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Use of Diabetes Self-Management Instruments Among Rural African American Populations

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Abstract

There are numerous instruments to determine quality of life, self-efficacy, and self-management knowledge among patients with diabetes. Diabetes has a higher incidence and prevalence nationally among people from certain racial/ethnic

groups and rural regions. Choosing the appropriate instrument is central to meaningful analysis of research data. The purpose of this review of the evidence was to examine diabetes self-management instruments used in research with rural African American populations diagnosed with diabetes. A search was conducted of medical and nursing literature to examine published research reports using instruments to measure diabetes self-management, focusing on samples of rural African Americans. Results revealed diabetes-specific instruments measuring self-management among African American populations cited in the literature include a summary of diabetes self-care activities, Diabetes Knowledge Test, Diabetes Empowerment Scale-Short Form, the Spoken Knowledge in Low Literacy in Diabetes Scale, and the Diabetes Self-Care Practices questionnaire. Finding appropriate instruments to measure outcomes is central to measuring the problem and determining changes over time. Educators, healthcare providers, and researchers should use instruments that have been shown to be culturally appropriate, valid, and reliable to assess accurately the effectiveness of diabetes self-management, and to tailor diabetes education programs effectively when working with rural African American populations.

Keywords: instruments, diabetes, diabetes self-management, rural, and African American

Use of Diabetes Self-Management Instruments Among Rural African American Populations

Introduction

There are numerous instruments to determine quality of life, self-efficacy, and self-management knowledge among patients with diabetes. Psychometric properties of several diabetes-specific instruments have been discussed in the literature.^{1-5 6-9} Psychometric analysis of instruments used in research studies is a crucial component of research design. DeVon et al. provide a review of psychometric properties including definitions of reliability and validity.¹⁰ Choosing the appropriate instrument is central to meaningful analysis of research data. This paper will discuss instruments typically used to measure diabetes self-management among rural African-American populations diagnosed with diabetes.

Background

Diabetes is a chronic progressive disease with multiple complications and a higher incidence and prevalence nationally among people from certain racial/ethnic groups and rural regions.^{11,12} Diabetes has been linked to lower socioeconomic status, obesity, poor nutrition, and family history of diabetes. Rates of diabetes are higher in rural areas where healthcare

disparities are increased by the lack of specialty providers, lack of access to healthcare facilities, high rates of poverty, and cultural beliefs that may prevent seeking or accepting health care.^{13,14} Diabetes represents a serious health problem among African Americans with rates of 14.7% compared to an overall rate of 10.7% among U.S. adults.¹⁵ African Americans have high rates of inadequate glycemic control, hypertension, and dyslipidemia relative to the population as a whole, and are thus at risk for micro and macro-vascular complications.^{16,17}

Funnell and associates defined diabetes self-management as “the ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care.”^{18pS89} Necessary components of self-management include self-care behaviors and problem solving. Barriers to self-management in rural minority populations include lack of access to specialty healthcare providers and socioeconomic differences from urban populations.¹⁹ Additionally, the influence of cultural considerations such as duty to family and God’s will, the health professional as an outsider, and use of home remedies need to be considered particularly among racial/ethnic minorities.^{9,20,21}

Diabetes self-management education/training (DSME), defined as a process to assist in diabetes self-care, has demonstrated improvements in outcomes and reduction in complications. Self-management is considered crucial for all people with diabetes for monitoring the disease process, prevention of complications, and glycemic control leading to improved quality of life.^{18,22} There are many approaches to diabetes self-management, but successful programs include group education, behavioral goal-setting, and attention to cultural health perspectives.^{18,23} The goals of diabetes education programs are to improve decision-making in diabetes care, increase self-efficacy, improve health maintenance, improve quality of life, and decrease morbidity and mortality.¹⁸ Successful diabetes education facilitates ongoing support for managing the disease and the illness. Furthermore, research indicates that culturally-tailored DSME improves self-management among racial/ethnic populations.²⁴⁻²⁶

Use of instruments in research should be both specific and appropriate for the goals of the research study. This includes determining applicability of established instruments to populations that differ from those in original instrument development.²⁷ Instruments have been developed for assessing various aspects of diabetes.¹ Instruments used in rural African American populations to measure diabetes self-management include: the Summary of Diabetes Self-care Activities (SDSCA),^{4,28} Diabetes Knowledge Test (DKT),^{29,30} Diabetes Empowerment Scale-Short Form (DES-SF),²⁶ the Spoken Knowledge in Low Literacy in Diabetes Scale (SKILLD),³¹ and the Diabetes Self-Care Practices questionnaire.²⁹

Method and Data Sources

The research question directing the literature search was: What instruments are used to assess diabetes self-management in rural African American populations diagnosed with diabetes? A search was conducted of medical and nursing literature to examine published articles about instruments to measure diabetes care during the period from 1990 to 2010. Databases of CINAHL, PsychInfo, and MEDLINE were searched, focusing on research about instruments used for African Americans, diabetes, and self-management. Specific search terms used were instruments, diabetes, diabetes self-management, rural, and African American. Limits included English language, research, and adult. Additional search methods included searching and review of reference lists. Initial results yielded 126 articles of which 8 fit the criteria for the analysis, which were original research focused on diabetes self-management and using instruments with rural African American populations.

Summary of Diabetes Instruments Used With African American Populations

Bradley²⁷ stated that choice of instruments for measurement of diabetes outcomes should be both specific and appropriate for the goals of the research study. The determination must be made whether the instrument will be applicable to a population different from the original population studied during instrument development. Use of instruments in different populations or modification of established instruments may alter the original psychometrics; however, modifications may be necessary to fit the population being studied.²⁷ An example would be modifying to accommodate relevant language, cultural beliefs and/or behaviors. Researchers and healthcare providers should examine applicability to the study population before administering modified instruments.²⁷

Diabetes- specific instruments measuring self-management among rural African American populations cited in the literature include: the Summary of Diabetes Self-care Activities (SDSCA),^{4,28} Diabetes Knowledge Test (DKT),^{29,30} Diabetes Empowerment Scale-Short Form (DES-SF),²⁶ the Spoken Knowledge in Low Literacy in Diabetes Scale (SKILLD),³¹ and the Diabetes Self-Care Practices questionnaire.²⁹ Each of these instruments will be described and analyzed below in terms of their use in research with rural African American populations. Table 1 summarizes the instruments including number of questions, reading level, administration time, and ability for self-administration. Table 2 lists sample questions from each instrument. Table 3 provides an overview of instruments used in research studies with rural African American populations, including sample, research question if stated, psychometric properties and methods used when available. Each instrument below is analyzed according to the categories in Table 3.

Summary of Self-Care Activities (SDSCA)

The SDSCA has been used extensively with various racial/ethnic populations to measure diabetes self-management. The original SDSCA measured five areas of diabetes management: (1) general diet, (2) specific diet, (3) exercise, (4) medication, and (5) blood glucose monitoring. The revised SDSCA is an 11-item self-report questionnaire.⁷ The revised SDSCA includes items on foot care and smoking. Modifications to the revised version also include moving the medication questions to the expanded version and changing the diet questions to focus on carbohydrate intake. Scores are calculated for each area creating five subscales measured by the SDSCA: diet, exercise, blood glucose testing, foot checks, and smoking status. Numerical scoring of items is based on the number of days of the week that the behavior is enacted (0-7); then compared to a standard score with a mean of zero and a standard deviation of one. A mean number is then calculated for each area by averaging the standard scores; overall Cronbach's alpha is 0.71; however, Toobert, Hampson, and Glasgow recommend use of inter-item correlations to measure internal consistency reliability.⁷ The SDSCA is well validated; for example, moderate stability measurement (0.43 to 0.58) of test-retest was performed during instrument revision. Patient burden is minimal as to time required for administration (5 - 10 minutes), self report style, and readability level (Flesch readability 7th grade). In addition, the SDSCA can be used in measuring diabetes self-management changes over time.

Diabetes Knowledge Test (DKT).

The Diabetes Knowledge test, developed by the Michigan Diabetes Research Training Center (MDRTC) for educators and researchers, is a two-part, 23-item questionnaire that measures diabetes knowledge.² Part one consists of general questions and is applicable to individuals with either type 1 or type 2 diabetes. Part two is specific for those who use insulin. The general knowledge portion has questions related to: (1) diet, (2) HbA1c, (3) hypoglycemia management, (4) activity, (5) effect of illness and infection on blood sugar levels, (6) foot care, and (7) signs and symptoms of diabetic neuropathy. Scoring is done by summing the number of questions answered correctly. Higher scores mean that an individual has greater knowledge about diabetes and management of diabetes than those individuals who score lower on the instrument. The DKT can be self-administered. The readability level is 6th grade. Administration time is 15 minutes; therefore, the instrument is administered easily to a broad range of participants. Reliability of the sample was tested with Cronbach's alpha ($\alpha = .71$ overall). Content validity was tested with analysis of scores (1) by diabetes type and treatment, (2) by educational level, and (3) by prior diabetes education. The sample was tested in two sectors: 312 community and 499 public health clinic participants. The public health clinic sample was 17% African American, 61% non-insulin use, and 68% female.

In summary, patient burden is minimal with use of the DKT regarding time required for administration, self report style, and readability level. Cost is minimal because the copyrighted instrument is freely accessible with acknowledgement to the MDRTC. Stability measurement by test-retest was not performed during instrument development. The Michigan Diabetes Research Training Center³² states that this instrument should not be used to evaluate diabetes self-management education/training because the questions do not match item-to-item with diabetes self-management program educational components, but rather it should be used as a measure of general diabetes knowledge.

Diabetes Empowerment Scale-Short Form (DES-SF)

The DES-SF is an 8-item Likert-type rating scale used to measure psychosocial efficacy of people with diabetes.³³ Developed by researchers at the University of Michigan Diabetes Research Treatment Center (MDRTC), the DES-SF was revised from its predecessor, the 28-item Diabetes Empowerment Scale (DES). The original instrument measured eight conceptual domains: (1) assessing the need for change, (2) developing a plan, (3) overcoming barriers, (4) asking for support, (5) supporting oneself, (6) coping with emotion, (7) motivating oneself, (8) making appropriate individualized diabetes choices. The original DES also measured three subscales: (1) managing the psychological aspects of diabetes, (2) assessing dissatisfaction and readiness to change, and (3) setting and achieving goals. The DES-SF uses the highest ranked item from the original instrument for each conceptual domain. The DES-SF can be self-administered to patients as a brief measure of overall patient diabetes self-efficacy.³³ The original DES was based on Bandura's Self-efficacy theory.³⁴ The empirically derived DES-SF asks the participant to consider responses to the question "in general I believe that I..." and offers 5 Likert-type response choices: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree. Scoring is performed by summing the total items completed and dividing by the number of items completed. Patients who score 3.00 or less will be placed in a negative attitude group. Patients who score greater than 3.00 will be placed in the positive attitude group.³⁵ A positive attitude score (> 3.0) will be interpreted as a higher level of self-efficacy. The Flesch-Kincaid readability indicates a 7th grade level; administration time is 5 minutes; therefore, the instrument is easily administered to a broad range of participants. DES-SF was tested on a sample of 229 patients enrolled in a diabetes education program. Equivalent-form reliability for the new sample was tested with Cronbach's alpha ($\alpha = 0.84$). Construct validity was established by representation of each domain identified in the original DES from self-efficacy theory. Content validity was verified by a positive change between DES-SF scores and HbA1C levels after completion of a diabetes education program.

Patient burden is minimal with use of the DES-SF in terms of the time required for administration, self-report style, and readability level. Cost is minimal as the copyrighted instrument is freely accessible with acknowledgement to the MDRTC. Stability measurement by test-retest was not performed during instrument development. Internal consistency among the subscales was determined by factor analysis using Pearson's correlations and ranged from 0.32 to 0.75. Construct validity, measured via factor analysis, was supported with adherence to Bandura's Social Cognitive Theory and domain representation. The DES-SF is useful in determining level of self-efficacy among patients with type 2 diabetes; also, in evaluating outcomes of diabetic education. The DES-SF can be used in planning and evaluating diabetes self-management among patients with diabetes.

Diabetes Self-Care Practices

The Diabetes Self-care Practices instrument is a self-report log for participants to record self-care activities. The instrument measures self-care actions related to: (1) diet, (2) home glucose monitoring, (3) medications, (4) exercise, and (5) foot care.³⁶ The participant is asked to respond to the frequency of self-care activities ranging from (100%) *all of the time*, 75%, 50%, 25%, to (0%) never. Scoring demonstrates actions related to the treatment plan in each of the self-care areas.³⁶ Internal consistency was tested with Cronbach's alpha ($\alpha = .88$). Stability measurement was performed via test-retest reliability of 95% indicating the instrument was appropriate in measuring self-care activities over time. Patient burden is minimal with use of the DSCP in terms of time required for administration (<10 minutes), self-report style, and readability level (< grade 6). Limitations include self-report over a time period of two days on dietary and self-care behaviors and subject bias.²⁹ The Diabetes Self-Care Practices questionnaire is useful in assessing perceived knowledge in diabetes self-management.

The Spoken Knowledge in Low Literacy in Diabetes Scale (SKILLD)

The SKILLD is a 10-item, verbally-administered instrument to measure basic knowledge and self-care among individuals diagnosed with type 2 diabetes.³¹ The SKILLD scale is the only instrument developed to be verbally administered. The instrument measures the following domains: (1) glucose management, (2) lifestyle modifications, (3) recognition of acute complications, (4) treatment of acute complications, and (5) activities to prevent long-term complications. The SKILLD scale asks the respondent to give responses to open-ended questions relating to diabetes self-management such as "What are the signs and symptoms of high blood sugar?" A second question relating to the same information is asked if

the respondent is unable to answer within 10 to 15 seconds or does not understand the initial question. A limitation of the SKILLD scale is that it does not include questions relating to nutrition or medication.

Scoring is performed on the overall questionnaire score (0% - 100%) and on each individual scale item. Results are reported dichotomously, that is respondents who score 50% or less are placed in the 'low knowledge' group, while those who score greater than 50% are placed in the 'high knowledge' group.³¹ The Flesch-Kincaid readability indicates below the 5th grade level, and the administration time is less than 10 minutes. Reliability for the new scale was tested with the Kuder-Richardson coefficient of reliability (0.72). Content validity was verified by a higher knowledge level among those respondents who had been diagnosed with diabetes for a longer time period, were on insulin for disease management, and who had lower HbA1c levels. Stability measurement by test-retest was not performed during instrument development. Patient burden is minimal with use of the SKILLD scale with relation to time required for administration, verbal administration style, and readability level. The SKILLD scale is useful in assessing diabetes knowledge among those from vulnerable populations with low literacy, and results help to identify topics of diabetes management that need additional attention.

Analysis of Studies Using Diabetes Self-Management Instruments

A summary of studies in rural African American populations with diabetes that use of instruments described above is presented in Table 4. The analysis will discuss briefly the study, population, and usefulness of the instrument in the study population.

Summary of Diabetes Self-Care Activities (SDSCA)

The Summary of Diabetes Self-Care Activities (SDSCA), a well-established instrument for measuring diabetes self-care behaviors, has been used as a measure of self-management among rural African American samples. Three studies used the SDSCA in measuring self-care behaviors in rural African American populations. Amoako, Skelly, and Rossen²⁸ in a study of 68 rural African American women found improved psychosocial adjustment correlates with increased performance of self-care behaviors. They also found that participants demonstrated increased psychosocial adjustment with a decrease in uncertainty regarding diabetes self-care. Limitations of this study include a limited test-retest interval of 2 weeks that did not allow assessment of the long-term effects in this sample. However, Wallston, Rothman, and Cherrington⁴ in a multi-ethnic study of 398 participants (134 African Americans), modified the SDSCA into two-item

subscales and found a weak correlation (.29) between self-care activities. This study was used in the development of the Perceived Diabetes Self-Management Scale (PDSMS). Finally, Utz et al.²⁶ used the SDSCA in a quasi-experimental pilot study of 41 rural African American individuals with diabetes to measure change in diabetes self-care management from baseline and post-intervention. SDSCA results showed clinical importance in the intervention group, who received group DSME, with an increase noted in the self-care behaviors of foot care and carbohydrate spacing.²⁶ The SDSCA is a convenient measure for clinicians, educators, and researchers to assess diabetes self-management practices in a population. Limitations include self-report by respondents.

Diabetes Knowledge Test (DKT)

Two studies used the DKT in measuring diabetes knowledge in rural African American populations. Nguyen et al.³⁰ studied a multi-ethnic ($n = 31$ African American, $n = 28$ Native American, $n = 31$ non-Hispanic white) elderly rural population to determine the relationship between glycemic control and the executive function of cognition. The Diabetes Knowledge Test (DKT) was used to assess a participant's knowledge in diet, exercise, and glucose management. This cross-sectional study was statistically significant for the relationship between glycemic control and executive function. Executive function is defined as a "domain of cognition" including components necessary for management of complex tasks such as diabetes self-management.³⁰ The overall model was not statistically significant for glycemic control and executive function when self-care behaviors were considered. However, this study has important clinical implications including a relationship between decreased executive function and lower diabetes knowledge ($p < .001$).³⁰ This suggests that healthcare providers should assess executive function among older patients when determining self-care behavior management such as a measure of executive function. Skelly, Carlson, Leeman, Holditch-Davis, and Soward²⁹ also used the Diabetes Knowledge test to conduct a pilot study of 41 African American women, with type 2 diabetes from various rural areas in one state. Participants were randomly assigned to test the effectiveness of a four module, in-home teaching intervention focusing on the symptoms experienced by the individual. The Diabetes Knowledge Test was designed originally to be used to assess diabetes knowledge among the sample; however, the DKT proved too difficult for this particular sample. This finding reinforces the need for instruments to be appropriate for the study, including level of readability.

Diabetes Empowerment Scale-Short Form (DES-SF)

The Diabetes Empowerment Scale-Short Form (DES-SF) has been used in one study relating to rural African American populations.²⁶ Utz and associates²⁶ conducted a culturally tailored intervention pilot study for African American individuals ($n = 21$) diagnosed with diabetes. The Diabetes Empowerment Scale-Short Form was used to measure diabetes self-efficacy in this sample. Reasons for effectiveness of this instrument include the ability of educators and researchers to determine changes in diabetes self-efficacy between baseline and post-intervention, thereby allowing determination of an individual's psychosocial self-efficacy related to diabetes self-management. Additionally, patient burden is minimal with a 5-minute administration time.

Diabetes Self-Care Practices

The Diabetes Self-Care Practices questionnaire has been used in two studies focusing on rural African American populations. Skelly et al.²⁹ also measured self-care practices, in the above described pilot study, by use of the Diabetes Self-Care Practices instrument.²⁹ Statistical significance between intervention and control groups was shown by improvement in self-care behaviors in the domains of medication-taking, eating a healthy diet, home glucose monitoring, and foot care following the intervention. A recent randomized control-intervention study by Skelly et al.²⁰ used the Self-Care Practices instrument to measure self-care behaviors among 180 rural African American women, to measure the effectiveness of a follow-up telephone booster to an intervention group. These studies demonstrate the need for a culturally-tailored instrument, tailored to the needs of the individual. The Diabetes Self-Care Practices instrument provides information to providers, educators, and researchers to assess diabetes self-care among patients and research participants.

The Spoken Knowledge in Low Literacy in Diabetes Scale (SKILLD)

One study used the Spoken Knowledge in Low Literacy in Diabetes Scale. Rothman et al. (2005) conducted a study to assist in development of the SKILLD instrument to measure diabetes knowledge among low literacy adults.³¹ The sample ($n = 217$) consisted of 65% African American individuals with diabetes. This study not only showed that individuals with lower literacy have less knowledge of diabetes symptoms and management, but also found a relationship between knowledge and glycemic control (HbA1C). Reasons for effectiveness of this instrument include the ability of educators and providers to assess knowledge deficits and tailor education to individuals with low literacy. Limitations of this study include no longitudinal follow-up to measure the effectiveness of increased knowledge and improvement in diabetes outcomes in addition to absence of questions related to nutrition and medication.

It should be noted that most researchers did not comment on the usefulness, validity, or patient burden of the instruments; however, Skelly et al,²⁹ in their pilot study of individuals with diabetes, stated that the Diabetes Knowledge Test had a readability level that was beyond the literacy level of the study participants. This finding emphasizes the need of the researcher or educator to determine the appropriateness of the instrument for the population. Rothman and colleagues³¹ stated that the Spoken Knowledge in Low Literacy in Diabetes Scale was effective in assessing knowledge deficits for individuals with low literacy.

Conclusion

As noted, the incidence of diabetes and rate of complications are higher among African Americans. Disparities are even greater among racial/ethnic minorities living in rural locations. Given these serious health problems among rural African Americans, researchers and clinicians need to examine relationships between diabetes knowledge, self-management, and improved outcomes. The importance of finding appropriate instruments to measure outcomes is central to measuring the problem and determining changes over time. Additionally, it is important for rigorous research design to determine the appropriateness of psychometric properties for specific study populations. This includes determination of previous psychometric testing or testing within the scope of the research study.

Several instruments, including the Summary of Self-Care Activities (SDSCA),^{4,28} Diabetes Knowledge Test (DKT),^{29,30} Diabetes Empowerment Scale-Short Form (DES-SF),²⁶ Diabetes Self-Care Practices questionnaire,^{28,29} and The Spoken Knowledge in Low Literacy in Diabetes Scale (SKILLD)³¹ have been used successfully in rural African American populations. Educators, healthcare providers, and researchers should use instruments that have been shown to be culturally appropriate, such as those described above, to assess accurately the effectiveness of diabetes self-management, and to tailor diabetes education programs effectively when working with rural African American populations.

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Table 1 Diabetes Self-Management instruments

Instrument	Number of items	Readability level (grade)	Administration time (minutes)	Self-administered
Summary of	11	7	5-10	yes

Diabetes Self-Care Activities (SDSCA)				
Diabetes Knowledge Test (DKT)	23	6	15	yes
Diabetes Empowerment Scale-Short Form (DES-SF)	8	7	5	yes
Diabetes Self-Care Practices questionnaire	NA	NA	NA	yes
Spoken Knowledge in Low Literacy in Diabetes Scale (SKILLD)	10	<5	10	no

NA: not available

Table 2 Sample questions from selected diabetes self-management instruments

Instrument	Sample Questions
Summary of Diabetes Self-care Activities (SDSCA)	<p data-bbox="779 386 1289 532">How many of the last SEVEN DAYS have you followed a healthful eating plan?</p> <p data-bbox="779 589 1335 678">On how many of the last SEVEN DAYS did you check your feet?</p>
Diabetes Knowledge Test (DKT)	<p data-bbox="779 706 1350 852">Glycosylated hemoglobin (hemoglobin A1) is a test that is a measure of your average blood glucose level for the past:</p> <ul data-bbox="821 901 1020 1039" style="list-style-type: none">a. dayb. weekc. 6-10 weeksd. 6 months <p data-bbox="779 1096 1344 1177">The best way to take care of your feet is to:</p> <ul data-bbox="821 1226 1350 1336" style="list-style-type: none">a. look at and wash them every dayb. massage them with alcohol every dayc. soak them for one hour each day

	d. buy shoes a size larger than usual
Diabetes Empowerment Scale-Short Form (DES-SF)	<p>In general I believe that I:</p> <p>know what parts of taking care of my diabetes that I am dissatisfied with.</p> <p>am able to turn my diabetes goals into a workable plan.</p>
Spoken Knowledge in Low Literacy in Diabetes Scale (SKILLD)	<p>What are the signs and symptoms of high blood sugar? How do you feel when your blood sugar is high or when you were diagnosed?</p> <p>Why are foot exams important in someone with diabetes? Why is it important to look at your feet? What are you looking for?</p>
Diabetes Self-Care Practices questionnaire	How often did you take your diabetes medications when you were supposed to?

	How often did you follow your recommended diet over the last seven days?
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Table 3 Research studies in rural African American populations using instruments for diabetes self-management instruments

Instrument/ Acronym	Author/Year	Research question	Sample/Size	Psychometric properties	Psychometric values
Summary of Diabetes Self-Care Activities (SDSCA)	Wallston, Rothman, & Cherrington (2007)	Used to develop and test a new instrument measuring diabetes self- efficacy (Perceived Medical- Condition Self- Management Scale; PMCSMS)	n = 398 male = 196 female = 202 African American = 134 Caucasian = 249 Other = 15 Location: Tennessee	Correlation	Weak correlation between subscales: .40 between the two diet subscales; ≤ or = .29 all other subscales

	Amoako, Skelly, & Rossen (2008)	Does a telephone intervention reduce uncertainty in diabetes self-care and psychosocial adjustment among older African American women?	n = 68 female = 68 African American = 68 Location: North Carolina	Test-retest Reliability – not done on medication subscale since only one item was used	Subscale Time 1: Diet $\alpha = .62$ Foot care $\alpha = .54$ Time 2: Diet $\alpha = .57$ Foot care $\alpha = .42$ All other subscales $\alpha > .70$ at both times of measurement
Diabetes Knowledge Test (DKT)	Nguyen et al. (2010)	What is the relationship between executive function and glycemic control in rural older	n = 95 (5 excluded for missing data) female = 68 male = 22 African American = 31	Not discussed in this sample	Not applicable

		adults with diabetes?	Caucasian = 31 Native American = 28 Location: North Carolina		
	Skelly, Carlson, Leeman, Holditch-Davis, & Soward, (2005)	Pilot study: What are the effects of a culturally tailored intervention on symptom distress, diabetes knowledge, A1c, perceived quality of life, and self-care practices in older African	$n = 41$ Female = 41 African American = 41 Location: North Carolina	Reliability not tested with this sample. DKT not used due to level of difficulty in this sample.	Reliability from previous research: $r > .70$

		American women?			
Diabetes Self-Care Practices	Skelly, Carlson, Leeman, Holditch-Davis, & Soward (2005)	Pilot study: What are the effects of a culturally tailored intervention on symptom distress, diabetes knowledge, A1c, perceived quality of life, and self-care practices in older African American women?	$n = 41$ Female = 41 African American = 41 Location: North Carolina	Reliability not tested with this sample; however, psychometrics tested in original instrument development	Not applicable

	Skelly, Carlson, Leeman, Soward, & Burns (2009)	What is the effectiveness of a symptom-focused diabetes intervention with a telephone booster in older African American women residing in a rural location?	$n = 180$ Female = 180 African American = 180 Location: North Carolina	Logistic regression Test-retest reliability at two week interval Pilot tested in African American participants	$\alpha = .88$ reliability > 95%
Diabetes Empowerment Scale-Short Form (DES-SF)	Utz et al. (2008)	Pilot study: To determine the effectiveness of a culturally tailored intervention for	$n = 21$ Female = 16 Male = 6 African American = 21 Location: Virginia	Reliability not tested with this sample; however, was tested during instrument development from original Diabetes	$\alpha = .88$ (original)

		African Americans with diabetes located in a rural location.		Empowerment Scale.	
Spoken Knowledge in Low Literacy in Diabetes Scale (SKILLD)	Rothman et al. (2005)	Is the SKILLD scale an accurate and reliable instrument for determining knowledge deficit in lower literacy individuals with diabetes?	n = 217 Female = 121 Male = 96 African American = 141 (other racial demographics not given) Location: North Carolina	Validity was tested with bivariate analysis; Internal consistency reliability was tested with Kuder-Richardson; Factor analysis was used to confirm item fit in subscales.	Internal reliability: $\alpha = .72$ No test-retest validity in longitudinal study.

Table 4 Diabetes Self-Management Instruments in Rural African American Populations

Instrument/	Variables	Format	Author/
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Acronym/ Developer	Measured		Year/ Source
Summary of Diabetes Self- Care Activities (SDSCA) (Toobert, Hampson, & Glasgow, 2000)	Diabetes self-care behaviors	11-item questionnaire; Measures diabetes self-care behaviors including diet, exercise, blood glucose testing, foot care, and smoking	Wallston, Rothman, & Cherrington (2007) <i>Journal of Behavioral Medicine</i>
			Amoako, Skelly, & Rossen (2008) <i>Western Journal of Nursing Research</i>
Diabetes Knowledge Test (DKT)	Diabetes knowledge	Two-part questionnaire that measures	Nguyen et al. (2010) <i>Journal of the</i>

(Fitzgerald et al., 1998)		diabetes knowledge including diet, HbA1c, hypoglycemia management, activity, foot care, Part 1: general Part 2: insulin use	<i>American Geriatrics Society</i>
			Skelly, Carlson, Leeman, Holditch-Davis, & Soward, (2005) <i>Applied Nursing Research</i>
Diabetes Self-Care Practices (Skelly, Marshall, Haughey, Davis,	Daily diabetes self-care behaviors	Measures diabetes self-care behaviors including diet,	Skelly, Carlson, Leeman, Holditch-Davis, & Soward (2005)

& Dunford, 1995)		medication, blood glucose testing, exercise, and foot care	<i>Applied Nursing Research</i>
			Skelly, Carlson, Leeman, Soward, & Burns (2009) <i>Nursing Research</i>
Diabetes Empowerment Scale-Short Form (DES-SF)	Psychosocial efficacy of diabetes management	8-item Likert-type rating scale used to measure psychosocial efficacy of people with diabetes	Utz et al. (2008) <i>The Diabetes Educator</i>
Spoken Knowledge in Low Literacy in Diabetes Scale (SKILLD) (Rothman et al.,	Core knowledge about diabetes self-care	10-item open ended questionnaire; Measures diabetes knowledge in low	Rothman et al. (2005) <i>The Diabetes Educator</i>

2005)		literacy vulnerable populations	
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