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The Influence of Self-Efficacy on Physical Activity in Older Adults with Diabetes

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by

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Abstract

Diabetes affects million individuals within the United States with the highest prevalence in older adults. Physical activity has been shown to improve diabetes control; yet older adults are significantly less physically active than national recommendations suggest. Higher levels of self-efficacy have been shown to increase physical activity in many populations. Bandura's theoretical framework of self-efficacy has supported that a higher level of self-efficacy correlates with higher levels of physical activity. The research for this dissertation first explored a gap in the literature regarding older adults with diabetes as it relates to self-efficacy and physical activity with an integrative review. This integrative review was foundational for the pilot study which explored the role of self-efficacy on physical activity in older adults with diabetes. Since the role of self-efficacy on physical activity in this population was not well-researched a mixed-method approach was developed for the pilot study to further enhance this research. A relationship between the self-efficacy and physical activity was established and rich accounts of the multiple influencing factors surrounding self-efficacy and physical activity in rural older adults with diabetes are discussed. Due to the uniqueness of this study, there were no studies we could utilize for direct comparison of our results. However, further testing is recommended with larger sample size and in multiple senior center sites to validate these findings. Although there are limitations to this pilot study, this study adds to the limited number of studies on the role of self-efficacy on physical activity in individuals $\geq$ 65 years with diabetes and is foundational for future studies.

Keywords: self-efficacy, older adults, physical activity, integrative review, pilot study, senior center

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CHAPTER 1

Introduction

Overview

Diabetes affects 29.1 million Americans including more than one-fourth of people over 65 years old (Centers for Disease Control and Prevention [CDC], 2014). Fewer than 20% of these older adults meet the national recommendations for control of diabetes such as A1C, blood pressure, and lipids (Casagrande, Fradkin, Saydah, Rust, & Cowie, 2013). One important intervention to improve diabetes control is regular physical activity (American Diabetes Association [ADA], 2013). Despite the benefits of physical activity, the CDC notes that fewer than 15.9% of adults 65 years old and older meet the recommended guidelines for physical activity (CDC, 2011). Although multiple benefits of physical activity have been noted, physical activity is one of the most difficult lifestyle changes to implement (Marcus, Selby, Niaura, & Rossi, 1992). Moreover, individuals with diabetes have special concerns such as hypoglycemic events surrounding physical activity, with older adults being particularly more vulnerable to this change (Brisco, & Davis, 2006).

In addition, many older adults with diabetes have co-morbid conditions further compounding this problem. Although older adults are the largest group of individuals with diabetes, this group has often been excluded from randomized controlled trials (Kirkman et al., 2012). This exclusion makes evaluation of effective interventions for physical activity with the older adult more challenging (Kirkman et al., 2012). However, higher levels of self-efficacy, a construct of Social Cognitive Theory (SCT) (Bandura, 1986) have been associated with higher levels of physical activity (Sallis et al., 1989); yet little research has examined this association in older adults with diabetes. The overall aim of this dissertation was to explore the role of self-efficacy on physical activity in older adults with diabetes.

Background/Significance

The number of individuals ≥ 65 in the US is currently 35 million and by 2030 this population is estimated to reach 70 million (Resnick & Jenkins, 2000). Forty-two percent of all individuals with diabetes are 65 years and older, and that percentage is predicted to increase (CDC, 2014). This dramatic increase in the number of older adults and the prevalence of diabetes within the older adult population will have large impacts on society.

In 2012, the estimated annual cost of diabetes in the U.S. was $245 billion dollars; this number includes $176 billion in direct medical costs and $69 billion in reduced productivity (ADA, 2013). Because of the complex nature of the disease, it is difficult to measure the true impact of the disease. Diabetes often leads to multiple complications and co-morbidities: it is the leading cause of kidney failure, new cases of blindness, and non-traumatic lower-limb amputations (CDC, 2014).

In the US, diabetes is the seventh leading cause of death of all individuals (CDC, 2014) and ranks as the sixth leading cause of death among individuals 65 years old and older (Stewart et al., 2001). One known way to reduce the cost and complications of diabetes is through physical activity. Regular physical activity improves blood glucose control, reduces cardiovascular risk factors, and improves overall well-being (ADA, 2013). Although the benefits of physical activity across the lifespan are well-documented, limited research exists to explore the role of self-efficacy on physical activity in older adults with diabetes (Resnick & Jenkins, 2000) which is noted in other populations to have a positive effect on the relationship between the two variables.

Despite multiple methods to improve diabetes control, research supports that change in physical activity alone can make a significant difference in A1C levels (CDC, 2013), a key

indicator of diabetes control. Boulé, and colleagues (1991) conducted a meta-analysis of 14 studies examining exercise versus non-exercise groups with 504 participants across all studies and an average age for all participants of 55.0 years. Boulé and colleagues concluded that exercise alone was correlated with reduction in A1C levels, i.e., higher levels of exercise were related to lower levels of A1C. Boulé and colleagues found both a clinically and statistically significant reduction in A1C with levels of 7.65% versus 8.31%, in the exercise group versus the control group, respectively or a 0.66% difference ($p \leq .001$). This difference in A1C levels was not mediated by weight, exercise intensity, nor exercise volume (Podsiadlo & Richardson, 1991).

The change in A1C levels in the Boulé et al. (1991) meta-analysis is comparable to the results from the large classic United Kingdom Prospective Diabetes Study (UKPDS) (U. S. Department of Health and Human Services, 2011) which used intensive insulin therapy and sulfonylureas to lower A1C by 0.9%. Both studies showed not only a reduction in A1C levels, but also in clinical end point events such as sudden death and fatal myocardial infarction; however, the UKPDS used significantly more aggressive interventions of intensive insulin therapy and sulfonylureas to make comparable changes in A1C levels. It is important to note that the Boulé and colleagues' meta-analysis found changes in A1C levels despite the frequency, duration, and intensity of the physical activity which may correlate with what older adults are able to perform. This lifestyle change of physical activity could have tremendous impact on an individual's control of diabetes that is comparable to using an intensive insulin regimen. The intensive insulin regimen is not where most individuals with diabetes begin treatment. However, without adequate control of diabetes many individuals ultimately progress to this aggressive treatment option.

Examining a ten-year follow-up of the UKPDS study, a hallmark study in diabetes, the continued benefit of sulfonylureas-insulin therapy was demonstrated with a reduction in myocardial infarction (15%, p = 0.01) (U.S Department of Health and Human Services, 2013). However, a long-term follow up study regarding physical activity alone could not be found in the literature.

Gaps in the literature

A systematic search of the literature identified no similar research related to older adults with diabetes. As stated earlier, older adults are the largest population with diabetes and physical activity is a critical element in the treatment of diabetes. This dissertation identified a gap in the literature through an integrative review presented in manuscript 1 and presents the perspectives of older adults with diabetes regarding barriers and motivators of physical activity utilizing a theoretical construct, self-efficacy. .

Concepts

Physical activity.

It was important to define physical activity for this dissertation as this term is poorly defined and is a key term in this research. Physical activity is described by Caspersen, Powell, and Christenson (1985) as any form of movement or exercise which has planned movement (Boule et al., 2001). The World Health Organization (2013) has defined physical activity for adults 65 years and older as including "leisure time physical activity (for e.g., walking, dancing, gardening, hiking, swimming), transportation (e.g. walking or cycling), occupational activities (if the individual is still engaged in work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities" (p. 1). The Centers for Disease Control (2007) have defined physical activity that yields sustained impacts on health as

"moderate-intensity activities in a usual week (i.e., brisk walking, bicycling, vacuuming, gardening, or anything else that causes small increases in breathing or heart rate) for greater than or equal to 30 minutes per day, running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate for greater than or equal to 20 minutes per day, greater than or equal to 3 days per week or both" (p. 1). Due to the multiple descriptions of physical activity, the Community Healthy Activities Model Program for Seniors (CHAMPS) instrument was utilized in the pilot study for this dissertation because this instrument incorporates the definitions described above and utilize a code book to calculate variations in level of intensity of physical activity. This instrument was specifically designed for older adult to detect even small to large amounts of physical activity levels. (Stewart et al., 2001).

Older adults.

The concept of older adults was defined for this dissertation since what constitutes an older adult does not have a consistent definition and this was the population of interest. According to the WHO (2013), most developed countries have accepted classifying individuals 65 years and older as older adults. The root of this definition may have had its inspiration from Germany's social programs of the late 19th and early 20th century. In a Royal Proclamation on Social Welfare in 1881, Kaiser Wilhelm I, laid the foundation for an entitled disability due to age with the decree, "those persons who have become unfit for gainful employment through age or disability also have a legitimate claim to a greater degree of state welfare than they have received thus far" (Retallack, 2013, p. 2). This concept brought about the Law Concerning Disability and Old-Age Insurance of 22 June 1889 allowing for a pension which could be applied for at age 70 (Stolleis, 2013). However, around 1900, only 27% of men actually reached the age of 70 (Stolleis, 2013) so the pension benefit was limited. During the First World War, socio-political

pressures led to the Law on the Patriotic Auxiliary Service in 1916 which reduced the age of retirement from age 70 to age 65 (Stolleis, 2013).

Later in 1934, President Franklin D. Roosevelt issued an executive order establishing the Committee on Economics Security (Myers, 2010). The Committee was charged with establishing the framework for what would now be known as Social Security. Setting the framework for retirees, the United States had to establish the age of retirement, which ultimately was set at 65 years as well. That age had been credited to Germany's social security system but this wasn't the case. "The manner in which the federal government chose 65 as the minimum retirement age in 1935 was admittedly arbitrary and empirical" (Myers, 2010, p. 82). Empirical actuary calculations were developed on how many people would reach the age of 65 in 1990, but the actual age of 65 was somewhat arbitrary, "Age 65 was picked because 60 was too young and 70 was too old. So we split the difference" (Myers, 2010, p. 82).

While social programs have defined retirement age, in 2013, the WHO recognized that the concept of older adults was still poorly defined and had personal correspondence with the United Nations regarding the definition of older adults (WHO, 2013). WHO found that Britain refers to anyone 60 years or older as the older population (as cited in WHO, 2013). Britain's Friendly Societies Act of 1875 defined old age as any age after 50 (as cited WHO, 2013). Many other countries vary on the definition of older adults. For example, within countries of Africa older adults are defined as being anywhere between 50-65 years depending on the region in Africa (WHO, 2013). American society also has difficulty defining older adults. Many discounts are available for older adults in America, but the age for a retailer's term "senior discount" varies greatly. This could be interpreted as American society being uncertain about what defines being an older adult. For example, at 50, individuals are eligible to join the

American Association of Retired Persons (AARP) (AARP, 2013). As seen in these examples, the term older adult does not have one clearly defined beginning.

Another important fact to consider when discussing the concept of older adult is the life expectancy related to diabetes. According to the CDC (2013), today the average life expectancy is 78.7 years old. However, an individual with diabetes can have a shorter life expectancy of up to 15 years (CDC, 2013). Geiss, Herman, and Smith (1995) pointed out that much of what is known about the mortality of an individual with diabetes is gathered from a death certificate, which has inaccuracies. These inaccuracies include inaccurate diagnosis and incorrect physician interpretation of conditions that contributed to death (Geiss et al., 1995) which are then reported incorrectly on death certificates. This lack of accurate reporting further leads to the question of the exact cause of death and an underreporting of diabetes related deaths. Because of the lack of a clear definition of older adults, the lower life expectancy of individuals with diabetes, and the inequity in access of care, more individuals at younger ages may be affected by diabetes related deaths. Hence, a combination of the above definitions was utilized for this dissertation and guided age selection for this research.

Theoretical Framework

Theoretical frameworks are important when developing interventions which is the long-term goal of this research. Biddle, Hagger, Chatzisarantis, and Lippke (2007) proposed that a theory-based intervention is more effective than non-theory based intervention for affecting change in an individual. Many theories guide behavior change and motivation which have been applied to interventions for diabetes care; these theories include the Theory of Planned Behavior (Ajzen & Madden, 1986), the Health Belief Model (Strecher, DeVellis, Becker, & Rosenstock, 1986), and the Social Cognitive Theory (SCT) (Bandura, 1986).

Multiple studies have revealed no association between level of physical activity and the constructs of the health belief model (Hofstetter et al., 1991; Mirotznik, Feldman, & Stein, 1995; Oldridge & Streiner, 1990; Taggart & Connor, 1995) and between level of physical activity and the constructs of theory of planned behavior (Courneya & McAuley, 1995; Godin, Valois, & Lepage, 1993; Hawkes & Holm, 1993). One theoretical construct of SCT that has been associated as a strong predictor of physical activity behavior change is self-efficacy (Trost, Pate, Freedson, Sallis, & Taylor, 2000). Bandura (1986) identified self-efficacy as a key construct of his social cognitive theory. Bandura described self-efficacy as the belief in one's ability to organize and execute a course of action which is required to produce the desired outcome.

Self-efficacy has shown positive effects on physical activity among different groups such as men, women, younger adults, and older adults (Sallis et al., 1989). Multiple studies have tested self-efficacy's predictive ability with physical activity specifically in older adults (Conn, Burke, Pomeroy, Ulbrich, & Cochran, 2003; Resnick, Orwig, Magaziner, & Wynne, 2002; Resnick, Palmer, Jenkins, & Spellbring, 2000). These studies support positive relationship between higher levels of self-efficacy and higher levels of physical activity (Conn et al., 2003; Resnick et al., 2002; Resnick et al., 2000); however, the populations in these studies were older adults, but not specifically older adults with a diagnosis of diabetes as proposed in this dissertation research. With multiple studies supporting higher levels self-efficacy associated with higher levels of physical activity, self-efficacy offers a possible explanation of physical activity behavior and the development of effective behavioral interventions for older adults with diabetes.

Description of the 3 manuscripts

Due to the rising rate of diabetes among older adults, which can have devastating effects, and the resulting need to develop effective behavioral interventions to improve or halt the effects of this disease process this dissertation research was started. The purpose of these 3 manuscripts contained in this dissertation compendium is to begin foundational work that investigates the role of self-efficacy on physical activity. Physical activity in older adults with diabetes is essential in management of the disease. However, it is important to first test whether a relationship does exist between levels of self-efficacy and levels of physical activity in older adults with diabetes. This dissertation serves as a building block for examining self-efficacy levels and its potential influence on physical activity levels in older adults with diabetes.

After a systematic search of the literature identified limited research related the relationship of self-efficacy to physical activity in older adults with diabetes, manuscript 1 was developed to systematically appraise the current literature and thus establish the gap in the literature. Manuscript 1 was an integrative review on the relationship of self-efficacy to physical activity in older adults with diabetes. This manuscript established a gap in the literature by only being able to identify a small number of studies. These studies did report statistically significant relationships between higher levels of self-efficacy and higher levels of physical activity. However, due to the lack of the research on this topic additional research was warranted to fill the gaps identified in the literature.

A pilot study was developed with a primary purpose to explore the feasibility of research in senior centers and nutrition centers, however while conducting this original research recruitment challenges were encountered. These recruitment challenges led to implementation of a theory-based approach to improve the recruitment process. The feasibility and application of this theory-based approach are described in manuscript 2. Manuscript 3 was developed to

address a gap in the literature with a pilot study to explore the influence of self-efficacy on physical activity in older adults with diabetes utilizing a mixed-method approach.

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CHAPTER 2

Relationship of Self-Efficacy to Physical Activity in Older Adults with Diabetes

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ABSTRACT

Diabetes affects 29.1 million individuals within the United States and has a highest prevalence in older adults than any other age group. Physical activity has been shown to improve diabetes control, but older adults are significantly less physically active than national recommendations. Higher levels of self-efficacy have been shown to increase physical activity in many populations. This integrative review critically examines the literature on the effects of self-efficacy on level of physical activity in older adults with diabetes. Four electronic databases were used to identify articles published between January 1996 and July 2015. Inclusion criteria were (a) studies with a theoretical link between self-efficacy and physical activity, (b) use of the definition of self-efficacy described by Bandura, (c) measurement of physical activity or exercise as an outcome variable, (d) mean age of study participants 50 years old or greater, (e) individuals with T2DM, and (f) articles in the English language. The search yielded a total of nine articles that met the inclusion criteria. Six of the nine articles reported significant relationships between higher levels of self-efficacy and higher levels of physical activity. Limited research has examined this relationship. This integrative review demonstrates a gap in research related to the effect of self-efficacy on physical activity in older adults with type 2 diabetes. Additional research is needed to further examine the relationship of level of self-efficacy to physical activity in older adults with T2DM.

Type 2 diabetes (T2DM) is the most prevalent form of diabetes affecting 95% of individuals with the disease.[1] There are 29.1 million people in the United States with diabetes.[1] According to the Centers for Disease Control and Prevention (CDC), 11.2 million Americans with diabetes are 65 or older and more than a fourth of people over 65 years old have diabetes.[1] Minority populations have higher rates of the disease. The risk of diabetes was 18% higher among Asian Americans, 66% higher among Hispanics, 77% higher among non-Hispanic Blacks, 87% higher for Mexican Americans, and 94% higher for Puerto Ricans than non-Hispanic white adults.[1]

An enormous concern is as the number of older adults continues to increase, the number of individuals with diabetes is also expected to increase. By 2030, the number of older Americans is expected to grow from 35 million to 70 million.[2] Given the growth of the older population and the incidences of diabetes in this population, the future number of older adults with diabetes could be much greater than current predictions, with a huge impact on individuals and society. The burdens associated with diabetes include pain, anxiety, personal relationship burdens, inconveniences caused by altered activities, and poorer quality of life.[3] In addition, the estimated annual cost of diabetes in America was $245 billion dollars, including $176 billion in direct medical costs and $69 billion in reduced productivity.[3]

One way to reduce the cost and complications of diabetes is through physical activity. Regular physical activity improves blood glucose control, reduces cardiovascular risk factors, and improves overall well-being.[3] Despite the benefits of physical activity, the CDC[4] has noted only12.8% of adults 65-74 years and only 6.8% of adults 75 years or older meet the recommended guidelines for physical activity.

Social cognitive theory[5] offers promise for explaining physical activity and developing effective activity interventions for older adults with T2DM. Self-efficacy is a key construct of Bandura's social cognitive theory.[5] Self-efficacy is belief in one's ability to organize and execute a course of action required to produce a desired outcome. Self-efficacy has been a strong predictor of physical activity behavior change and is a modifiable variable.[16] Multiple studies have shown a positive relationship between higher levels of self-efficacy and higher levels of physical activity;[17-19] however, the participants in these studies were not older adults with a diagnosis of diabetes. Allen[20], a noted researcher on SCT[5] and physical activity, conducted an integrative review on the ability of SCT to predict physical activity in individuals with T2DM. Allen examined 13 studies, and all showed a strong positive correlation between increased self-efficacy,[5] and increased physical activity in these individuals. However, the participants were primarily white with a mean age range of 31.3 to 61 years and a mean age of 52 years for all studies. Older adults with T2DM are a unique population because of their multiple co-morbidities and vulnerabilities. This integrative review examines the literature on whether higher levels of self-efficacy predict higher levels of physical activity in older adults with T2DM.

Concepts

Physical activity

The World Health Organization[21] has defined physical activity for adults 65 years and older as including "leisure time physical activity (for e.g., walking, dancing, gardening, hiking, swimming), transportation (e.g. walking or cycling), occupational activities (if the individual is still engaged in work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities." (p. 1) In this integrative review, a study was

included if it addressed any form of physical activity as defined here and met other criteria described below.

Older adults

The concept of older adults does not have a consistent definition. According to the WHO,[21] most developed countries have accepted classifying individuals 65 years and older as older adults. The US society also has difficulty defining older adults. Many discounts are available for older adults in America, but the age for a retailer's term "senior discount" varies greatly. For example, at 50, individuals are eligible to join the American Association of Retired Persons (AARP).[22] Because of the lack of a clear definition of older adults and health disparities for racial and ethnic minorities in the US that result in 'premature' aging, studies with a mean age of 50 years or above were included.

Methods

This literature review began with a comprehensive computer-assisted search. The five-stage literature search method of Whittemore and Knafl[23] was used for this review.
Figure 1 further illustrates the search method for this review. The criteria for inclusion in the review were (a) published studies with a theoretical link of self-efficacy to physical activity, (b) a definition of self-efficacy as described by Bandura,[8] (c) measurement of physical activity or exercise as an outcome variable, (d) mean age of participants 50 years or older, (e) individuals with T2DM, and (f) articles written in English. Unpublished articles, including dissertations and theses, and studies that included children were excluded. Because of the importance of Bandura's theory of self-efficacy,[5] articles were excluded that did not include this theory (either implied or clearly stated).

Keywords used for CINAHL, Ovid, and PsycInfo were: *type 2 diabetes, diabetes, self-efficacy, social cognitive theory, exercise* and *physical activity*. A CINAHL search using combinations of the keywords yielded 78 articles. An initial search in PubMed utilizing MeSH term combinations of *motor activity, recreation, exercise, diabetes mellitus, type 2 diabetes, and self-efficacy* yielded 344 articles. A search in PsycInfo using combinations of the keywords yielded 56 articles. An Ovid Medline search utilizing keyword combinations yielded 82 articles. Databases were searched from January 1996 to July 2015. The review began in 1996, one year before the last article included in a key study by Allen.[20] Searches from the four databases were combined for a total of 240 articles. After elimination of duplicates, 216 articles remained. Of those, 7 articles met the inclusion criteria for the review. A hand search of the reference lists from these 7 articles was performed and 2 additional articles were identified for a total of 9 articles.

Evaluation of Studies

The studies were assessed for quality using guidelines from the Oxford's Center of Evidenced Based Medicine.[24] All nine articles were graded as high in quality with A or B rating.

Results

Study Analysis and Interpretation

The data from the 9 studies reviewed were synthesized to answer the question: "Do higher levels of self-efficacy predict higher levels of physical activity behavior in older adults with T2DM?" The nine studies are summarized in Table1; these include three randomized controlled trials (RCT), three cohort studies, one observation and two experimental studies. Two of the RCTs tested physical activity interventions.[25, 27]

The results of the research studies are further summarized in Tables 1 and 2. Six[25-30] of the nine articles reported significant relationships between higher levels of self-efficacy and higher levels of physical activity. Four studies[26-28,30] that reported significant relationships between higher levels of self-efficacy and higher levels of physical activity did not report r-values, but did report other measures as noted in Table 1.

Of the nine studies reviewed, three studies[25,26,32] identified variables that affected either physical activity, self-efficacy, or both physical activity and self-efficacy; for example, lower level of education was related to self-efficacy (r = -.27) and co-morbidities at baseline were related to physical activity (r = -.27).[25]

Sample Characteristics

Samples for the nine studies reviewed ranged from 55 to 2,311 participants (mean = 387); one study included 2,311 individuals,[29] but all other samples included 250 participants or fewer. The participants were White in six of the nine studies;[26,27,32,33,35] all had type 2 diabetes, and were an average age of 58.7 years. Seven years was the average length of diagnosis of diabetes reported in four studies.[25,27,28,35] In five studies[25,29,30,32,35] the number of male and females participants were almost equal. Educational level, a potentially moderating variable, was not reported in five of the nine articles.[25,27,30,32,33]

Instruments

A total of five specific instruments were named in six of the studies.[26-28,32,33,35] The instruments included the Self-Efficacy for Managing Chronic Disease by Lorig, Sobel, Ritter, Laurent, and Hobbs;[36] the Physical Activity Self-Efficacy Scale adapted from Marcus et al.[37] the Self-Efficacy for Exercise Scale modified from Resnick et al.;[19] the Self-Efficacy Scale developed by van der Bijl, Poelgeest, and Shortridge-Baggett;[38] and McAuley's[39] Barriers to

Self-Efficacy scale. Two[28,29] of the six studies that found a positive relationship between self-efficacy and physical activity reported Cronbach's alpha ≥ .80 for internal consistency.[31] The validity of the instrument used was not reported in four of the six studies[25,26,29,30] which reported a positive relationship between greater self-efficacy and increased physical activity. This lack of information on validity created difficulty in assessing the merit of these results. Table 2 provides greater detail of the psychometric characteristics of these instruments.

Scoring

Eight studies used Likert or Likert-type scales with a 5 or 10 point range for rating of each item[25-30,32,35] while one study used confidence ratings from 0 to 100%.[33] All surveys used instruments with one to twenty questions. All measures were self-report and were analyzed using various versions of Statistical Package for the Social Science.[40]

Method of Measurement

Five studies used mailed instruments[25,27,28,32,35] while four collected the data during health care visits;[26,29,30,33] all nine used community dwelling participants.

Feasibility

All instruments contained both short items and short questionnaires;[25-30,32,33,35] however, the authors did not address the length of time needed to complete an instrument. The time factor may be important to consider in an older adult population.

Findings

Overall, six studies[25-30] positively supported the research question by reporting significant relationships between higher levels of self-efficacy and higher levels of physical activity. However, limited validity of instruments was reported with these six [25-30] studies. Additionally, limited RCT's (n = 3) were discovered within the literature review.

Eight studies used Likert or Likert-type scales.[25-30,32,35] The number of participants in all studies equaled a mean of 387 with one study's participants as an outlier with 2,311 individuals.[29] Only three studies[25,26,32] identified variables that affected either physical activity, self-efficacy, or both physical activity and self-efficacy.

Discussion

The integrative review did identify nine studies,[25-30] of which six reported statistically significant relationships between higher levels of self-efficacy and higher levels of physical activity. Although, there are limitations of the research as previously discussed, a statistically significant relationship was discovered between higher levels of self-efficacy and higher levels of physical activity which warrants additional research filling the gaps identified.

Regarding the instruments utilized,[19,36-39] only the one instrument developed by Resnick was specifically developed for use in older adults.[19] The Self-Efficacy for Managing Chronic Disease questionnaire by Lorig et al.[36] was not specifically designed for older adults; however many older adults have chronic disease. The original instruments by Resnick et al.[19] and Lorig et al.[36] had alpha coefficients of .92 and .91 respectively, which is evidence for internal consistency of the instruments.

Only three of the identified studies included interventions.[25,27,35] Another limitation included the lack of minority populations which have higher rates of the diabetes,[1] and none of the studies focused on people newly diagnosed with diabetes or people who had the disease for more than 10 years. Additionally, given the number of older adults with T2DM, it is a limitation that the highest mean age in the studies only reached 66.5 years old.[26] Additional research is clearly needed to incorporate these other groups.

Limited instruments have been tested in older adults with T2DM. The studies by Gleeson et al.[35] and Kara et al.[28] add value to the proposed research question because these instrument were developed specifically for older adults by testing the prior instrument and revising based on participant feedback of not feeling that certain questions were applicable to their group[19] or individuals with diabetes.[38] Future studies should examine the instruments used in these studies.

In summary, this review discovered gaps in the research including a lack of testing of interventions, lack of minority populations, individuals with newly diagnosed T2DM or diagnosis of diabetes longer than 10 years, low highest mean age, and minimal exploration of mediating and moderating variables.

Conclusions

Diabetes is a devastating disease and older adults have the highest incidence of diabetes, with minority populations experiencing the highest rates among older adults. Astonishing tangible and intangible costs are associated with diabetes within the United States and globally. Given that the rate of diabetes is projected to grow even more among older adults, the scenario for future generations demands effective interventions.

Physical activity has been identified as a key link in improving diabetes control. Social cognitive theory has been supported by other research to increase physical activity. Interventions based on SCT may promote positive behavior change in older adults with diabetes. Although the limited studies have examined the predictive effect of self-efficacy on physical activity in individuals with diabetes, the research on older adults remains limited and a substantial research gap exists for this particularly vulnerable population. This additional research on the relationship between physical activity and self-efficacy in older adult populations with T2DM, including

minority groups most affected by the disease, is desperately needed. The research findings can provide healthcare workers with information to improve potential mediating variables that affect older adults with diabetes and implement interventions effective in increasing physical activity. Research in this area has tremendous potential to fight the growth in the impact of diabetes on the older adult population.

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Table 1.
Summary of Self-efficacy and Physical Activity Research in Older Adults with Type 2 Diabetes, 1997-2013

Author	Sample	Research Question	Measurement Instrument	Intervention/Design	Results
Clark et al.[25]	n = 100 (n = 50 control group, n = 50 intervention group), mean age = 59.5 race not reported, 58% men, study location UK, average years with type 2 diabetes = 8 years, average bmi = 31, average A1C = 8.4 all individuals in sample with a diagnosis of type 2 diabetes, education not reported	To examine predictors of lifestyle behavior change related to a tailored self-management intervention for patients with type 2 diabetes was examined in a RCT	One item question, references instrument for measuring self-efficacy based on Lorig et al.[36] guidelines, uses 10-point Likert scale to rate confidence about taking part in physical activity, confidence rated as 1 = not at all to 10 = extremely confident, only one question used to assess physical activity related to self-efficacy, additional independent variables measured included stages of change for dietary fat reduction, stages of change for physical activity, barriers to healthy eating and physical activity, self-efficacy, personal models of diabetes	Randomized controlled trial, how randomization occurred is not explained, 50 individuals in usual care group, 50 individuals in intervention who received brief tailored interventions which included follow-up phone calls, other details regarding intervention not included in article, confidence (self-efficacy) measured at baseline, 3 months, and 1 year	No significant difference in intervention or control group for physical activity and self-efficacy. However, stages of change for intervention group, but not control group, changed from contemplation to action. Correlation of self-efficacy as a predicator of physical activity at baseline and 12 months for the intervention participants was moderate (r = .36, p = .01), correlation of self-efficacy and physical activity for control group not reported, authors report high levels of self-efficacy levels at baseline

Table 1.
Summary of Self-efficacy and Physical Activity Research in Older Adults with Type 2 Diabetes, 1997-2013 continued

Author	Sample	Research Question	Measurement Instrument	Intervention/Design	Results
Collins et al.[26]	n = 145, all individuals with a diagnosis of type 2 diabetes and PAD, mean age 66.5, 69% men, study location US, average A1C = 7.1, Caucasian = 90%, married = 62%, greater than High school = 92%,	Determine the relationship of self-efficacy and walking ability in individuals with diabetes mellitus and PAD	Six-item Self-Efficacy for Managing Chronic Disease Scale by Lorig et al.,[36] Likert scale with each of the six items ranging from 1 (not confident at all) to 10 (totally confident), additional independent variables measured included: socio-demographics (Lifestyle and Clinical Survey), walking impairment scores (Walking Impairment Questionnaire), health-related quality of life (Medical Outcomes Study Short Form 36-Item), exercise behaviors (Exercise Behaviors Scale), and depressive symptoms score (Geriatric Depression Scale)	Cohort study, participants identified from a randomized clinical trial	Self-efficacy scores of $\geq$ 7 were determined to be high self-efficacy scores, self-efficacy scores $\geq$7 and 6 minute walking distance equaled 293.0 meters (SD 60.75, p = .0040), self-efficacy scores < 7 and 6 minute walking distance equaled 247.3 meters (SD 79.7, p = .0040), self-efficacy scores $\geq$ 7 and maximal treadmill walking distance equaled 481.3 meters (SD 252.28, p = .0020), self-efficacy scores < 7 and maximal treadmill walking distance equaled 348.9 meters, (SD 252.28, p = .0020), higher self-efficacy scores the greater 6 minute walking time (p = .0061), higher self-efficacy scores the maximal treadmill walking distance (p = .0036)

Table 1.
Summary of Self-efficacy and Physical Activity Research in Older Adults with Type 2 Diabetes, 1997-2013 continued

Author	Sample	Research Question	Measurement Instrument	Intervention/Design	Results
Dutton et al.[27]	n = 85 with 80 completing the 1-month study, 94% retention, community diabetes center participants, all individuals with a diagnosis of type 2 diabetes, mean age = 57.1, study location not reported, 73% Caucasian, 69% female, weight = 98.5kg, average duration of type 2 diabetes was 3.0 years	Examine whether self-efficacy was affected by participation in a print-based physical activity intervention and improvements in activity levels	Five items asked one's confidence to exercise in five situations, five-point Likert scale used, higher scores indicative of greater self-efficacy	Randomized controlled trial; individuals were randomized to receive either a print-based tailored physical activity intervention or the usual care which consisted of a dietary tip sheet at baseline, 1-week after baseline assessment the intervention group received a two-page letter tailored to constructs assessed at baseline self-efficacy assessment collected at baseline and 4 weeks later after a diabetes education class	Tailored intervention associated with significant improvement in PA and self-efficacy, increase in walking 136.89 minute per week for intervention group (CI = 23.01, 271.68), self-efficacy scores increased 1.73 units with intervention group (CI = 0.02, 3.48), according to researchers, one unit increase in self-efficacy equals 12.67 minute a week in physical activity effect of treatment on physical activity after accounting for effect on self-efficacy (CI = -7.33, 253.40), this suggests treatment did not have a direct influence on physical activity after self-efficacy effect entered into the model

Table 1.
Summary of Self-efficacy and Physical Activity Research in Older Adults with Type 2 Diabetes, 1997-2013 continued

Author	Sample	Research Question	Measurement Instrument	Intervention/Design	Results
Gleeson-Kreig[35]	n = 55, 28 = women, 27 = men, all individuals with a diagnosis of type 2 diabetes, English speaking, under a physician's care, mean age = 53, mean time since diagnosis = 78 months, 100% Caucasian, study location northern New York State, mean years of education = 15, mean household income = $50,000	Tested the effect of keeping daily activity records on physical activity and self-efficacy in adults with type 2 diabetes and examined the feasibility and acceptability of this intervention	Nine-item five-point Likert scale using Resnick et al.[14] Self-efficacy for exercise scale instrument, total score was the mean of nine items, scores ranged from one to five with higher scores indicating higher levels of self-efficacy	Randomized controlled trial, randomly assigned subjects to intervention group which kept activity record or control which did not keep activity record; activity level and self-efficacy recorded at baseline and approximately six weeks later	No significant change in intervention or control group regarding self-efficacy and physical activity, intervention group (r = .23, p = .10), control group (r = .29, p = .05)
Kara et al.[28]	n = 101, convenience sample from outpatient center, all individuals diagnosed with type 2 diabetes, study location Turkey, mean age = 59.69, race not reported, 32.7% men, 67.3% women, average number of years with a diagnosis of diabetes was 10.74 years , 1% of population had a university education, 65% low income, 86% had health insurance	To adapt a Dutch/English self-efficacy scale for use in a Turkish population	Twenty item five point Likert scale	Cohort study, pretested instrument with 20 participants then invited larger participant group for study, 101 participants completed the survey, 85% of the 101 completed at four weeks	Kaiser-Meyer-Olkin = .80, factor analysis identified four factors related to self-efficacy 1. adequate nutrition, specifically weight control, 2. general nutrition related to medical treatment, 3. physical activity, 4. metabolic control, factor at significant levels for all three physical activity questions (factor load = .800, .614, .434) scale acceptable level of reliability and validity, Suggest testing in larger sample size, in different regions

Table 1.
Summary of Self-efficacy and Physical Activity Research in Older Adults with Type 2 Diabetes, 1997-2013 continued

Author	Sample	Research Question	Measurement Instrument	Intervention/Design	Results
Plotnikoff et al.[29]	n = 2,311 (number of participants with type 1 diabetes = 697, participants with type 2 diabetes = 1614), n = 1,717 of individuals who completed the questionnaire at 6 months, mean age of individuals with type 1 diabetes was 51.1 years old, mean age of individuals with type 2 diabetes was 63.0 years old, race reported as typical Canadian population, study location Canada, 51% participants with type 1 diabetes were female, 49% participants with type 2 diabetes were female, 34% completed university	Tested the social cognitive theory as an explanation of physical activity (PA) in adults with type 1 or type 2 diabetes	Thirteen-item five point scale, eight core items from Plotnikoff et al.[38] with five additional items added for the specific population confidence ratings ranged from 1 (not at all confident) to 5 (extremely confident)	Observational study, part of a larger study, but this current study reports the social-cognitive theory results from the Alberta Longitudinal Exercise and Diabetes, Research Advancement Study, questionnaires collected at baseline and six months	Significant positive outcome of increased PA in individuals with both type1 and type 2 diabetes related to self-efficacy and positive outcome of PA (baseline participants with type 1 diabetes (r = .47, p = .05), participants with type 2 diabetes (r = .44, p = .05), at 6 months, type 1 participants (r = .35, p = <.01), type 2 participants (r = .29, p = <.01)
Plotnikoff et al.[30]	n = 244, study location Canada, all participants had a diagnosis of type 2 diabetes, mean age = 60.9, 45.9% women, race not reported, 65% experienced a heart attack, angina, and hypertension	To determine variables as predictors of aerobic physical activity and resistance training in adults with type 2 diabetes	Eleven-item five point Likert scale by Plotnikoff et al.,[37] confidence ratings ranged from 1(not at all confident) to 5 (extremely confident)	Experimental study questionnaire at baseline and at 3 months	Higher levels of PA for both resistance training and aerobic physical activity associated with higher levels of self-efficacy at 3months (β = .45, p = .001)

Table 1.
Summary of Self-efficacy and Physical Activity Research in Older Adults with Type 2 Diabetes, 1997-2013 continued

Author	Sample	Research Question	Measurement Instrument	Intervention/Design	Results
Sweet et al.[33]	n = 234, all participants had type 2 diabetes, described as mainly Caucasian, 35% female, mean age of 53 years old, study location Canada	The study tested if motivation mediated the relationship between self-efficacy and 12-months physical activity with type 2 diabetes in the maintenance phase	Seven item confidence rated 0-100%, shortened version of McAuley's[36] scale, seven-item questionnaire, rated confidence level 0-100% to seven different barriers of exercise three times per week to determine if motivation such self-efficacy offset physical activity	Longitudinal study, participants part of randomized controlled trial (DARE trial) which was examining the effects of exercise on biophysical measurements Individuals randomized into four groups with three exercise groups: n = 59 aerobic n = 59 resistance n = 59 combined aerobic and resistance n = 57 waiting list control, intervention not described, focus of this study was the relationship of theory to exercise not intervention so all data pooled	Self-efficacy significantly and positively predicted 12-months of PA (β = .137, p = <.05), however when combined with autonomous motivation, self-efficacy and PA was not significant (β = .095, p > .10)
Vickers et al.[32]	n = 207, convenience sample, all participants had type 2 diabetes, mean age of 63 years old, study location United States, 95% White, 52% female, 68% of participants with co-morbid conditions	Study purpose to examine association between depressive symptoms and exercise-related variables, such as self-efficacy, in individuals with type 2 diabetes	Five item five point scale of self-efficacy utilized one time, confidence rated from one (not confident at all) to five (extremely confident)	Cohort study participants part of a larger study	Self-efficacy for exercise (CI = 0.68-0.88, p < .001), exercise frequency (CI = 0.98-1.00, p = .05)

Table 2. Review of Self-Efficacy Instruments

Characteristic			
Author	Clark et al.[25]	Collins et al.[26]	Dutton et al.[27]
Instrument	one item survey adapted from Lorig et al.[41] guidelines	Self-Efficacy for Managing Chronic Disease from Lorig et al.[36]	Physical activity self-efficacy scale adapted from Marcus et al.[37]
Scoring	10-point scale ranging from 1 (not at all) to 10 (extremely)	1 (not confident at all) to 10 (totally confident), linear regression performed with self-efficacy and each dependent variable including exercise	1 (not confident at all) to 5 (extremely confident)
Reliability	Not reported in this article	Previously tested with an internal consistency with a reliability = .91	In this study, test-retest reported as "good" from the original scale
Validity	Not reported in this article	Not reported	Internal Consistency reported as .82
Feasibility	Feasibility not commented, but with one item feasibility may be very high.	Short 6 item survey to complete and easy to obtain instrument from Stanford website, free to use	Short 5 item survey to complete, instrument available as requested from author Marcus[37]

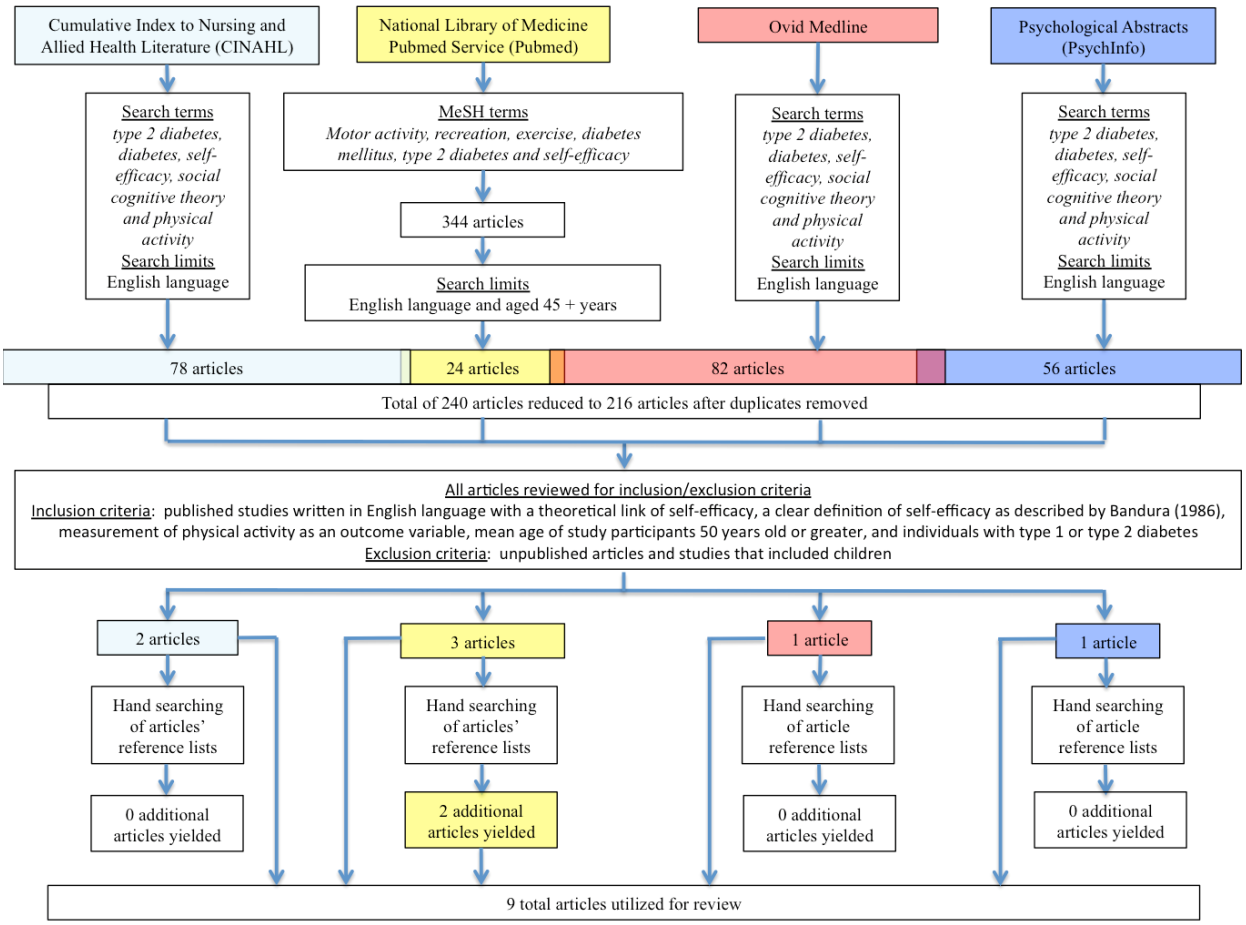
Table 2. Review of Self-Efficacy Instruments continued

Characteristic			
Author	Gleeson-Kreig[35]	Kara et al.[28]	Plotnikoff et al.[29]
Instrument	Self-efficacy for exercise scale[19]	Self-efficacy scale[38]	No specific name of instrument is given, but Plotnikoff et al.[42] self-efficacy scale is referenced with eight core items used from this scale and five additional items developed
Scoring	Total score was the mean of nine items with each item on a five point Likert scale, score range one to five, higher score indicated higher self-efficacy	New instrument for this language which was tested for content validity, internal consistency stability, construct validity, factor loading with three factors	Items were scored one (not at all confident) to five (extremely confident)
Reliability	High internal consistency with a Cronbach's $\alpha = .91$	Cronbach's $\alpha = .88$, test-retest conducted at 4 weeks during outpatient appointment intraclass correlation coefficient .91, $p < .001$, 95% Confidence interval (.86 - .94)	Cronbach's $\alpha = .95$
Validity	Not reported after modified, but reported before modification, $r = .56$	Nine experts in the field reviewed for content validity each item rated on 4 point scale	Not reported
Feasibility	Initial survey and meeting regarding research completed in 30 min. to 1 hour, 6 week follow up survey and instructions lasted 15-30 minutes	Short five item survey completed, during office visit	Short thirteen item survey

Table 2. Review of Self-Efficacy Instruments continued

Characteristic			
Author	Plotnikoff et al.[30]	Sweet et al.[33]	Vickers et al.[32]
Instrument	No specific name of instrument is given [42] self-efficacy scale is referenced	Shortened seven item version of McAuley's barrier self-efficacy scale[39]	Self reported self-efficacy scale$_{37}$
Scoring	Items were scored one (not at all confident) to five (extremely confident)	Participants rated their confidence 0 to 100% on seven items, the average percentage scores were computed from the seven items	Five items with rating from one (not at all confident) to five (extremely confident) were used, the authors do not state specifically how the scores are calculated.
Reliability	Not reported in this study references$_{42}$ as the instrument utilized for this study$_{42}$, reports a Cronbach's $\alpha = .88$ (time 1), $\alpha = .89$ (time 2), $\alpha = .90$ (time 3). However Plotnikoff et al. (2001) instrument measuring self-efficacy is an eight item scale versus the current reported eleven item survey	Cronbach's $\alpha = .87$, good internal consistency	Instrument had reported previous test-retest reliability as .90 previously in a medical population, but unclear which medical population
Validity	Not reported	Not reported	Not reported
Feasibility	Short eleven item survey	Short seven item survey, easy to complete	Short five item survey

Figure 1.
Relationship of Self-Efficacy to Physical Activity in Older Adults with Diabetes
Search Method



CHAPTER 3

Recruitment of Older Adults from Rural Senior Centers: An Exemplar of Lessons Learned Utilizing a Theory Based Approach

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Background

In the US there are currently 35 million individuals ≥ 65 years old, and by 2030 this population is estimated to reach 70 million.[1] It is well established that many older adults suffer from chronic diseases with multiple long-term effects to their health. Despite this growing number of older adults with multiple health problems, this population remains underrepresented in essentially all areas of health-related research.[2-7] The principal reason for lack of inclusion is a study design eliminating older adults from a study altogether.[8] However, even when older adults are targeted for a study, often investigators are challenged to reach the number of participants needed to demonstrate feasibility or provide sufficient power to answer the research question.

One area where recruitment proves to be daunting is in studies proposed to answer questions about older adults living in rural areas. Two-thirds of US counties are considered rural[9] with 20% or more of the older adult population residing in these areas.[10] Large disparities exist when comparing individuals living in rural to those living in urban areas. Those disparities include: lower socioeconomic status, higher rates of chronic disease and obesity, deferment of care due to cost, lower levels of exercise, lower provider-to-individual ratios, and higher mortality rates.[10] Furthermore, there are multiple barriers for these rural older adults that challenge recruitment goals such as isolation, poverty, fear of motives of 'outsiders', depression, transportation, and mental illness.[11] These barriers are compounded by the usual 'practical' barriers such as study design or demands placed on older adults by study requirements.[8] Despite the critical need for recruitment of older rural adults into research, limited resources and tools exist to improve this challenging phenomenon.

It is well recognized that planning a research recruitment design is a vital part of successful research.[8,11,12] A search of the existent literature, however, revealed limited evidence

regarding techniques and protocols to enhance recruitment with older adults, particularly in rural areas and in places older adults are known to congregate such as a senior center and nutritional site setting.

Based on the Social Ecological Model as described by McLeroy and colleagues[13] as a framework to suggest approaches, this article summarizes barriers and facilitators of research recruitment encountered with community dwelling older adults attending senior centers and nutrition centers in rural underserved areas. The investigators utilized the findings from a multi-site mixed-method study that involved a minimum of two interactions with the participants (one to collect bio-behavioral data, the other collect data from a focus group) conducted in rural areas of a southeastern state with lower socio-economic adults as an exemplar of recruitment issues.

Exemplar Research – overview and participants

Approval for the research was obtained from the Institutional Review Board at the Medical University of South Carolina and the University of North Carolina in Charlotte with informed consent obtained from study participants. The primary goal of the research was to determine self-efficacy levels, physical activity levels, and barriers/facilitators of physical activity to explore the relationship between these variables among community dwelling older adults with type 2 diabetes in rural counties of North Carolina while also determining the feasibility of enrolling older adults from senior centers and nutrition sites as input for the design of future studies.

A convergent parallel design with a mixed method approach was used to determine feasibility and to explore the relationships among variables affecting diabetes in older adults. The quantitative method consisted of a first of a survey packet followed by the qualitative study that consisted of focus groups.

Because this phenomenon is not well studied, a pilot study was designed. Pilot studies require a sample size justification. Hertzog recommends a sample size for a pilot study be 10 to 40.[14] Hertzog suggests informal guidelines from experienced researchers as another method for determining sample sizes in pilot studies.[14] While Leon and colleagues assert that pilot sample size is often based on pragmatics of recruitment and feasibility.[15] Thabane and colleagues recommend the combination of qualitative and quantitative research to optimize information obtained from a pilot study which will be utilized for this study.[16] After consideration of the above recommendation and consultation with the experienced researchers, it was determined that the ideal goal of this mixed methods pilot study is to recruit 40-60 individuals with complete data collected on a minimum of 40 individuals.

The inclusion criteria for participant recruitment were: (a) being ≥ 65 years; (b) attend or have access to the Senior Center and/or the Nutrition Center; (c) self-report a diagnosis of diabetes; (d) and able to ambulate without a wheelchair. Exclusion criteria were as follows: (a) planning to move out of the area within the next 2 months; (b) unwilling to complete both a survey and participate in a focus group; (c) non-English speaking; (d) scoring less than 3 points on the Mini-Cog.[17]

Five congregate nutrition sites whose clients were representative of people living in this rural region – fixed, poor to modest income, education at high school or less, several chronic illnesses that affected function – were chosen as sites for the study. The director of the senior center reported limited research had occurred in those centers and expressed interest in a long term research partnership with the senior center suggesting to also approach the four nutrition centers operated by the main senior center, which are located in four surrounding counties.

All five sites agreed to participate in the research. Recruitment began at the main center and the largest nutrition center, with goals to continue recruitment until sufficient numbers of surveys were completed for a representative sample of the selected population and saturation of the qualitative data was reached. All five sites were utilized with sufficient sample size recruited from these five sites.

Methods

Theoretical Model

The framework used in this study was the Social Ecological Model (SEM) (1988) of McLeroy and colleagues[13], that primarily focuses on behavior patterns affected by five factors: intrapersonal, interpersonal, institutional, community, and political policy. Table 2 displays specific examples of these five factors as barriers and facilitators of recruitment as it relates to our research and current literature. The interventions outlined in this paper explain how factors from the SEM affected barriers and facilitators of recruitment and assisted researchers to improve recruitment through application of this model in a rural older population.

Intrapersonal Factors.

Intrapersonal factors include characteristics of an individual such as knowledge, attitude, self-concept, and skills.[13] Some intrapersonal factors of research can be manipulated by the researcher, while others such as mobility cannot be changed. With carefully planning of research protocol numerous factors can easily be modified and positively affect recruitment.

An often used element is verifying all appointments one day prior to any interaction – whether it be focus group, interview or intervention. Accomplishing this verification requires inclusion of sufficient researcher assistant time built into the budget. The research team was not able to use a call back system and recruitment efforts of simply informing the participants of the

research was not yielding, so large red signs were provided for each participant with personalized date and time of the individual's focus group appointments with a suggestion of placement in an area that was easily visualized at home – usually the refrigerator . Recruitment numbers increased after implementing this small change. Participants reported that the sign served as a reminder to assist with the date and time of their focus group.

Recruitment also improves when the researcher and research staff are seen as approachable and knowledgeable; this been shown to be effective in increasing volunteers to participate in other studies and was positive in our exemplar.[18, 19] The PI [TA] was a native to the area, understood the dialect and history of the area which assisted with the research participants viewing the PI [TA] as approachable. Volunteering weekly in a non-research role at either the main senior center or satellite nutrition center 6 months prior to initiating the research study allowed participants to view the researchers as "giving back to their community" and further established trust.

Offering free blood pressure screenings was another method the researchers utilized to establish a rapport and give back to the senior "community." Participants reported they wanted to help the researcher and help others like themselves in their "community."

Another important intrapersonal factor is offering small incentives as a thank you gift, which is important to seniors.[12,18, 19] Often seniors in our research reported that this token of thanks made them feel that others thought their time was valuable. The seniors were very appreciative of these small items and began telling others about the research study, even mentioning the thank you gift. This referral of a friend by "insiders" further validated the purpose of our research to other potential participants which further positively affected our recruitment efforts creating a snowball effect.

Interpersonal Factors.

Interpersonal factors include social networks both formal and informal such as friends and family.[13] This critical interpersonal factor largely affected recruitment for the study. One of the best examples was the relationship among peers at the centers. Close relationships among peers existed; however, any large groups of 30 people or more at the senior center did not appear to have as closely woven relationships. Often these large groups met once a month with changes in attendees from month to month, and consistent participation was minimal in large groups. However, targeting smaller groups that met weekly and already had tightly formed networks, such a card-playing groups, produced more "buy-in" from the group.

When the researcher established trust and buy-in from the group as advocated in the literature,[12, 19] the research was supported, and individuals from the smaller group encouraged others to participate in the study. For example, when the researcher took time to participate in two sessions of a card playing group enrollment doubled from those small groups.

Institutional Factors.

Institutional factors include social institutions with organizational characteristics and formal and informal rules by which they operate.[13] Senior centers and nutrition sites often have multiple formal and informal rules. For example, an implicit rule was - coordinate with key individuals such as the senior center director before you schedule an event. Often administrators coordinate events, however there are key individuals beyond administration. An example we experienced was senior groups often had unofficial leaders informally selected by the group. This individual often required notification of the event or we would not receive "buy-in" from the group.

In addition, logistics for an event may not be communicated to all staff members within a particular site leading to disruption. The following methods can improve communication of events: sending an reminder email to the director and staff, going to the site the day before to remind staff of the event, and placing flyers in the center regarding date, time, and location of the event. We found these small details having a large positive impact on our recruitment.

Community Factors.

Community factors include relationships among organizations, institutions, and informal networks that contain defined boundaries.[13] There are many examples that one can see in society related to recruitment of older adults in a rural community environment. One major factor, as cited in the literature[11, 19] and experienced during our research was that "outsiders" do not fit into the senior community. Multiple methods were utilized to overcome this barrier. For example, prior to the study the researcher volunteered to become part of a group and serve as needed in a non-research role. Offering services such as free blood pressure screenings, and participating in activities within the center such as playing cards or bingo with the group are examples of being involved with the groups. This presence served as a means for individuals to establish trust and view the researcher as part of the group and as "giving back" to the center. This example demonstrates not only the role of community factors, but also interpersonal factors that affected our research.

Another example that is easily modified in any research plan and important for future research studies is endorsement from local individuals.[11, 18] The director or staff endorsed the researcher at every event and often encouraged potential subjects to participate in the research positively affecting recruitment. Many of the strategies mentioned above are simple, yet not well published in the literature.

Political Policy.

Political policy includes local, state, and federal policies.[13] One political policy is related to the cost to attend the nutrition center program; some of this may be dictated by funding through the Older Americans Act – Congregate Nutrition Services[20] and some may be related to the wealth of the local tax base and its ability to support services for older adults vs. other key infrastructure services. People who attend congregate nutrition services programs tend to be older (average age 76) and 56% receive over half their daily food at the center suggesting this is a poorer group of older Americans.[20] There are various options related to cost which are associated with participants at the nutrition center that exist across the targeted county in North Carolina and those in the US. The political policy surrounding this factor gives a nutrition center flexibility of implementation based on multiple factors specific to that center.

The researchers observed various options related to cost methods across the sites. One method was taking payment from individuals who attended the nutrition center, which could indirectly affect recruitment at the nutrition center as it might generally affect attendance. The most commonly observed method related to meal cost, was cost sharing of the meals. As individuals entered the room, a sign-in sheet was located on a desk as a check-in to the facility. Next to the sign-in was a locked box for collection of money to share the cost. All observed participants were familiar with this process and signed in as they entered the building then deposited the set amount in the box.

One individual informed the researcher if they did not participate in the cost sharing of the meal, their name was called out among the participants, and they were notified that they did not participate in the cost sharing. This individual reported she did not attend as often because she could not afford the $3.00 cost associated with the meal and did not want to be embarrassed

in front of her peers. This cost sharing could hinder participants from attending a research study event, especially if the date of the research was not a meal not factored into the participant's budget. One way to increase participation could be offering to cover the cost sharing for all individuals who are eligible to participate in the research study. This method was not part of our protocol; therefore, we were not able to test the effect on our recruitment efforts.

Results

Our recruitment was planned for 40-60 individuals and ultimately recruited 46 individuals. The principal investigator [TA] initially screened individuals for eligibility at various activities already offered at the senior center such as luncheons or large monthly events over a 4 month period. We experienced recruitment failure and realized the critical importance of interpersonal relationships as discussed in the SEM model.[13] We then began recruitment with smaller groups which improved the interpersonal relationship and increased enrollment.

At the beginning and throughout the research project the senior center director and staff assisted the PI [TA] with identification of group activities or days that were best to recruit. However, initially the director suggested larger groups for recruitment which did not assist with the interpersonal relationship. We maintained a close relationship with the director who then suggested smaller groups for recruitment. Endorsement was given by the director or staff at these smaller group events which further assisted us in reaching our research goals.

We initially scheduled our focus groups without input from participants. However, after recruitment failure occurred with this method, we planned the focus group meeting based on input from participants on time and location. Once we changed to the recruitment techniques discussed here, our recruitment numbers increased from sixteen to forty-six in a four week

period and our recruitment goals were met. Table 2 illustrates additional methods utilized to assist in meeting our recruitment goals.

Discussion

Throughout the study, recruitment strategies were consistent for both the main senior center and nutrition centers. By utilizing methods described in this article, we met our research and recruitment goals with the targeted population. This exemplar describes multiple methods to effectively recruit the older adult population utilizing the five SEM factors.[13] Each of these factors is important to address; however there are a few critical items that improved our recruitment efforts which is supported throughout the research such as: incentives/gift[12,18,19], establish trust[11,12, 19], partnership with key leaders/community advisory board[11,18, 19], and location convenient to participants.[8,11]

The major factor of the SEM[13] model for recruitment was the intrapersonal factor of developing a close social network between the research and participant that assisted with establishing trust. This intrapersonal factor greatly influenced our recruitment and is essential for recruitment of any older adults for research. However, as demonstrated in this exemplar intrapersonal factors can be time intensive with months of establishing trust prior to the research study. Adequate planning in the research design for this time factor is crucial.

Conclusion/Limitation

Many details can affect the recruitment for participation in research and researchers are encouraged to explore all methods for recruitment discussed throughout this article when planning a research study of the older adult population. This paper describes an exemplar in which recruitment was bolstered by attention to the SEM components. Limitations of this study include location for example the culture of aging in a rural area which may be more

homogeneous (interpersonal domain) and thus more easy to generalize than those found in suburban and urban areas. Furthermore, accessibility issues may be moderated by better transportation (policy domain) which was a recruitment issue in this study. Successful recruitment strategies need to be tailored to the older adult population – this paper gives some insight into strategies. Additional research exemplars utilizing theory -based approaches are necessary to further explore these recruitment challenges in a complex and ever growing population of older adults.

Table 1. Intentional/Unintentional Exclusion of Older Adults in Research Studies

Intentional exclusion	Unintentional exclusion
Safety concerns[8] Capacity to consent[8] Additional time commitment with older adults not accounted for with planning (extended family responsibility, health appointments, civic, and church/religious)[11] Fall risk[8]	A simply lack of planning around practical barriers of a study[8,11,12,18,19] Demands a study places on the research participant[8] Location of research[19] Inflexible scheduling of distribution of surveys, collection of surveys, and or focus group timing[19] Literacy issue[8, 11,19] Privacy/cultural concerns[19] Lack of resources (telephone, internet, or transportation) for participation in research[11,19] Hearing impairments[8] Lack of access to targeted study sites[19] Lack of accounting for multiple and chronic disease and or poor health status[11]

Table 2. Examples of SEM Levels: Exemplars from the Current Research Theory Based Approach Paralleled with Examples from the Literature

Level of SEM	Barriers/Facilitators from this exemplar	Examples from the literature	Examples of methods included which enhanced recruitment
Intrapersonal	<u>Barriers</u> Physical barriers Age Mobility Chronic illness Change in health status (illness, hospitalization) Weather Transportation Education Comprehension of research instructions Literacy Fear regarding money/cost associated with research Education level Time constraints Employment status Doctor's appointment Other time commitments Memory Forget about date and time of assigned research focus group Depression <u>Facilitators</u> Attitudes/beliefs Previous experience with research	<u>Facilitators</u> Incentives/gift[12,19] Follow-up letters and telephone call[19] Effective communication of research objective [11, 12] Scheduling several different times to account for weather/ arthritis acting up or other illness[19] Respect culture, use familiar language, similar dress[19] Sensitivity to culture[11] Allow adequate time for recruitment[11] Motivation to participate whether to benefit others with answers, incentives, or other benefits[8]	<u>Facilitators</u> Incentives/gift Effective communication of research objective Scheduling several different times to account for weather/ arthritis acting up or other illness Respect culture, use familiar language, similar dress Sensitivity to culture Allow adequate time for recruitment Motivation to participate whether to benefit others with answers, incentives, or other benefits Assisted with completing surveys

	Interest in research Desire/will power Education Literacy Education level Comprehension of research instructions Incentive for research participant		
Interpersonal	<u>Barriers</u> Relationships Cliques at center Relationship with researcher Researcher who look like research Groups often not open for new member of the group New researcher New individual to center Family responsibilities - care giver for grandchildren / significant other <u>Facilitators</u> Relationships Relationships with peers at center Researcher who look like research Relationship of researcher with director of the senior center and other key players at the senior center Researcher serving as volunteer Participation of	<u>Facilitator</u> Each-one-reach-one, encouraging others to reach out to friends and family[19] Reach out to friend or neighbor[11,12] Staff training to treat the participants like "gold"[12] Use targeted scripts and speak in slow, courteous manner[12] Knowledgeable, caring researchers that relate well to older adults and can provide information, explain research, problem solve concerns, and establish trust[11,12, 19] Establish participant registry for current and future research[12] Encourage bonding with study by designing study logo[12] Increased visibility assist with establishing trust[19] Schedule from intact group[19]	<u>Facilitator</u> Reach out to friend or neighbor Staff training to treat the participants like "gold" Use targeted scripts and speak in slow, courteous manner Knowledgeable, caring researchers that relate well to older adults and can provide information, explain research, problem solve concerns, and establish trust Increased visibility assist with establishing trust Schedule from intact group Make it a social event with refreshments Give key leaders and volunteer leadership positions

	researcher at events Buy in to research by groups (asking participants preferences regarding date and times of focus groups Asking participants to encourage others to participate, "Spread the word" Incentive for research participation	Make it a social event with refreshments[19] Give key leaders and volunteer leadership positions[11,19]	
Institutional	<u>Barrier</u> Logistics Hours of operation for senior center Hours of operation for nutrition center Dates and time of classes already offered by the center Space availability at the research site <u>Facilitator</u> Dates and time of classes offered by offered by the center		<u>Facilitator</u> Dates and time of classes offered by offered by the center (Utilized these to establish focus groups)
Community	<u>Barriers</u> Payment policy Regulation of food served at the nutrition centers Qualification for receiving food Sign up requirement for event or meal program Qualification for	<u>Facilitator</u> Partnership with key leaders/community advisory board[11,19] Media campaign/Mass mailing[11,12,19] Health presentation (allowing participants to come and get to know the research before signing up for research)[19]	<u>Facilitator</u> Partnership with key leaders/community advisory board Flyers/Monthly Newsletter/Announcements during events at the senior center Health presentation (allowing participants to come and get to know the research before signing up

	program <u>Facilitator</u> Logistics Communication among staff about location and time of research event Announcements Flyers Monthly newsletters	Community event to promote research[11]	for research)
Political Policy	<u>Barrier</u> Payment policy Regulation of food served at the nutrition centers Qualification for receiving food Sign up requirement for event or meal program Qualifications for program <u>Facilitator</u> Ease of access to multiple groups Ease of access to nutritious foods/dietary needs	Location convenient to participants[8,11]	<u>Facilitator</u> Ease of access to multiple groups Ease of access to nutritious foods/dietary needs

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CHAPTER 4

The Influence of Self-Efficacy on Physical Activity in Older Adults with Diabetes: A Mixed-Methods Approach

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Introduction

Diabetes Mellitus affects 29.1 million Americans[1] and more than one-fourth of people over 65 years have diabetes mellitus.[1] Fewer than 20% of these individuals meet the national recommendations for control of diabetes such as A1C, blood pressure, and lipids.[2] One important intervention to improve diabetes control is regular physical activity.[3] Despite the benefits of physical activity, the CDC notes that fewer than 15.9% of adults 65 years and older meet the recommended guidelines for physical activity.[4]

Although multiple benefits of physical activity have been noted, physical activity is one of the most difficult lifestyle changes to implement.[5] Moreover, individuals with diabetes have special concerns such as hypoglycemic events surrounding physical activity, with older adults being particularly more vulnerable to this change.[6] Additionally, many older adults with diabetes have co-morbid conditions further compounding this problem. Although older adults are the largest group of individuals with diabetes, this group is often not included or specifically excluded from randomized controlled trials.[7] This limitation makes evaluation of effective interventions for physical activity with the older adult more challenging.[7]

However, higher levels of self-efficacy, a construct of Social Cognitive Theory (SCT),[8] have been associated with higher levels of physical activity.[9] Williams and French conducted a recent systematic review with a meta-analysis of psychological techniques that are most effective in changing self-efficacy related to physical activity inteventions.[10] They examined 27 studies and concluded that increases in self-efficacy resulted in increases in physical activity ($r_s = 0.69$, $p < 0.001$). The mean age of persons included in the meta-analysis was 43.2 years with a SD of 7.7 years,[10] which indicates that the largest population with diabetes, older adults was not included.

The goal of this pilot study was to examine the relationship of self-efficacy with physical activity as well as the barriers to and facilitators of physical activity in older adults with diabetes, as well as to explore the feasibility of senior center recruitment. The feasibility of senior center recruitment is addressed in a previous manuscript. The results of this pilot study adds to the limited number of studies regarding the influence of self-efficacy on physical activity in individuals ≥ 65 years and older who self-report a diagnosis of diabetes; thus this study addressed a key gap in the research literature.

Methods

Study design

A convergent parallel design with a mixed method approach was used to explore the relationships among variables affecting diabetes and physical activity in older adults.[11] This study received approval from two southern university's IRB boards. Written informed consent was obtained from all participants prior to enrolling in the research study.

Sample and recruitment

A participant was included if they were ≥ 65 years and older, attended a rural Senior Center in North Carolina and/or an associated Senior Nutrition Center, self-reported a diagnosis of diabetes , and had the ability to ambulate without a wheelchair. Exclusion criteria included non-English speaking, plans to move out of the area within the next 2 months, unwilling to complete both a survey and participate in a focus group, or scoring less than 3 on the Mini-Cog.[12]

Measurements

A survey packet was given to all eligible individuals to complete at home. This survey packet consisted of the nine questions from the Behavioral Risk Factor Surveillance Survey

(BRFSS)[13] demographics and selected questions related to physical activity and self-reported health conditions, Self-Efficacy of Exercise Scale (SES)[16], Community Healthy Activities Model Program for Seniors (CHAMPS).[17] Cognitive impairment was assessed utilizing the three-item Mini-Cog,[12] with sensitivity up to 99% and a specificity of 93% for predicting dementia.[12] The Timed "Up & Go" [14] (TUG), utilized to assess fall risk, has an 87% sensitivity for predicting falls in older adults[15] in a variety of clinical settings. An older adult who takes ≥12 seconds to complete the TUG assessment is at high risk for falling which was the criterion used to dichotomize the scores.[14] Individuals were also asked if they were an exerciser or non-exerciser which was then marked on their survey packet as a yes for exerciser and no for non-exerciser. No definition for exerciser or non-exerciser was given. This was self-determined by the individual as our focus group questions explored their concept of physical activity.

The SES[16] instrument assesses self-efficacy levels using a 9-item scale with possible score range of 0-90 with an internal consistency of 0.92 (Cronbach's α). The validity has been tested with Lambda X values from structural equation modeling for all items and ranged from 0.61 to 0.87, $p<0.05$.[16]

Physical activity was assessed utilizing the CHAMPS questionnaire which is a 41-item scale developed to specifically measure level of physical activity among older adults. Harada and colleagues utilized Pearson correlation to compare individuals scoring moderate levels of physical on the CHAMPS questionnaire to findings from mini-ankle log (0.42, $p = <0.01$) and waist device (0.48, $p = <0.001$) in older adults.[18]

Focus group

All individuals who completed the survey packets were also invited to participate in a focus group utilizing a semi-structured interview guide with 11 open-ended questions to gain

insight about barriers to and motivators of physical activity. All focus groups were audio recorded, transcribed, and verified by two independent researchers following Kruger and Casey methodology.[19] On average the focus group activities lasted 60 minutes. A minimum of two trained researchers were at each event with the PI always leading the focus group.

Two independent researchers entered and confirmed data entry. Statistical analyses were conducted using Windows version 21.0 of the Statistical Package for the Social Science (SPSS, Chicago, Inc., IL). The 'Framework Analysis' approach was used for analysis of the focus groups.[20] The software NVIVO 10.0[21] was used to assist with organizing codes.

Analysis

Quantitative

Descriptive statistics were calculated for the entire sample and by site (main center vs. nutrition centers). Normality of continuous variables was assessed utilizing the Shapiro-Wilk test. A t-test was used to compare age, BMI, and waist-hip ratio (WHR) by site. TUG, education, marital status, income level, and activity were dichotomized as appropriate for each of the groups and the dichotomized variables were compared by site utilizing Chi squared or Fisher's exact test as appropriate for smaller sample size. Demographics/clinical findings of exercisers/non-exercisers were assessed utilizing a t-test. Race was not investigated due an almost homogeneous sample of whites with only two African-Americans out of 46 participants. In addition, internal consistency was determined for SES using Cronbach's α.

A Shapiro-Wilk was utilized to assess for normality among SES and CHAMPS. After the results of Shapiro-Wilk were examined, a Spearman rho was calculated to assess correlation between SES and CHAMPS. A one-way ANCOVA was used to compare CHAMPS scores in exercisers and non-exercisers after the adjustment of the SES scores. A one-way ANCOVA was

also used to compare CHAMPS scores by an individual's site location after adjustment of the SES scores.

Further, in the absence of established cut-points, total CHAMPS/SES median scores were utilized to set high/low levels of physical activity and self-efficacy. Scores at or above the median were categorized into high levels of self-efficacy and physical activity while scores below the median were categorized as low levels of self-efficacy and physical activity, respectively. The median total score of the SES and CHAMPS for this study was 50 for level of self-efficacy and 2586.2 METs per week for CHAMPS. A Chi square test was used to compare SES and CHAMPS levels for all participants. Mean TUG, SES, and CHAMPS were compared by site and exerciser/non-exerciser using independent t-tests.

TUG scores, age, BMI, and WHR means were compared across each of the four groups (high and low self-efficacy, high and low levels of physical activity) utilizing a one-way ANOVA.

Qualitative

We directly informed 322 individuals about our research and the criteria. We had 57 individuals approach us with interest in our research; 48 of these individuals were eligible to participate in the focus groups with ultimately 46 participating in 9 focus groups. Following the focus group transcriptions, an initial 87 themes were developed for all of the questions as several themes emerged from each question. The 87 themes were categorized and then reviewed until 30 major themes were developed with 9 minor themes for all the questions to assist with a clearer understanding of older adult's thoughts about levels of self-efficacy, levels of physical activity, barriers and motivators of physical activity in older adults with diabetes. However, to further explore one of the major goals of this study, self-reported barriers to and facilitators of

physical activity for seniors with diabetes, thematic codes were further explored to develop the overall themes of the focus groups regarding this concept. A total of 6 major themes emerged.

Results

Quantitative

Descriptive analysis.

The convenience sample consisted of a total of 46 older adults including 44 non-Hispanic Whites (96%) and 2 non-Hispanic African-Americans (4%) with a total of 29 females (63%) and 17 males (37%) from all sites (Table 1). The number of participants recruited from the main senior center and nutrition centers were similar (n = 20 and n = 26, respectively). Overall, participants for this study were primarily white, mean age of 75 years old, low income, and overweight with limited college education or less, normal blood pressures according to the JNC 8 national guidelines[22] and at risk for heart disease based American Heart Association for WHR[23] (Table 1). However, when comparing participant characteristics by site there was a significant difference noted for level of education, marital status, income, and TUG scores. The participants at the main senior center were primarily married (80%) with college educations (70%), higher income levels (60%), and low TUG scores (90%). The nutrition center individuals were primarily not married (69%), no college education (54%), high TUG scores (54%) with the greatest difference in these groups noted as low incomes status (88%) (Table 2). There were no significant differences noted in exercisers and non-exerciser by the demographics/clinical findings that were assessed (Table 3).

Self-efficacy and physical activity

Spearman correlation of SES with CHAMPS scores identified a weak, but positive statistically significant ($r = .377$, $p = .010$) correlation. When dichotomizing SES and CHAMPS

and comparing the resulting 4 groups, this relationship did not hold (p = .238) (Table 4). Similarly, when comparing exercisers and non-exercisers, there was no significant difference in CHAMPS scores after the adjustment by SES scores [F (1, 42) = 1.492, p = .229]. However, when comparing CHAMPS scores by activity level without adjustment by SES scores a statistically significant difference was observed (p = .022) (Table 6). TUG scores differed significantly by site (p = .015) (Table 5). There was also a significant difference between CHAMPS scores based on an individual's site location after adjustment was made for the SES scores [F (2, 42) = 4.064, p = .024)].

Qualitative

Self-efficacy.

A total of 6 major themes emerged that are described in Tables 7 and 8. The major theme identified by participants regarding self-efficacy or confidence in the ability to exercise was they had the ability to be physically active. One participant reinforced this by stating, "I think I have no problem with the ability. It's just the motivation. I'm like one of the other guys said: My wife has been a member of the Y years and years and years but I would not go."

Another participant discussed motivation slightly different, yet displays the same theme. The participant states, "you're tired and not really all that motivated…Yeah and by the time you realize that you're pretty decrepit already…it affects you mentally because you look in the mirror and it's like being in a horror movie… You look in it and say 'My God'!"

A minor theme about physical activity identified was limitations and stamina. One participant supported this by stating, "Well, also, that thing about it (physical activity), and I'm sure everybody knows this, by the time you get up, and you actually get moving and get yourself

dressed, get a shower or get whatever it is you need done, you already you know, gosh, I've already spent 3 hours just getting ready to go someplace and then I'm tired."

Barriers.

The major barrier identified with physical activity was pain. We observed statements that support this multiple times in our research. Statements from participants included, "When you have a lot of aches and pains, you're not as motivated to get out."

Motivators.

The major theme identified as motivators of physical activity was a drive to engage in physical activity. One participant's statement supports our finding with this statement, "I think there's got to be a drive within you. I'll say I'm getting older and older and if I don't try to do some exercise or something like that, I'm just gonna lay down in the bed and die." Another participant supported this with their statement, "I feel that if we don't use it we're gonna lose it."

The following statements support the minor themes of needing to push self, friend system, and motivation, "Most of the time I enjoy it because I got friends you know there is some several of us three or four of us, I'd say majority of people like camaraderie and being able to talk to somebody while they doing exercise."

Diabetes.

Themes developed regarding the effect of diabetes on an individual such as low blood sugar and being tired. These themes were supported with statements such as, "You just get tired", "yeah. When mine gets low that's when I get tired", and "if your sugar goes below 60 you start to get jitters…" A different major theme emerged from multiple individuals regarding the effects of diabetes. These individuals reports such statements as diabetes had "no affect" on

them with statements such as, “it don’t bother me” and “Ahhh, it it really I don’t think it has at all.”

Triangulation

Themes that emerged were analyzed for levels of self-efficacy, levels of physical activity, barriers and motivators of physical activity. The data were then synthesized by using quantization from the themes that emerged from the qualitative focus groups by coding each participant as high or low level of self-efficacy and physical activity based on their response which was linked to the individual in the focus group. Level of self-efficacy and level of physical activity that were reported in the surveys were ranked with dichotomous variables for each participant as either high or low. A table was developed to further validate the level of self-efficacy and physical activity between survey results and focus group results for each individual.

When examining the relationship between our survey results and focus groups, we found that 63% of the time both self-efficacy levels and physical activity level from the survey responses were consistent with an individual participant’s focus group response. While comparing our focus group response to survey results, we found a validation of only 22% when looking at one variable of either self-efficacy level or physical activity.

Discussion

This pilot study examined the feasibility of recruitment in senior and nutrition centers while examining the influence of self-efficacy on physical activity in older adults with diabetes. This knowledge from this convenience sample adds to the current literature regarding feasibility of recruitment in senior centers. The research question regarding the influence of self-efficacy and physical activity was assessed and among all the groups, this research supports a weak, but positive association between self-efficacy and physical activity. The sample size in this study

was adequate for a pilot study, but a relatively small sample size to answer the research question; yet a positive correlation between SES and CHAMPS was found. This positive finding in this vulnerable population warrants the need for additional research in this area.

We also noted a relationship between TUG[14] scores and site. This relationship may be further explained by significant differences in demographic variables by site. We observed this difference while conducting our research and further validated these findings with our statistical tests. This difference should be further explored.

Because of the gap that exists in the literature, we added mixed-methods to further enhance our findings. There are studies reporting the barriers to and facilitators of physical activity in older adults, [24, 25] but limited literature specifically targeting older adults with diabetes; thus this qualitative data further adds to the limited research in this population. Our research revealed major themes that add to the knowledge of barriers and facilitators of physical activity in older adults with diabetes. The themes included: reporting an ability to exercise, pain is a barrier to physical activity, and knowing they need to exercise is a motivator to physical activity. These findings are supported by previous literature. [26, 27] An additional surprising and unique theme were reports that diabetes did not have any effect on some individuals – they were still able to …. We could not find previous literature to support these findings and thus this should be explored further.

Triangulation further added to the validity of this newly researched area and validated our findings from participant's surveys and focus group response regarding self-efficacy and physical activity. We compared the responses from the surveys to their responses in the focus group and found a link between reports of both self-efficacy and physical activity, but a limited link between either self-efficacy or physical activity.

The SES and CHAMPS are well-tested instruments utilized for this study; yet limited studies report utilizing these instruments together in this population.[28-30] Although there is a lack of generalizability of this study, which was not the primary focus of this research, this research does add to the gap in the literature by developing a pilot study and design with preliminary results to further build upon. There remains limited research of the influence of self-efficacy on physical activity in older adults with diabetes. This influence of self-efficacy and physical activity has been important in developing effective interventions for other populations[10] and should be further assessed in larger populations of older adults with diabetes.

Conclusion

Although the correlation between self-efficacy and physical activity levels is weak, a correlation does exist and is statistically significant. These findings along with relationship of CHAMPS and TUG scores by activity level and site, respectively, add to the literature. A significant difference in demographics by site was noted as well. These differences can have an effect on results and should be explored with future research studies that include older participants from other rural regions to see the influence of culture and diversity of race and on activity.

Additionally, our research added a rich description to the literature regarding barriers and facilitators of physical activity among older adults with diabetes. Our research also revealed a unique finding of individuals' perception that diabetes as "no effect" on their ability to participate in activity, which could not be found in the literature. This new finding warrants additional investigation.

We recommend further assessment of the variables of self-efficacy and physical activity in older adults with diabetes with modifications. These modifications would include testing the

current research design with a larger sample size. This larger sample size can then be used to assist with the development of effective interventions for physical activity.

As the number of older adults continues to increase and the number of these individuals with diabetes continues to increase, the development of effective interventions for increasing physical activity in this population is paramount to improving outcomes with these individuals. Further exploration of the findings from this study can addresses a significant gap in the research with this vulnerable population. By addressing this gap, researchers can begin to address a significant health care need for our older adult population.

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Table 1 Demographic of research participants n = 46

	Proportion (n=46)
Age (mean +/- std)	75 +/- 6.1
Race	
African American (n = 2)	4%
White (n = 44)	96%
Gender	
Male (n = 17)	37%
Female (n = 29)	63%
Marital status	
Never married (n = 1)	2.2%
Divorced (n = 3)	6.5%
Widowed (n =20)	43.5 %
Married (n = 22)	47.8.%
Income	
Less than $10,000 (n = 1)	2.2%
$10,000 to less than 15,000 (n = 5)	10.9%
$15,000 to less than $20,000 (n = 5)	10.9%
$20,000 to less than $25, 000 (n = 9)	19.6%
$25,000 to less than $35,000 (n = 11)	23.9%
$35,000 to less than $50,000 (n = 7)	15.2%
$50,000 to less than $75,000 (n = 7)	15.2%
$75,000 to less than $100,000 (n = 1)	2.2%
More than $100,000 (n = 0)	0.0%
Education	
Elementary (n = 3)	6.5%
Some high school (n = 3)	6.5%
High school graduate or GED (n = 12)	26.1%
Some college 1-3 years (n = 19)	41.3%
4 years or more of college (n = 9)	19.6%

Table 2 Comparison of proportions and mean of demographic/clinical characteristics by site

	Main Center (n=20)	Nutrition Centers (n=26)	*p*-value
Age	71.6 +/- 5,7	77.6 +/- 5.1	.359[a]
BMI	28.8 +/- 6.0	30.3 +/- 4.7	.520[a]
Female	60% (12/20)	65.4% (17/26)	
Waist-hip-ratio			
Overall	.913 +/- .11	.917 +/- .07	.031[a]
Male	.981 +/- .12	.963 +/- .73	
Female	.867 +/- .08	.891 +/- .05	.000[d]
TUG risk			
Low	90% (18/20)	46% (12/26)	.002[c]
High	10% (2/20)	54% (14/26)	
Education			
College	80% (16/20)	46% (12/26)	.032[c]
No College	20% (4/20)	54% (14/26)	
Marital status			
Married	70% (14/20)	31% (8/26)	.008[b]
Not Married	30% (6/20)	69% (18/26)	
Income			
Low Income	40% (8/20)	88% (23/26)	.001[c]
High Income	60% (12/20)	12% (3/26)	
Activity level			
Exerciser	65% (13/20)	54% (14/26)	.446[b]
Non-exerciser	35% (7/20)	46% (12/26)	

[a]t-test
[b]Chi-square
[c]Fisher's exact test
[d]ANOVA

Table 3 Demographics/Clinical findings of research participants by exerciser or non-exerciser using a t-test

	Exercisers (n=27)	Non-exerciser (n=19)	*p*-value
Age	74.7 +/- 6.3	75.4 +/- 5.8	.868
BMI	27.7 +/- 4.2	32.4 +/- 5.5	.350
Waist-hip-ratio	.913 +/- .8	.917 +/- .1	.868
Systolic blood pressure	131.5 +/- 12.3	127.9 +/- 17.5	.201
Diastolic blood pressure	76.2 +/- 8.2	76.5 +/- 10.2	.291

Table 4 Relationship of Level of Self-efficacy and Level of Physical Activity (All groups) using Chi-square

		Level of Self-efficacy		
		Low (n =23)	High (n =23)	*p*-value
Level of CHAMPS	Low High	61% (14/23) 39% (9/23)	43% (10/23) 57% (13/23)	.238[b]

Table 5 Comparison of TUG, SES, and CHAMPS by Site [mean +/- std (median; range)] using a t-test

	All groups (n = 46)	Nutrition Center (n =26)	Main Center (n =20)	p value
TUG	(11.9 +/- 5.7) (10.1; 4.15-29.8)	(13.8 +/- 5.7) (11.9; 6.7-30.0)	(9.4 +/- 5.7) (8.7; 4.2-24.0)	.015[a]
SES	49.9+/-23.1 (50.0; 0-90)	(46.7 +/ 23.6) (43.5; 0-90.0)	(54.1 +/- 22.3) (51.0; 13.0-90.0)	.982[a]
CHAMPS	3904.8+/-4258.2 (2586.1; 0.0-18576.4)	(3088.8+/-3281.8) (2223.5; 0-12656.0)	(4965.6+/-4968.35) (3080.1; 0-18576.4)	.093[a]

Table 6 Comparison of TUG, SES, and CHAMPS by Activity [mean +/- std; (median; range)] using t-test

	Exerciser (n =27)	Non-exerciser (n = 19)	p value
TUG	(10.7 +/- 4.6) (10.0; 4.15-24.0)	(13.3+/-6.8) (11.6; 7.00-30.0)	.071
SES	(56.5 +/- 21.5) (56.0; 13.0-90.0)	(40.5 +/- 22.5) (38.0; 0-90.0)	.852
CHAMPS	(4766.5 +/- 4874.9) (3146.12; 0-18576.4)	(2680.4 +/- 2490.7) (2386.2; 0-10111.1)	.022

Table 7 Major and Minor Themes from Focus Groups (n = 46 individuals)

Theme 1 Self-efficacy	**Major theme** Able to exercise **Minor themes** Limited Not motivated to exercise Laziness Less stamina Less desire
Theme 2 Barriers	**Major theme** Pain **Minor themes** Age Arthritis Health Laziness
Theme 3 Motivators	**Major theme** Because they need to exercise **Minor themes** Need to push self Friend system Motivation
Theme 4 Diabetes	**Major theme** No effect **Major theme** More tired **Major theme** Low blood sugars makes them feel poorly

Table 8 – Matrix of Thematic Codes with Illustrative quotes

Question	Theme 1	Theme2	Theme 3	Theme 4	Illustrative Quotes
What do you consider physical activity?	**Major theme** Walking Running Jogging	**Major theme** Housecleaning/Housework **Minor themes** Gardening/yard work	**Major theme** Gym/Exercise Class **Minor theme** Working	**Major theme** Recreation **Minor theme** Dancing	"walking is supposed to be the best form of exercise." "they say even gardening and working in the yard... Things like that are good for the elderly." "taking the trash out, vacuuming, dusting, washing dishes. "
What do you think about your ability to do physical activity?	**Major theme** Able to exercise	**Major theme** Limited by knees/hip pain **Minor themes** Limited	**Major theme** Not motivated to exercise		"Yeah I can walk too but I don't do much extensive." "I think.. I have no problem with the ability. It's just the motivation. I'm like one of the other guy said: My wife has been a member of the Y for years and years and years but I would not go.
Think back to a time you were most physically active. How did you feel about physical activity then? How did you think about your ability to be physically active?	**Major theme** Felt good about it	**Major theme** Felt like I could do anything **Minor themes** Listed age they could do the most	**Major theme** Didn't think about it just did		"I could do anything I wanted to do." "I could do anything I wanted to do."

What has made you do less physical activity?	**Major theme** Pain-knees/hips **Minor themes** Pain	**Major theme** Motivation **Minor theme** Health Laziness	**Major theme** Age	**Major theme** Arthritis	"Both of my knees gave out on me and I had replacements … and that slowed me down" "you're tired and not really all that motivated." "Well, also, that thing about , and I'm sure everybody knows this, by the time you get up, and you actually get moving and get yourself dressed, get a shower or get whatever it is you need done, you already you know, gosh, I've already spent 3 hours just getting ready to go someplace." "Age and health"
What makes you feel like you are not able to do physical activity?	**Major theme** Less stamina	**Major theme** Less desire	**Major theme** Age		"I just don't have the get up to go really. " "The want to wants to but your wanting to can't do" "Let's just say you if you don't use it you loose it."

What has helped you make changes to your level of physical activity?	**Major theme** Need to push self	**Major theme** Friend system			""You know they say the old saying. 'If it's to be, It's up to me. ' Do it myself." "Most of the time I enjoy it because I got friends you know there is some several of us three or four of us" "Nothing is fun by yourself."
What has helped you feel like you are able do physical activity?	**Major theme** Because they have to	**Major theme** Drive or state of mind			"I think you have to talk to yourself to do more… You have to yourself that this is good for you, that you better start doing it or else." "I think there's got to be a drive within you. I'll say I'm getting older and older and if I don't try to do some exercise or something like that, I'm just gonna lay down in the bed and die. "
How do you feel getting older affects your ability to be physically active?	**Major theme** Less stamina	**Major theme** Less energy **Minor themes** Body parts wear out	**Major theme** No effect		"Just don't have the energy.."

How do you feel getting older affects your ability to be physically active? (Continued)					"Well it don't seem don't seem like you got the energy to do things…And you keep and you keep waiting so maybe I'll maybe I'll have the energy tomorrow and that don't seem to work either."
How do you feel diabetes affects your ability to be physically active?	**Major theme** No effect	**Major theme** More tired			I get sleepy when my sugar's high "I can't tell if it's affected me. I'm diabetic. I don't know if it's affected anything other than my diet. I cannot ..cause I was controlled with exercise. I cant do that exercise now, so.. "
Of all the things we discussed, what is most important to you about your physical activity and ability to do physical activity?	**Major theme** Motivation	**Major theme** Need to keep moving			"Well, even though you don't feel like you can do it you really need to push yourself to do it. " "Makes you feel like more active keeping busy kind of give up and say I don't want to do that but you have to keep going."

We were interested in your thoughts about physical activity and self-confidence regarding physical activity. Have we missed anything? We were interested in your thoughts about physical activity and self-confidence regarding physical activity. Have we missed anything?	**Major theme** Bad weather	**Major theme** Confidence/ You have to make yourself			"Well, the most important thing I've found is just have the mindset…To keep to keep putting one foot in front of the other" "I feel that if we don't use it we're gonna lose it."

CHAPTER 5

Conclusion and Summary

Overview of manuscripts

The result of this dissertation adds to the research on the influence of self-efficacy on physical activity in individuals ≥ 65 years and older who self-report a diagnosis of diabetes; thus these studies address a key gap in the research literature. Manuscript 1, an integrative review, identified limited research, interventions, and instruments in the study of physical activity and self-efficacy in older adults with diabetes.

Manuscript 1 was important in establishing a gap in the literature, thus forming a foundation for this research and dissertation. Manuscript 2 added to the literature by addressing recruitment which is critical to any research, but historically difficult with older adults in senior centers. Manuscript 2 is unique because it describes the utilization of a theoretical approach to aid in the recruitment in older adults. This theoretical approach can be further tested and used to enhance future recruitment with older adults. Manuscript 3 was a mixed-method study conducted as a pilot study to begin exploring the role of physical activity in older adults with diabetes.

Contribution to overarching research question

This research adds to the body of knowledge with an integrative review which then informed the design of this pilot study. In this pilot study, there was a correlation found between self-efficacy and physical activity among the entire group ($r = .377$, $p = .010$). We also found the CHAMPS[17] score median was marginally significant for site and activity level ($p = .022$). Further, when comparing the overall TUG[14] scores by site, a significant difference ($p = .015$) was noted.

Although there is limited generalizability of this study, which was not the primary goal of this research, the feasibility of research in older adults with diabetes at senior centers was examined while also providing a rich account of the multiple influencing factors surrounding self-efficacy and physical activity in rural older adults with of diabetes. Additionally, our focus groups yielded valuable information to contribute to the scientific community related to barriers and motivators of physical activity with identification of major themes. Our research uncovered unique findings related to diabetes perception and physical activity. Each of the findings above warrant further exploration.

Limitations

As with many research studies there are limitations. We have identified 3 major limitations with this dissertation. The first limitation is our sample size. We recognize that this was a pilot study with an adequate sample for a pilot study, but due to sample size we are limited in our secondary purpose of this pilot study of answering our research question and thus inhibiting the generalizability of this research. The second limitation is experience of the PI in conducting focus groups. We consulted with the literature and our experts on the team for assistance with this barrier. However, although we have rich findings from our focus group, we feel that having a novice researcher conduct focus groups could have limited our findings. We noted improvement with the flow of dialogue with each additional focus group conducted. The last limitation is the specific elements of the design of the mixed-methods. The design of the mixed-methods provided us with rich information. However, linking each research participant's survey to their focus group responses later was a tedious process. Despite detailed notes taken by several researcher assistants at each focus group session, at times the local dialectic was

difficult to understand, thus making it tedious and difficult to link an individual's focus groups response to a particular individual. Recording and verbatim transcription by someone from that locale could improve fidelity of data; funding will be sought for this resource in future work.

Importance of theoretical model

As previously noted, physical activity has been identified as a key link toward improving diabetes control. Self-efficacy, a construct of Social Cognitive Theory, has been supported by other research to increase physical activity. Interventions based on SCT may promote positive behavior change in older adults with diabetes. Although limited studies have examined the predictive effect of self-efficacy and physical activity in all ages of individuals with diabetes, the research for older adults in this area is nearly non-existent and a substantial research gap exists for this particularly vulnerable population in an ever expanding disease. The use of this theoretical-model is important for additional research which explores the role of self-efficacy with physical activity. Additional research in all older adult populations with diabetes and inclusive research of minority groups most affected by the disease on physical activity and self-efficacy relationships is desperately needed.

Research Trajectory

Because of the uniqueness of this study, there were no studies we could utilize for direct comparison of results. We do recommend further testing with larger sample size and in multiple senior center sites to validate these findings. After adequate testing, we would recommend the introduction of an intervention to test self-efficacy and physical activity levels. We recommend expanding and revising the questionnaire to focus on themes we have identified. We specifically recommend the use of a scale to expand on the concept of self-efficacy scores and physical activity levels during the focus groups. Although there are limitations to this pilot study, this

study adds to the limited number of studies on the influence of self-efficacy on physical activity in individuals ≥ 65 years and older who self-report a diagnosis of diabetes. Additional studies such as this should be conducted and can add rich data to physical activity among this population.

Contribution to research

Astonishing tangible and intangible costs are associated with diabetes within the United States and globally. Given that rates of diabetes are projected to grow even more disproportionally among older adults and that the older adult population is increasing as well, the combination of these factors set up a debilitating scenario for future generations which demands effective interventions.

The nurse researcher is well positioned to further critically examine and perform this research which can promote evidenced-based behavior change. This evidenced-based behavior change can occur by understanding the role of self-efficacy with physical activity behavior which holds the potential to diminish the increase and impact of diabetes on the older adult population. Additionally, research findings from larger studies with similar design to this one can have the potential to provide healthcare workers with information to improve their understanding of potential variables that affect older adults with diabetes. This understanding can allow healthcare workers to offer more effective interventions to improve control of diabetes in older adults.

APPENDIX A: IRB APPROVAL LETTER

Institutional Review Board for Human Research (IRB)
Office of Research Integrity (ORI)
Medical University of South Carolina

Harborview Office Tower
19 Hagood Ave., Suite 601, MSC857
Charleston, SC 29425-8570
Federal Wide Assurance # 1888

APPROVAL:

This is to certify that the research proposal **Pro00042239** entitled:
The influence of self-efficacy on physical activity in older adults with diabetes

submitted by: **Heather Anderson**
Department: **Medical University of South Carolina**
Review for Pro00042239

for consideration has been reviewed by the IRB and approved with respect to the study of human subjects as adequately protecting the rights and welfare of the individuals involved, employing adequate methods of securing informed consent from these individuals and not involving undue risk in the light of potential benefits to be derived therefrom. No IRB member who has a conflicting interest was involved in the review or approval of this study, except to provide information as requested by the IRB.

Continuing Review Approval Date: **5/9/2016**
Approval Expiration: **5/8/2017**

Type: **Expedited**

Vice Chairman, IRB-I - Medical University of South Carolina
∗ Susan Newman, PhD, RN, CRRN

Statement of Principal Investigator:

As previously signed and certified, I understand that approval of this research involving human subjects is contingent upon my agreement:

1. To report to the Institutional Review Board for Human Research (IRB) any adverse events or research related injuries which might occur in relation to the human research. I have read and will comply with IRB reporting requirements for adverse events.
2. To submit in writing for prior IRB approval any alterations to the plan of human research.
3. To submit timely continuing review reports of this research as requested by the IRB.
4. To maintain copies of all pertinent information related to the research activities in this project, including copies of informed consent agreements obtained from all participants.
5. To notify the IRB immediately upon the termination of this project, and/or the departure of the principal investigator from this Institution and the project.

∗ ***Electronic Signature****: This document has been electronically signed by the IRB Chairman through the HSSC eIRB Submission System authorizing IRB approval for this study as described in this letter.*

APPENDIX B: IRB CONTINUING REVIEW APPROVAL LETTER

Institutional Review Board for Human Research (IRB)
Office of Research Integrity (ORI)
Medical University of South Carolina

Harborview Office Tower
19 Hagood Ave., Suite 601, MSC857
Charleston, SC 29425-8570
Federal Wide Assurance # 1888

APPROVAL:

This is to certify that the research proposal **Pro00042239** entitled:
The influence of self-efficacy on physical activity in older adults with diabetes

submitted by: **Heather Anderson**
Department: **Medical University of South Carolina**
Review for Pro00042239
for consideration has been reviewed by the IRB and approved with respect to the study of human subjects as adequately protecting the rights and welfare of the individuals involved, employing adequate methods of securing informed consent from these individuals and not involving undue risk in the light of potential benefits to be derived therefrom. No IRB member who has a conflicting interest was involved in the review or approval of this study, except to provide information as requested by the IRB.

Continuing Review Approval Date: **5/9/2016**
Approval Expiration: **5/8/2017**

Type: **Expedited**

Vice Chairman, IRB-I - Medical University of South Carolina
∗ Susan Newman, PhD, RN, CRRN

Statement of Principal Investigator:
As previously signed and certified, I understand that approval of this research involving human subjects is contingent upon my agreement:

6. To report to the Institutional Review Board for Human Research (IRB) any adverse events or research related injuries which might occur in relation to the human research. I have read and will comply with IRB reporting requirements for adverse events.
7. To submit in writing for prior IRB approval any alterations to the plan of human research.
8. To submit timely continuing review reports of this research as requested by the IRB.
9. To maintain copies of all pertinent information related to the research activities in this project, including copies of informed consent agreements obtained from all participants.
10. To notify the IRB immediately upon the termination of this project, and/or the departure of the principal investigator from this Institution and the project.

∗ ***Electronic Signature****: This document has been electronically signed by the IRB Chairman through the HSSC eIRB Submission System authorizing IRB approval for this study as described in this letter.*

APPENDIX C: MINI-COG OFFICE BASED TOOLS FOR DEMENTIA

Mini-Cog Screening Test composed of a 3-item recall and a clock drawing test.

Instructions:

1. Instruct the patient to listen carefully to 3 unrelated words (e.g. apple, table, car).

2. Ask the patient to draw a clock face. After the clock is drawn, ask the patient to draw the hands so that the clock shows the time, ten minutes after eleven.

3. After the clock drawing, ask the patient to repeat the 3 unrelated words.

Scoring

Give 1 point for each recalled word after the Clock Drawing Test distractor.

Patients recalling none of the three words are classified as demented (Score=0.)

Patients recalling all three words are classified as non-demented (Score=3).

Patients with intermediate word recall of 1-2 words are classified based on the CDT (abnormal= demented; normal=non-demented)

Note: The Clock Drawing Test is considered normal if all numbers are present in the correct sequence and position and the hands readably display the requested time.

APPENDIX D: SELF-EFFICACY OF EXERCISE SCALE INSTRUMENT

Self-Efficacy of Exercise Scale

How confident are you right now that you could exercise three times per week for 20 minutes if:

	Not Confident	Very Confident
1. the weather was bothering you	0 1 2 3 4 5 6 7 8 9 10	
2. you were bored by the program or activity	0 1 2 3 4 5 6 7 8 9 10	
3. you felt pain when exercising	0 1 2 3 4 5 6 7 8 9 10	
4. you had to exercise alone	0 1 2 3 4 5 6 7 8 9 10	
5. you did not enjoy it	0 1 2 3 4 5 6 7 8 9 10	
6. you were too busy with other activities	0 1 2 3 4 5 6 7 8 9 10	
7. you felt tired	0 1 2 3 4 5 6 7 8 9 10	
8. you felt stressed	0 1 2 3 4 5 6 7 8 9 10	
9. you felt depressed	0 1 2 3 4 5 6 7 8 9 10	

APPENDIX E: CHAMPS INSTRUMENT

CHAMPS Activities Questionnaire for Older Adults

Date:_____

CHAMPS: Community Healthy Activities Model Program for Seniors

Institute for Health & Aging, University of California San Francisco

Stanford Center for Research in Disease Prevention, Stanford University

Contact: Anita L. Stewart, Ph.D., UCSF, anitast@itsa.ucsf.edu

This questionnaire is about activities that you may have done in the past 4 weeks. The questions on the following pages

In a typical week during the past 4 weeks, did you…	

are similar to the example shown below.

INSTRUCTIONS

If you DID the activity in the past 4 weeks:

Step #1 Check the YES box.

Step #2 Think about <u>how many</u> TIMES <u>a week</u> you usually did it, and write your response in the space provided.

Step #3 Circle how many TOTAL HOURS <u>in a typical week</u> you did the activity.

1. Visit with friends or family (other than those you live with)? ☒ ☐ **YES** How many TIMES a week? ٢ ➔ ☐ **NO**	How many TOTAL hours a week did you usually do it? ➔ Less than 1 hour / 1-2½ hours / 3-4½ hours / 5-6½ hours / 7-8½ hours / 9 or more hours

Here is an example of how Mrs. Jones would answer question #1: Mrs. Jones usually visits her friends Maria and Olga twice a week. She usually spends one hour on Monday with Maria and two hours on Wednesday with Olga. Therefore, the total hours a week that she visits with friends is 3 hours a week.

If you DID NOT do the activity:

- **Check the NO box and move to the next question**

In a typical week during the past 4 weeks, did you …							
1. Visit with friends or family (other than those you live with)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
2. Go to the senior center? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

3. Do volunteer work? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
4. Attend church or take part in church activities? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

5. Attend other club or group meetings? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
6. Use a computer? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

7. Dance (such as square, folk, line, ballroom) (do <u>not</u> count aerobic dance here)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
8. Do woodworking, needlework, drawing, or other arts or crafts? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

9. Play golf, carrying or pulling your equipment (count walking time only)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL hours a week did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
10. Play golf, riding a cart (count walking time only)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL hours a week did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

11. Attend a concert, movie, lecture, or sport event? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
12. Play cards, bingo, or board games with other people? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

13. Shoot pool or billiards? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
14. Play singles tennis (do <u>not</u> count doubles)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

15. Play doubles tennis (do <u>not</u> count singles)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
16. Skate (ice, roller, in-line)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

17. Play a musical instrument? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
18. Read? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

19. Do heavy work around the house (such as washing windows, cleaning gutters)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
20. Do light work around the house (such as sweeping or vacuuming)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

21. Do heavy gardening (such as spading, raking)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
22. Do light gardening (such as watering plants)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

23. Work on your car, truck, lawn mower, or other machinery? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
****Please note: For the following questions about running and walking, include use of a treadmill.**							
24. Jog or run? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

25. Walk uphill or hike uphill (count only uphill part)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
26. Walk <u>fast or briskly</u> for exercise (do <u>not</u> count walking leisurely or uphill)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

27. Walk <u>to do errands</u> (such as to/from a store or to take children to school <u>(count walk time only)</u>? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
28. Walk <u>leisurely</u> for exercise or pleasure? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

29. Ride a bicycle or stationary cycle? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
30. Do other aerobic machines such as rowing, or step machines (do <u>not</u> count treadmill or stationary cycle)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

31. Do water exercises (do <u>not</u> count other swimming)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
32. Swim moderately or fast? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

33. Swim gently? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
34. Do stretching or flexibility exercises (do <u>not</u> count yoga or Tai-chi)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

35. Do yoga or Tai-chi? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
36. Do aerobics or aerobic dancing? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

37. Do moderate to heavy strength training (such as hand-held weights of <u>more than 5 lbs</u>., weight machines, or push-ups)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
38. Do light strength training (such as hand-held weights of <u>5 lbs. or less</u> or elastic bands)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

39. Do general conditioning exercises, such as light calisthenics or chair exercises (do not count strength training)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL hours a week did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
40. Play basketball, soccer, or racquetball (do not count time on sidelines)? ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL hours a week did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

41. Do other types of physical activity not previously mentioned (please specify)? _____ ☐ **YES** How many TIMES a week?_____ ➔ ☐ **NO**	How many TOTAL <u>hours a week</u> did you usually do it? ➔	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

Thank You

APPENDIX F: LETTER OF PERMISSION TO UTILZE CHAMPS INSTRUMENT

Dear Heather:

Thank you for your interest in the CHAMPS Physical Activity Questionnaire. You are free to use it with no permission required. Information, instructions, the questionnaire, and scoring rules are on our website.

http://dne2.ucsf.edu/public/champs/resources/qxn/

Note that the scoring requires knowing the weight and height of the respondent – in case you don't collect that information elsewhere, we have a version in which that is added at the end of the questionnaire.

There also is a Spanish translation of the CHAMPS questionnaire, including information on the method of translation.

If you need to modify it for applicability to your particular situation, feel free to do that as well. Many people find that they need to add items to be appropriate. An article by Ken Resnicow and colleagues is cited there that provides an example of modifying the questionnaire.

Please let me know if you need anything else.

Sincerely,

Anita Stewart

APPENDIX G: TIMED UP AND GO INSTRUMENT

Measures mobility in people who are able to walk on their own (assistive device permitted)

Name_____

Date_____

Time to Complete_____seconds

Instructions:

The person may wear their usual footwear and can use any assistive device they normally use.

1. Have the person sit in the chair with their back to the chair and their arms resting on the arm rests.

2. Ask the person to stand up from a standard chair and walk a distance of 10 ft. (3m).

3. Have the person turn around, walk back to the chair and sit down again. Timing begins when the person starts to rise from the chair and ends when he or she returns to the chair and sits down. The person should be given 1 practice trial and then 1 scored trial.

An older adult who takes ≥12 seconds to complete the TUG is at high risk for falling.

APPENDIX H: BEHAVIORAL RISK FACTOR SURVEILLANCE INSTRUMENT

Behavioral Risk Factor Surveillance (BRFSS)

1. What is your age? _____years

2. Are you Hispanic or Latino?

1 Yes
2 No
3 Don't know / Not sure
4 Refused

3. Which one or more of the following would you say is your race?

(Check all that apply) Please read:

1 White
2 Black or African American
3 Asian
4 Native Hawaiian or Other Pacific Islander
5 American Indian or Alaska Native
6 Something else [specify]_____

4. Are you…?

Please read:

1 Married
2 Divorced
3 Widowed
4 Separated
5 Never married
6 A member of an unmarried couple

5. What is the highest grade or year of school you completed?

1 Never attended school or only attended kindergarten
2 Grades 1 through 8 (Elementary)
3 Grades 9 through 11 (Some high school)
4 Grade 12 or GED (High school graduate)
5 College 1 year to 3 years (Some college or technical school)
6 College 4 years or more (College graduate)

6. Are you currently…?

1 Employed for wages-full-time
2 Employed for wages-part-time
3 Self-employed
4 Out of work for more than 1 year
5 Out of work for less than 1 year
6 A Homemaker
7 A Student
8 Retired
9 Unable to work

7. What kind of business or industry do you work in or did you work in?

_____

8. What is your annual household income from all sources?

1 Less than $25,000
($20,000 to less than $25,000)
2 Less than $20,000
($15,000 to less than $20,000)
3 Less than $15,000
($10,000 to less than $15,000)
4 Less than $10,000
5 Less than $35,000
($25,000 to less than $35,000)
6 Less than $50,000
($35,000 to less than $50,000)
7 Less than $75,000
($50,000 to less than $75,000)
8 Less than $100,000
($75,000 to less than $100,000)
9 $100,000 or more

9. Please circle your gender.

1 Male
2 Female

10. Do you engage in a physical activity group?

1 Yes

2 No

11. If you engage in a physical activity group, is it at the Stanly County Senior Center?

1 Yes

2 No

12. Please list any other health problems you may have?

_____

_____

_____

APPENDIX I: FOCUS GROUP INTERVIEW INSTRUMENT

Welcome to our focus group today. Thank you for taking time out to talk with us about your physical activity. My name is Tonya Anderson and I am a PhD student at the Medical University of South Carolina. We are trying to find out more about your thoughts about physical activity and self-confidence about physical activity. You were invited because you completed survey at the senior center. Please feel free to share your thoughts even if they are different from others, we are interested in everyone's point of view. Please remember there are no wrong answers but different ideas about physical activity. We are interested in both positive and negative comments to the questions we ask. You may have noticed the recorder. Because we do not want to miss any comments, we are recording the session today. People often say things so fast we are not able to write all the comments down and we do not want to miss anything. We will be using first names today; however we will not use any names in our report. Confidentially about your information will be maintained during and after our discussion. This report will be used to gain understanding of physical activity in older adults. This understanding can assist with future planning of physical activity. Nametags were handed out to help us remember each other's name. We would like to find out more about each other. Let's go around and tell us your name and where you live.

1. What do you consider physical activity?
2. What do you think about your ability to do physical activity?
3. Think back to a time you were most physically active. How did you feel about physical activity then? How did you think about your ability to be physically active?
4. What has made you do less physical activity?
5. What makes you feel like you are not able to do physical activity?
6. What has helped you make changes to your level of physical activity?
7. What has helped you feel like you are able do physical activity?
8. How do you feel getting older affects your ability to be physically active?
9. How do you feel diabetes affects your ability to be physically active?
10. Of all the things we discussed, what is most important to you about your physical activity and ability to do physical activity?
11. We were interested in your thoughts about physical activity and self-confidence regarding physical activity. Have we missed anything?