2.12 (P .0006) for the action stage. Patients had significantly more hbA1c measurements in the preparation stage (4.63 2.42, P .036) and the action stage (4.94 2.38, P .013) than patients in the precontemplation-contemplation stage (3.00 1.22) during the 24-month study. In this small population, stage of change as determined by a clinical tool (specific tool not mentioned) was significantly associated with clinical improvement in	

					hbA1c at 3 months after an educational intervention. Significant differences in clinical improvement between groups persisted for at least 12 months.	
Stetson, B., Schlundt, D., Rothschild, C., Floyd, J. E., Rogers, W., & Mokshagundam,S. P. (2011). Development and validation of the Personal Diabetes Questionnaire (PDQ): A measure of diabetes self-care behaviors, perceptions and barriers. *Diabetes Research and Clinical Practice, 91*(3), 321-332.	To provide initial information on development of the PDQ and its feasibility in a clinical setting and to present preliminary information on the instrument norms and reliability. The study also aimed to assess the criterion validity of the PDQ's primary	Cross sectional, quantitative study; Level of Evidence: B	N = 790 adults; n = 205 with type 1 and n = 585 with type 2; participants were recruited from a metropolitan Midwestern city in an outpatient diabetes clinic.	PDQ: The tool is divided into thirteen subscales with a total of 68 questions that assess four domains of diabetes self-care behaviors, including diet, medication, blood glucose monitoring, and exercise.	All subscales of the PDQ demonstrated good internal consistency (Cronbach alpha=0.650-0.834) and demonstrated significant associations with BMI ($p \leq 0.001$). Therefore, the PDQ can be considered a useful measure of diabetes self-care behaviors and related perceptions and barriers that is reliable, valid, and feasible to administer in a clinic setting.	Recommendation 1; poses little to no harm to individuals.

	subscales by examining their associations with diabetes clinical outcomes, including hbA1c and BMI.					
Cooper, J., Stetson, B., Bonner, J., Spille, S., Krishnasamy, S., & Mokshagundam, S. P. (2015). Self-reported physical activity in medically underserved adults with type 2 diabetes in clinical and community settings. *Journal of Physical Activity & Health*, *12*(7), 968-975.	To inform selection and application of a reliable and accurate self-report physical activity tool for measurement in clinical settings, especially those serving medically underserved individuals.	Cross-sectional survey; Level of Evidence: B	N = 253	International Physical Activity Questionnaire Short Form - 7-item instrument developed providing information regarding habitual physical activity in daily routine. Reliability (Spearman's P range = .88 to .32) and validity (P= .51 to .64) Summary of Diabetes Self-Care Activities Measure - diabetes-specific instrument of self-care behaviors with	Accuracy of physical activity estimation in diabetes clinical practice could be improved using viable and economical self-report measures. The SDSCA may be particularly useful as a brief physical activity measure in diabetes samples in busy, clinical settings. The SDSCA was the only measure to demonstrate significant	Rating is 1, as there is minimal risk involved with survey completion. Although there was a variety of self-report measures tested, no specific practice recommendations were made. The measures tested were not specific to physical activity. Participants all came from an underserved population

				two items reflecting physical activity. Validity sampling has yielded moderate test-retest reliability (mean = .40), high average inter-item correlations (mean = .47) and sensitivity to change. **Personal Diabetes Questionnaire** - brief measure of patient centered diabetes-related self-management behaviors, perceptions, and barriers. No validity or reliability is reported.	associations between BMI and both programmatic and lifestyle physical activity.	limiting generalizability.

Appendix B. Personal Diabetes Questionnaire

Personal Diabetes Questionnaire (PDQ)							CODE #
We need to know about your recent eating habits, medicines, blood glucose testing, and your physical activity. Answer each question as accurately as possible.							
Basic Information							
1. Sex							
2. Age							
3. Height							
4. Weight							
5. Desired weight							
6. What ethnic background describes you? (Circle one)	Non-Hispanic White		Hispanic		African American		Asian	Other
7. What level of education have you completed? (Circle one)	No Schooling	Elementary School	High school diploma/ GED	Undergraduate level	Graduate level	Doctorate level		
8. What income bracket best applies to you? (Circle one)	Less than $10,000/year		$10,001-$35,000/year		$35,001-$55,000/year		$55,001-$100,000/year	More than $100,001/year

9. Are you married? (Circle one)	Yes	No			
10. What is your most recent Hemoglobin A1C?	Less than or Equal to 6%	Greater than 6% but less than or equal 8%	Greater than 8% but less than or equal to 10%	Greater than 10%	Your Value: _____

A. Blood Glucose Control						
Please circle the answer that is most appropriate for you						
1. How satisfied are you with your overall blood glucose control?	I have Excellent Control	I have Pretty Good Control	I have Good Control	I have a few problems	I have Poor Control	I have Very Poor Control
2. Do you have a target range for your blood sugar levels?	Yes		No		Unsure	
3. How often is your blood sugar high?	Never	Couple of times a month or less	Once or twice a week	3-5 times a week	Almost everyday	
4. How often is your blood sugar low?	Never	Couple of times a month or less	Once or twice a week	3-5 times a week	Almost everyday	

B. Weight Changes and Readiness				
Please circle the answer that is most appropriate for you				
1. Are you currently trying to lose weight?	Yes, I am trying to lose weight	No, but I am trying to keep from gaining weight	No, I am not making any attempts to control my weight now	
2. If you are NOT currently trying to lose weight or avoid gaining weight, is this something you plan to do in the future?	Yes, I plan to start in the next month	Yes, I plan to start in the next six months	No, I have no plans right now for starting a weight control plan	I am already following a weight control plan

C. Diet						
Please check the answer that is most appropriate for you						
During the past 3 months, how often did you:	Never	Once a month or less	2-3 times a month	1-2 times a week	4-6 times a week	1 or more times per day
1. Use the information about the number of calories in food to make decisions about what to eat?	○	○	○	○	○	○
2. Use information about carbohydrates to make food decisions?	○	○	○	○	○	○
3. Use information about the number grams of fats in foods you eat?	○	○	○	○	○	○
4. Deliberately skip a meal to cut calories or fat?	○	○	○	○	○	○

5. Deliberately take small portion sizes to cut calories, sugar or fat?	○	○	○	○	○	○
6. Use low-calorie, lite, reduced-fat, or fat-free products?	○	○	○	○	○	○
7. Use sugar free or reduced sugar products?	○	○	○	○	○	○
8. Resist the temptation to eat a food you want because it is too high in fat, sugar or calories?	○	○	○	○	○	○
9. Use a written meal plan to decide what to eat?	○	○	○	○	○	○

D. Diet Change Readiness								
Please circle the answer that is most appropriate for you.								
1. Are you currently following a diet plan to better your blood sugar?	Yes, I have a plan I am trying to follow		No, I am not following a plan, but I am conscious of how food affects my blood sugar			No, I really do not pay attention to how food affects my blood sugar		
2. If you are following a plan, what kind of plan are you using?	I do not use a plan	Carbohydrate counting	Food exchange system	Total available glucose	Healthy Foods	Food Guide Pyramid	Fat gram counting	Other
3. If you are NOT following a diet plan, is there something you plan to do in the future?	I am already following a diet or meal plan		Yes, I plan to start within the next month		Yes, I plan to start within the next 6 months		No, I have no plans right now to start following a diet or meal plan	

E. Diet Decision Making						
Please check the answer that is most appropriate for you						
During the past 3 months, how often did you:	Never	Once a month or less	2-3 times a month	1-2 times a week	4-6 times a week	Everyday
1. Eat meals and snacks at the same time every day?	○	○	○	○	○	○
2. Choose food portion sizes carefully so that your blood sugar will not be too high or too low.	○	○	○	○	○	○
3. Use the exchange system to decide what foods or how much of certain foods to eat.	○	○	○	○	○	○
4. Use the information about grams of carbohydrates in foods to make decisions about meals?	○	○	○	○	○	○
5. Use information about the grams of carbohydrates in the foods you are eating to decide how much insulin to take?	○	○	○	○	○	○
6. Deliberately eat more or less food to adjust for a change in your usual exercise or physical activity?	○	○	○	○	○	○

F. Eating Problems:						
Please check the answer that is most appropriate for you						
During the past three months how often do you:	Never	Once a month or less	2-3 times a month	1-2 times a week	4-6 times a week	1 or more times per day
1. Overeat, or eat until you feel stuffed?	○	○	○	○	○	○
2. Eat unplanned snacks? That is, how often do you find yourself snacking on foods then thinking "I wish I had not eaten that?"	○	○	○	○	○	○
3. Make poor food choices? That is, how often do you find that you have eaten a particular food then thought "I wish I had not eaten that?	○	○	○	○	○	○

G. Diet Barriers						
Please check the answer that is most appropriate for you						
During the past three months, how often do you have problems with each of the following?	Never	Once a month or less	2-3 times a month	1-2 times a week	4-6 times a week	1 or more times per day
1. Eating when feeling stressed, anxious, depressed or bored?	○	○	○	○	○	○

2. Eating problems because of hunger of food cravings?	○	○	○	○	○	○
3. Eating problems because of family or friends that tempt you or are not very supportive of your efforts to eat right?	○	○	○	○	○	○
4. Eating problems when eating away from home (e.g., fast food, restaurants, relatives, pot lucks)?	○	○	○	○	○	○
5. Eating problems because you feel deprived due to trying to follow a diet	○	○	○	○	○	○
6. Eating because you feel discouraged because of lack of results? (e.g., no weight loss, high blood sugars)	○	○	○	○	○	○
7. Eating problems because you are too busy with family, work, or other responsibilities?	○	○	○	○	○	○

H. Medication Use							
Please circle the answer that is most appropriate for you.							
1. Has your doctor prescribed pills for your diabetes?	Yes		No				
2. How often are you supposed to take these pills?	I do not take pills		As needed		Once a day	Twice a day	Three or more times a day
3. How often do you end up taking these pills?	I do not take pills	I never miss a dose	I miss a dose a couple of times a month or less	I miss a dose once or twice a week	I miss a dose 3-5 times a week	I miss a dose almost every day	I never take my prescribed pills
4. Has your doctor prescribed insulin shots for your diabetes?	Yes		No				
5. How often are you supposed to take insulin?	I don't take insulin		As needed		Once a day	Twice a day	Three or more times a day
6. How often do you end up taking your insulin?	I have not been prescribed insulin	I never miss a shot	I miss a couple of times a month	I miss once or twice a week	I miss 3-5 times a week	I miss almost every day	I never take my prescribed insulin

I. Medication Barriers						
Please check the answer that is most appropriate for you.						
During the past three months, how often has each of the following cause a problem in taking your prescribed medicine:	Never	1 time a month or less	2-3 times per month	1-2 times a week	4-6 times a week	1 or more times per day
1. Feeling stressed, anxious, depressed, angry, or bored?	○	○	○	○	○	○
2. The medicine has an unpleasant side effect	○	○	○	○	○	○
3. Family or friends are not very supportive	○	○	○	○	○	○
4. When away from home (e.g., on vacation, business trips, at restaurants)	○	○	○	○	○	○
5. My daily schedule (walking, going to bed, eat, work, etc.) is different from one day to the next.	○	○	○	○	○	○
6. Feeling discouraged due to lack of results (e.g., no weight loss, high blood sugars)	○	○	○	○	○	○
7. Being too busy with family and work or other responsibilities	○	○	○	○	○	○
8. The medication is too expensive	○	○	○	○	○	○

J. Blood Glucose Testing									
Please check the answer that is most appropriate for you.									
	I have not been told to check my blood sugar	Occasionally as needed	A couple of times a month	1-2 times a week	3-6 times a week	Once a day	Twice a day	3-4 times a day	5 or more times a day
1. How often have you been told to test your blood sugar?	○	○	○	○	○	○	○	○	○
2. How often do you actually check your blood sugar levels?	○	○	○	○	○	○	○	○	○

K. Blood Glucose Monitoring Barriers						
Please check the answer that is most appropriate for you.						
During the past three months, how often has each of the following caused a problem with testing your blood sugar:	Never	1 time a month or less	2-3 times per month	1-2 times a week	4-6 times a week	One or more times per day
1. Feeling stressed, anxious, or depressed, angry or bored.	○	○	○	○	○	○

2. I hate to stick myself	○	○	○	○	○	○
3. Family or friends are not very supportive	○	○	○	○	○	○
4. When away from home (e.g. on vacation, business trips, at restaurants, relatives)	○	○	○	○	○	○
5. My daily schedule (walking, going to bed, eat, work, etc.) is different from one day to the next	○	○	○	○	○	○
6. Feeling discouraged from lack of results	○	○	○	○	○	○
7. Being too busy with family, work, or other responsibilities	○	○	○	○	○	○
8. The testing supplies are too expensive	○	○	○	○	○	○

L. Physical Activity							
Please circle the answer that is most appropriate for you.							
1. Has your doctor advised you to get more exercise?	Yes		No		I don't know		
2. How active is your daily routine? How much physical activity do you get as a result of work, household chores, shopping, homework, and other daily activities?	Very inactive	Inactive	A little activity	A moderate amount of activity	Active	Very Active	
3. How often do you set aside time to exercise? How often do you do something physically active like walking, running, cycling, going to the gym or participating in sports?	Never	A couple of times a month	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	More than once a day

M. Exercise Barriers						
Please check the answer that is most appropriate for you						
During the past three months, how often have you had trouble exercising because of each of the following?	Never	1 time a month or less	2-3 times per month	1-2 times a week	4-6 times a week	One or more times a day
1. Feeling stressed, anxious, or depressed, angry, or bored	○	○	○	○	○	○
2. Exercise and physical activity cause pain and discomfort for me	○	○	○	○	○	○
3. Family and friends are not very supportive	○	○	○	○	○	○
4. When away from home (e.g., on vacation, business trips, at relatives)	○	○	○	○	○	○
5. My daily schedule (walking, to bed, eat, work, etc.) is different from one day to the next	○	○	○	○	○	○
6. Feeling discouraged from lack of results (e.g., no weight loss, high blood sugars)	○	○	○	○	○	○
7. Being too busy with family, work, or other responsibilities	○	○	○	○	○	○