8-2013

Development and testing the validity and reliability of items and scales to assess physical activity behavior of adults in the expanded food and nutrition education program

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DEVELOPMENT AND TESTING THE VALIDITY AND RELIABILITY OF ITEMS
AND SCALES TO ASSESS PHYSICAL ACTIVITY BEHAVIOR OF ADULTS IN
THE EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM.

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Food Technology

by
Tarana Khan
August 2013

Accepted by:
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ABSTRACT

Given the rising prevalence of obesity and other chronic diseases in the United States, the Expanded Food and Nutrition Education Program (EFNEP) includes physical activity as a core educational component along with diet quality, food safety, food resource management and food security. According to the Dietary Guidelines for Americans, research supports that participation in regular physical activity helps people maintain a healthy weight and prevent excess weight gain. When combined with reduced calorie intake, physical activity may aid weight loss and the maintenance of weight loss.

Two evaluation instruments are used in EFNEP nationwide. Nutritional intake is measured by a 24-hour diet recall at baseline and following completion of the intervention. A ten-item survey, referred to as the EFNEP Behavior Checklist, measures behaviors in the constructs of food safety, food resource management, food security, and nutrition practices. The EFNEP Behavior Checklist currently does not include questions related to physical activity behavior. Therefore, it is important to develop and add valid and reliable items to the EFNEP behavior checklist to document participant change in physical activity behaviors.

The community nutrition logic model, the constructs of Theory of Reasoned Action, and the theory of Planned Behavior provided the guiding framework of the development of items/scales. The target population was EFNEP eligible limited-income mothers who had at least one child under the age of 19 living in the household.

To accomplish the goals and objectives of this study, a step-by-step procedure was used which included the following phases: a) curriculum review and identification of contents/concepts, b) conceptual frame work & item generation, c) expert review & content validity, d) revision of items & scales, e) cognitive testing, f) psychometric testing & analysis which included construct validity, internal consistency, test-retest reliability and predictive validity.

Seventeen items/scales were developed on psychosocial mediating variables based on the constructs of TRA & TPB, which were attitude, subjective norm, perceived behavior control and intention. A total of 12 items/scales were developed in four dimensions of physical activity such as home, yard, walk and work.

Content validity was assessed through the expert review (n=8) and cognitive testing (n=14). Data from 302 mothers was collected for factor analysis and internal consistency. Test-retest reliability was also assessed (n=50). Predictive validity of the physical activity items/scales was assessed using a self-report of physical activity and accelerometer data.

Content analysis, expert review and cognitive testing were used to develop the items/scales and to establish the content validity. Factor analysis was used to determine the number of underlying factors in the items/scales and as a strategy of item reduction. Internal consistency for most of the final psychosocial items/scales was acceptable with Cronbach's alpha greater than .70. Spearman correlation statistics for test-retest reliability ranged between modest to stronger (r_s value between .59-.70 and P value < .0001). No significant association was found for the predictive validity of the items/scales.

The results of this study indicate the need for further investigation in using the items/scales to evaluate the impact of EFNEP on physical activity behavior of adults. This study provided an important first step in developing and testing items/scales with conceptual foundation and acknowledged essential elements to measure physical activity behavior of low-income population.

DEDICATION

To my dear parents, who always taught me the value of education and encouraged and inspired me to achieve higher education. To my dear husband who provides me the guidance, strength and support throughout the years. To my two lovely daughters, whose love, admiration and encouragements proved to be invaluable throughout this journey.

ACKNOWLEDGEMENTS

I would like to thank 'God' for helping me with courage, sincerity, persistence and patience throughout this journey.

Dr. Katherine Cason, thank you for giving me the opportunity to accomplish the project and chairing the committee. Thank you so much for all your supports, encouragements, advices and guidance to this whole process. Your uplifting encouragements always meant a lot to me!

My Advisory Committee members Dr. Joel Williams (Co-Chair), Dr. Sarah Griffin and Dr. Coffee, all of yours' expertise, talents and constant guidance through out this journey were invaluable. I will always be grateful for your time, talent and advices for the project.

A special thanks to EFNEP Nutrition Educator Assistants, Mrs. Debheror Walker, Mrs. Blond Simmons, Ms. Mary Ann Mobley, Ms. Linda Green, Mrs. Joyce Baker and Mrs. Josephine Alexander, your patience and willingness to the recruitment process was invaluable. Without your help, support and cooperation, I wouldn't have been able to complete this project. Thanks to all of you so much!

Dr. Yenory Hernández-Garbanzo, your constant guidance, advices and most importantly your time to review and edit each part of this dissertation was indispensable. Your constant guidance, advices, energy and enthusiasm motivated me and helped me to move forward with this project. I really appreciate it a lot!

Ms. Meg Hunt, your help with final editing of this manuscript was immeasurable. Thank you.

To my dear friend and colleague Kristen Welch, your constant motivation, word of encouragement and support provided me so much energy in this journey that I will always be grateful to you.

To my family, first my late parents who will miss my graduation only for a few years but I can see you guys were always smiling and bestowing your blessings from heaven which was a constant encouragement and inspiration throughout this journey. I love you 'Abba'-'Maa'!

And last but not least, my beloved husband Sher Khan and my two beautiful precious daughters Rubaiyat and Sadia Khan whose constant support, enthusiasm, encouragements, acknowledgements, advices and guidance provided me a constant light and energy through out this journey that I started five years ago. Thank you guys so much for being there for me! Without you I couldn't have done what I did today. Special thanks, to 'Sher' for running my statistical analysis and to 'Sadia' for all technological help with this project. Thank you and I love you a lot!

To all my colleagues and friends, who helped me and supported me with this project, thank you all so much!

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Activity Behavior of Adults in the Expanded Food and Nutrition Education Program

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<u>Introduction & Background</u>

Given the rising prevalence of obesity and other chronic diseases in the U.S, the

Expanded Food and Nutrition Education Program (EFNEP) includes physical activity as

a core educational component along with diet quality, food safety, food resource

management and food security. According to the Dietary Guidelines for Americans,

regular physical activity (PA) helps people maintain a healthy weight and prevent excess

weight gain. When combined with reduced calorie intake, physical activity may aid

weight loss and the maintenance of weight loss.

Two evaluation instruments are used in EFNEP nationwide. Dietary intake is

measured by a 24-hour diet recall at baseline and following completion of the

intervention. A ten-item survey, referred to as the EFNEP Behavior Checklist, measures

behaviors in the constructs of food safety, food resource management, food security, and

nutrition practices. The EFNEP Behavior Checklist currently does not include questions

related to PA behavior. Therefore, it is important to develop and add valid and reliable

items to the EFNEP behavior checklist to document participant change in PA

behaviors/and the antecedents (psychosocial constructs) of PA behavior.

Aims and Objectives

The goal of this study was to develop, pilot test and validate self-report PA items that could be potentially included in the EFNEP Behavior Checklist. The specific aim was to develop PA items based on behavioral theories, relevant to curricula content, Dietary Guidelines for Americans (DGA) and My Plate, which could reach the short-term outcomes of the Community Nutrition Education (CNE) logic model with an acceptable level of reliability and validity. This study also aimed to develop items that are practical to respond and to administer among low-income/low-literate audiences.

Methodology

To accomplish the goal and specific aims of this study, a step-by-step procedure was used which included the following phases: a) curriculum review and identification of contents/concepts, b) development of the conceptual framework & item generation, c) expert reviews and content validity, d) revision of items & scales, e) cognitive testing and lastly, f) psychometric testing and analysis which included construct validity, internal consistency, test-retest reliability and predictive validity.

The target population was EFNEP eligible limited-income mothers who had at least one child under the age of 19 living in the household. Study locations were six South Carolina Counties: Aiken, Chester, Lancaster, Richland, Saluda and Sumter.

The community nutrition logic model, and constructs from the Theory of Reasoned Action (TRA), and the Theory of Planned Behavior (TPB) provided the theoretical framework for the development of PA items/scales.

Seventeen items were developed on psychosocial mediating variables based on the constructs of TRA and TPB, which were: attitudes, subjective norm, perceived behavior control and intention. In addition, a total of 12 items/scales were developed in four dimensions of PA such as home, yard, walk and work.

Content validity of the psychosocial mediating variables was assessed through expert reviews (n=8) and cognitive testing (n=14). Data from 302 mothers was collected for factor analysis and internal consistency. Test-retest reliability was also assessed (n=50, a subset of the total 302 participants). Predictive validity of the PA items/scales was assessed using a self-report of physical activity and accelerometer data.

Content analysis, expert review and cognitive testing were used to develop the items/scales and to establish the content validity. Factor analysis was used to determine the number of underlying factors in the items/scales and as a strategy of item reduction. Result of the exploratory factor analysis revealed three interpretable factors with adequate factor loading. Internal consistency for most of the final psychosocial scales was acceptable with Cronbach's alpha greater than .70. Spearman correlation statistics for test-retest reliability ranged between modest to stronger (r_s value between .59-.70 and P value < .0001). No significant association was found for the predictive validity of the items.

Conclusion and Recommendations

The results of this study indicated the need for further investigation in using the items/scales to evaluate the impact of EFNEP on PA behavior of adults. This study

provided an important first step in developing and testing items/scales with conceptual foundation and acknowledged essential elements to measure PA behavior of low-income population.

Although it is essential and important to have an appropriate tool to assess the impact of program like EFNEP, the result of this study found it was challenging to develop a tool to accurately measure the PA behavior for a low-income population because it involved many different variables such as target audience, age, ethnicity, income, education level and location etc. This initial effort for developing and testing items/scales to measure PA behavior among EFNEP adults produced a solid foundation for future research and analyses. It also demands credit for providing future investigators with a conceptual basis and acknowledged essential elements to measure PA behavior of low-income populations.

Recommendation is made to test the items/scales in other geographic location of South Carolina as well as other states and U.S. territories to determine if they would be appropriate to use for the overall EFNEP population. A multi state approach is recommended for this kind of project because it will bring together the varied expertise needed to comprehensively address this complex issue. Each state has access to unique group of limited resource EFNEP participants that would not be available from any single state. Also multi state approach will enable to have proportion of urban versus rural participants and mixes of racial/ethnic groups. With multi state involvement and input, this kind of project will have a more complete understanding of cultural and other type of impacts on these diverse participant groups.

CHAPTER ONE

INTRODUCTION

Background

Physical Activity and Health Disparities

Physical activity is a major concern of today's society, especially among low-income and minority groups (USDA, 1990). A report of the Surgeon General found that about 43% of low-income populations are physically inactive and they are more susceptible of developing inactivity related diseases (USDA, 1996). Certain population groups such as those with limited resources are more likely to be physically inactive than the general population. Since the prevalence of physical inactivity is high among these populations, it has become a public health challenge to increase their physical activity levels. Several federally funded programs such as Expanded Food and Nutrition Education Program (USDA, 2010), the Supplemental Nutrition Assistance Program-Education (USDA, 2009) are targeting low-income populations to provide nutrition education programs with a goal of helping them to develop knowledge, skills, attitude, and to change behavior to increase the level of physical activity. It is essential to assess the impact of such programs, and an appropriate evaluation measure to assess physical activity behavioral outcomes is needed.

Physical Activity and Health

Over the past several decades, physical activity has been recognized as an important component in maintaining health and well-being. Physical activity is defined as bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level (US Department of Health and Human Services, 1996). Studies have shown that physical activity reduces the risk of developing chronic diseases such as diabetes, high blood pressure, heart disease, and colon cancer (Kaplan, Strawbridge, Cohen & Hungerford 1996; Kushi et al., 1997; Lee, Blair, and Jackson, 1999; Paffenbarger, Hyde, Wing, & Lee1993; Sherman, D'Agostino, Cobb, & Kannel 1994; Wei et al., 1999). Warburton, Nicole and Bredin (2006) in a review of current literature on the health benefits of physical activity reported that an energy expenditure of 1600 kcal per week was effective in decreasing the progression of coronary artery disease and an expenditure of 2200 kcal per week was associated with plaque reduction in a patient with heart disease. This same review indicated that both aerobic and resistance types of exercise were associated with a decreased risk of type 2 diabetes. This review also supported the health benefit of physical activity to patients with established cancer and concluded that the loss of bone mineral density and osteoporosis appeared to be reduced particularly in post- menopausal women if they are physically active. Another review study suggested that a minimum of 30 minutes per day of moderate physical activity could reduce the incidence of type 2 diabetes and cardiovascular events (Bassuk and Manson, 2005). Regular physical activity was found to be associated with lower mortality rates for both older and younger adults and important for maintaining muscle

strength, joint structure, joint functioning and bone health (U. S DHHS, 1996). A prospective study of healthy and unhealthy men reported that during follow-up, men who maintained or improved adequate physical fitness were less likely to die from all causes mortality and cardiovascular disease than persistently unfit men. Physical fitness in this report was determined by exercise test tolerance on a standard treadmill (Blair et al., 1995). An inverse relationship between physical activity and the risk of cardiovascular related death was reported in a systematic review of the literature regarding primary prevention in women. The review stated that these protective effects happened even with a minimum 1 hour of walking per week (Oguma and Shinoda, 2004). Another review on physical activity and all causes of mortality in women reported that the magnitude of benefit experienced by women was similar to men. The review indicated that a woman could reduce mortality by adhering to current guidelines for physical activity and expending about 4200 kcal of energy per week (Oguma, Sesso, paffebarger and Lee, 2002). Several other critical health benefits of physical activity have been found. The symptoms of depression and anxiety were reduced and general well-being was enhanced as a result of regular physical activity according to Ross & Hayes (1988). A high level of physical activity was reported to be critical in producing and maintaining weight loss. A systematic review of several nonrandomized weight reduction studies reported that weight regain was less with a large amount of physical activity (Fogelholm and Kukkonen, 2002).

Trends in Physical Activity

Despite all the benefits of physical activity in preventing disease conditions and mortality rate and enhancing general well being, the following studies reported that the rates of physical activity have either declined or remained unchanged. A seven-year longitudinal follow-up study on change and secular trends in physical activity patterns in young adults found a 30% decrease in the geometric mean level of physical activity across all race-sex groups during the early years of adulthood. The mean activity scores specific to the most moderate and vigorous intensity activities declined. In addition, this study reported that African American women were the least physically active group (Anderssen et al., 1996). The National Health Interview Survey (NHIS-HPDP) reported the status of physical fitness and exercise objectives for 1990. One of the objectives was that by 1990, the proportion of adults between 18-65 years old participating regularly in vigorous physical exercise should be greater than 60%, and 50% of adults 65 years and older should be engaged in appropriate physical activity (for example walking, swimming or other aerobic activity). The study revealed that only 7.6% of Americans between the ages of 18-65 and 7.5% between ages 65 and older met these objectives (Caspersen, Christenson & Pollard, 1986). A physical activity trend study of 26 states in 1986-1990 reported that 60% of adults were physically inactive or irregularly active, only 40% of adults were regularly active and less than 10% were regularly active at a level, which would promote or maintain cardio-respiratory fitness (Caspersen and Merritt, 1995). The Behavioral Risk Factor Surveillance System (CDC, 1996) report indicated that 29.2% of adults were not active in their leisure time, 43.1% were somewhat active but not enough

to ensure health benefit and 27.7% were physically active at the recommended level (Pratt, Macera and Blanton, 1999). BRFSS (1990-1998) data indicated that the trends in physical activity remained unchanged. Data were collected on two activities or exercises the respondents were engaged in during the preceding month and the frequency, duration and distance were also measured for those activities. The report indicates that only one fourth of adults in the United Sates were engaged in the recommended level of physical activity (CDC, Morbidity and Mortality Weekly Report, 2001). BRFSS (2001) lifestyle activity questions included questions on more domains of physical activities such as various household activities and transportation related physical activities and some leisure time activities. The data was collected on activities in a usual week. A BRFSS (2001) survey attempted to reveal a more complete measure of physical activity than the previous surveys. The survey indicated that the majority of the U.S. adults were still not physically active at the level that could promote health (CDC, MMWR, 2003). It is well documented from several studies that socioeconomic position has a significant role in health risk behaviors. The most two important socioeconomic indicators are education and income. The American's Changing Lives (ACL) longitudinal survey conducted by the University of Michigan Survey Research Center found that the prevalence of health risk behaviors such as physical inactivity, being overweight, and smoking are higher in the groups with low income and lower level of education (Lantz et al., 1998). The findings from this study for a strong socioeconomic differences in mortality- including larger socioeconomic differentials for women than men, and a stronger mortality effect for income than for education for both women and men were consistent with the findings

of other studies (Smith, Shipley & Rose, 1990; Kaplan and Keli, 1993; Sorlie, Backlund & Keller, 1995). BRFSS (1996) data also indicated the influence of education and income, the two closely linked variables of socioeconomic status on the participation of physical activity by adults in USA. About 48.9% with less than high school education indicated no participation in physical activity. The magnitude of family income showed inverse association with the level of physical activity participations. The report shows that inactivity fell from 42.6% to 15.1% from the lowest to highest income categories (Pratt, Macera & Blanton, 1999). Evidence from an Alameda County study indicates an interaction between changes in individual income level and physical activity. Physical activity changes for the residents who lived in an area with high level of poverty was similar for people with different income levels to the residents who lived in a non poverty area and a larger decrease in physical activity was observed for those who had inadequate income (Yen & Kaplan, 1998).

Physical Activity Recommendations

Since increasing physical activity is important to prevent disease prevention and health promotion, the Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) have developed a clear, concise recommendation for the types and amounts of physical activity needed for Americans of all ages. The recommendations maintain that people do not have to be engaged in vigorous, continuous exercise in order to obtain health benefits. Rather regular, moderate-intensity physical activity provides substantial health benefit. According to this

recommendation, every US adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week. While 30 minutes a day of moderate intensity physical activity provides health benefits, being active for longer or doing more vigorous activities may provide even greater health benefit. Walking up the stairs instead of taking the elevator, walking instead of driving short distances, gardening, housework, raking leaves, dancing and playing actively with children can contribute to the 30 minutes per day. These moderate intensity physical activities could be done all at once or divided into two or three parts during the day. Even 10 minutes bouts of activity count towards the total (Pate et al., 1995). The original CDC/ACSM recommendation was again reviewed and updated in 2003 by an expert panel. The final recommendation was that all healthy adults between the ages of 18 to 65 need moderate-intensity physical activity for a minimum of 30 minutes on five days each week or vigorous intensity aerobic physical activity for a minimum of 20 minutes on three days each week to promote and maintain health. In addition, every adult should perform activities that maintain or increase muscular strength and endurance a minimum of two days each week. The updated recommendation was specific about moderate and vigorous- intensity activities being complementary for producing health benefits and also that a variety of activities can be combined to meet the recommendations (Haskell et al., 2007). The US Department of Agriculture has recommended 30 minutes of physical activity per day to prevent chronic disease and at least 60 minutes per day to manage weight (USDA, 2005).

Physical Activity and Obesity

The prevalence of overweight and obesity is increasing rapidly in the United States. Results from the BRFSS (1991-1998) data showed that the prevalence of obesity increased from 12.0% in 1991 to 17.9% in 1998 steadily throughout the states (Mokdad et al., 1999). Results from the National Health and Nutrition Examination Survey (NHANES) (1999-2000) showed that prevalence of obesity was 30.5% compared with 22.9% in NHANES III data (1998-1994). During this period, the prevalence of overweight also increased from 55.9% to 64.5% (Flegal, Caroll, Ogden and Johnson, 2002). Data from NHANES (2003-2004), indicated 32.2% of adults were obese (Ogden et al., 2006). Socioeconomic status played an important role in the disparities in prevalence of overweight and obesity. With racial and ethnic groups combined, it was found that women of lower socioeconomic status were approximately 50% more likely to be obese than those with higher socioeconomic status (U.S. DHHS, 2002). CDC analyzed data from Behavioral Risk Factor Surveillance System (BRFSS) surveys conducted during 2006-2008. It was found that 35.7% African American had 51% greater prevalence of obesity when compared with Caucasians (23.7%). This pattern was consistent across most United States and greater among women than men. The African American women had the greatest prevalence (39.2%) followed by African American men (31.6%) (CDC, 2009). These significant increases of obesity have had a devastating impact on public health. Due to overweight and obesity close to 300,000 deaths occur in each year in the United States today (Allison, Fontaine, Manson, Stevens and Vanitallie, 1999). Several studies found a positive link between obesity and an increased risk of

heart disease, and 20-30% deaths due to cardiovascular disease were related to overweight or obesity (Seidell, Verschuren, and Van, 1996). Hypertension is another common condition associated with overweight and obesity (Must et al., 1999). Several studies found a strong relationship between body mass index (BMI) and the risk of type 2 diabetes mellitus, which, is considered to be the sixth leading cause of death in the country (Anderson & Smith, 2003). Studies indicated that the risk of diabetes was 10 times greater in obese individuals than non-obese (Colditz, Willett, Rotnitzky, and Manson, 1995; and Chan, Rimm, Colditz, Stampfer, and Willett, 1994). Several factors- including genetic, metabolic, behavioral and environmental influences- are associated with overweight and obesity. The rapid increase of obesity suggests that rather than biological changes, increased energy consumption and decreased energy expenditure, or a combination of both could be the factors contributing to the increased overweight and obesity in today's society, although the details of these complex relationships are not well understood because of the inconsistent data on energy intake. According to the USDA Nationwide Food Consumption Survey, in the United States the average fat intake decreased from 41% to 37% between 1977 and 1988. This study also found that total energy intake also decreased by 3% in women and 6% in men (Human Nutrition Information Service, 1993), whereas the Continuing Survey of Food intake by individuals in 1989-1991 and in 1994-1996 did not find any significant differences in calorie intake compared to the previous years (Popkin, Seiga, Haines, and Jahn, 2001). Another study indicated that the progressive increase in the prevalence of obesity in the US adult population still remained even when the average fat and energy intake were reduced

(Heini & Weinsier, 1997). Despite the fact of increased availability and consumption of reduced calorie and lower fat food, the prevalence of excess weight and obesity is still rising, suggesting that this rising trend of obesity may be more closely related to the effect of a substantial decline in daily physical activity related to energy expenditure (Heini & Weinsier, 1997). Researchers in Great Britain reported that the modern inactive lifestyle must be an important and perhaps dominant reason for the increasing prevalence of obesity (Prentice & Jebb, 1995). This conclusion was in support of another study report which stated that formerly obese women, now normal weight, who were 'non-exerciser' gained more than twice as much weight over 4 years of follow- up than did those who were 'regular exercisers' (Weinsier et al., 1995). On a much larger scale, a 5 year prospective study with Finnish adults found that substantial weight gain was experienced almost twice as much among sedentary individuals when comparing with the weight gain of physically active men and women (Rissanmen, Heliovaara, Knekt, Reunanen and Aromaa, 1991). The US Surgeon General's report indicated 60% of U. S. adults are not physically active on a regular basis and 25% lead entirely sedentary lives. Almost half of young Americans between the ages 12 and 21 years are not vigorously active on a routine basis (US DHHS; 1996). Data from National Health Interview Survey reported that about four in ten (38.3%) adults do not participate in leisure- time physical activity (US DHHS; 2002).

Problem Statement/Significance of the Study

The need for measuring physical activity interventions effectively

Since physical inactivity is a contributing factor for many diseases and conditions including the mounting public concern of overweight and obesity, it is crucial to make physical activity an integral part of daily life, especially among low-income people. As reported earlier, studies found that low- income women are more physically inactive than higher income women (Arriaza et al., 1998; U.S. DHHS, 2000). Effective community-based strategies and programs that promote physical activity among this population have become a higher priority (Satterfield et al., 2003). Several review studies summarize the different type of interventions with different settings and measure that targeted at risk population to promote physical activity (Bank & Conn, 2002, Taylor, Baranowski & Young, 1998; Yancey et al., 2004). The Physical Activity Risk Reduction (PARR) project was an intervention study conducted with the residents of rental communities administered by the Housing Authority of the Birmingham District in Birmingham, Alabama. Physical activity interventions based on residents' exercise practices and their beliefs about exercise and barriers to it, were implemented for six sessions in two control communities and were evaluated through a survey and process evaluation. A greater post intervention physical activity score was reported for the communities where organized intervention had been conducted (Lewis, Raczynski, Heath, Levinson, Hilyer and Cutter 1993). The Community Health Assessment and Promotion Project (CHAPP) was developed to reduce high incidence of cardiovascular risk factors in the African

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American lower socio economic community in Atlanta. This adjunct study incorporated two hours of class twice a week, consisting of nutrition assessment and counseling and one hour of exercise. Program evaluation of the study did not indicate any physical activity changes among participants but a significant reduction in weight and blood pressure was demonstrated immediately after the intervention (Lasco et al., 1989). Several other physical activity interventions and outcomes evaluated by self -report activity records demonstrated mixed results about the changes in physical activity (Chen et al., 1998; Kanders et al., 1994; Kumanyika & Charleston, 1992; McNabb, Quinn, Kerver, Cook and Karrison 1997).

All these studies reveal that, even though there has been a lot of progress in physical activity interventions and strategies to help people to adopt and maintain behavior change, improvement is needed in some areas of methodology. To evaluate the program outcome in more effective and efficient way, more theory- based interventions are needed as well as the development and use of valid and reliable instruments (Bank & Conn, 2002; Taylor, Baranowski and Young, 1998; Yancey et, al, 2004;). Instruments can provide misleading results and may threaten the internal validity of the study if they are not appropriate and valid for the target audience (Shadish, 2002). Several other studies reported participants' misunderstandings or misinterpretations of the wording of valid instruments (Alamimo, Olson and Frongilo 1999; Chang, Nitzke, Brown, Baumann and Oakley, 2003). Yet other studies reported that a standardized instrument, which was valid for middle class women, was not valid for women from a low-income population (Birkett and Boulet, 1995; Spoon et al., 2002). Schoenfeldt (1984) emphasized the

importance of sound measurement in a study, stating that the most important part in a study is the formation of the measuring instrument and because of the imperfect instrument many studies were not successful in investigating the expected outcomes. Therefore it is important to have a more valid and reliable measures in any study to overcome the barrier of inconsistent measurement and receive an effective and efficient assessment and evaluation of the study.

EFNEP and Physical Activity Measurement

There are several federally funded nutrition education programs nationwide that target low-income populations in an effort to promote healthier lifestyle and reduce the risk of developing chronic diseases. In order to enhance the effectiveness and accountability of these programs and to justify the continued federal funding, it is important to have an assessment tool, which is valid and reliable in capturing the program outcomes. The Expanded Food and Nutrition Education Program (EFNEP) is a federally funded program that operates in 50 states and US territories. This program was designed to educate limited-resource families and young children to help them acquire the knowledge, skills, attitudes, and changes in behavior necessary for a nutritionally sound diet, and to contribute to their personal development and the improvement of the total family diet and nutritional well being (USDA/NIFA). Paraprofessionals and volunteers, many of who are indigenous to the target population, deliver EFNEP through a series of 12 or more lessons over several months. The 'hands -on learn by doing approach' made EFNEP a unique community- based program, which allows the participants to gain the

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practical skills necessary to make positive behavioral changes (United States Department of Agriculture, NIFA, 2010). The Nutrition Education and Reporting System (NEERS), designed as an expansion of the Evaluation and Reporting System (ERS4), was the system used to capture evaluation data for EFNEP. In 2008, Clemson University was awarded a cooperative agreement with USDA National Institute of Food and Agriculture (NIFA) to design, develop and implement a new evaluation system for use nationwide. In 2012, this system was released as a web-based evaluation system, WebNEERS (USDA, NEERS5, 2012). There are two instruments currently used for the measurement and evaluation of individual-level outcomes. The 24- hour food recall is a technique utilized by EFNEP to compare the dietary intake of the participants with the Recommended Dietary Allowances (RDA) and recommendations from 'My Plate' developed by the United States Department of Agriculture (USDA, 2012). The EFNEP Behavior Checklist is an evaluation tool developed to measure behavior changes in the area of diet quality, food safety, food security, and food resource management reported by the EFNEP participants. The need for developing a behavior checklist was identified as essential for evaluating the key food and nutrition behaviors that could not be evaluated using 24-hour food recall. The other purpose and goal of developing the EFNEP Behavior Checklist was to have an evaluation tool that would be sufficiently brief and not be burdensome for both the participants and the paraprofessionals to use (Jean, Wells and Sylvia, 1997).

Given the rising prevalence of obesity and other chronic diseases in the United States described above, EFNEP began to incorporate physical activity as another

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component of behavior change as recommended by the Dietary Guidelines for Americans and My Plate, to promote physical activity and change behavior among EFNEP participants (USDA, Dietary Guidelines, 2005). The EFNEP Behavior Checklist currently does not include questions related to physical activity behavior. Therefore, it is important to develop and add valid and reliable items to the EFNEP behavior checklist to document participant change in physical activity behaviors. In 2011, part of the Clemson University/NIFA Cooperative Agreement, Dr. Helen Chipman, National Program Leader for EFNEP, charged a committee comprised of EFNEP staff throughout the country with examining the evidence base for questions on the EFNEP Behavior Checklist. The committee was charged with determining whether the behaviors that are currently measured are those that are the most important for improving the health and well-being of EFNEP participants, to identify gaps, and to make recommendations for revisions to the survey instrument. Results from this study will provide useful information to this national committee as they make recommendations related to questions regarding physical activity behaviors

Purpose of the Study

In order to assess the physical activity behaviors of adults in the Expanded Food and Nutrition Education Program (EFNEP) and to contribute to previous efforts, the purpose of this research study was to develop, pilot-test and validate self-report physical activity items that could be potentially included in the EFNEP Behavior Checklist.

Specific Aims of the Study

- Identify physical activity contents and mediators of behaviors addressed in EFNEP curricula used in the United States and U.S. territories.

- Develop physical activity items/scales to measure the effect of EFNEP on outcomes related to physical activity.

- Establish the content validity and face validity of the physical activity items.

- Assess the psychometric properties of the physical activity items: construct validity criterion validity, internal consistency and test retest reliability.

Research Questions

1. Which content and/or concepts related to physical activity behavior were addressed in the adult EFNEP curriculum, Dietary Guidelines of Americans (DGA), My Plate and Community Nutrition Education logic mode (CNE)?

2. To what extent did the items/scales reflect the content of the physical activity domain?

3. How well did adult EFNEP participants understand the new items/scales?

4. To what extent did the items/scales correlate with measures obtained on some external criterion?

5. To what extent did the items/scales produce the same responses when measured by the same groups in two different occasions?

Delimitations of the Study

The scope of the study was delimited to the following:

1. The content analysis was conducted only with the curricula shared by the states as a result of the survey sent to each state and US territory.

2. The study was delimited to the EFNEP population, who were limited resource mothers with young children.

Mothers of young children who did not have low incomes and older adults were not examined.

Limitations of the Study

The study was limited by the following factors:

1. EFNEP populations were predominantly African American in South Carolina, which limited the generalizability of the results among racial and ethnic groups.

2. Convenience sampling techniques were used to recruit participants for the study.

3. The study was conducted only in six counties in South Carolina.

4. Study population with a broad age range (mother with at least one child living in the household).

Assumptions

The following assumptions were made as a result of the study:

1. Physical activity was an important factor to promote health and prevent diseases.

2. Development of the items/scales that were valid and reliable would best capture the program impact for behavior change of physical activity in EFNEP.

3. The theory -based approach would provide the framework of the development of items/scales to measure the physical activity behavior change among EFNEP adults.

Definition of Key Terms

Physical Activity: "Physical activity is defined as bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level" (U.S.DHHS, 1996).

Physical Fitness: "Physical fitness is defined as the ability to carry out the daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure time pursuits and to meet unforeseen emergencies" (U.S. DHHS, 1996).

Exercise: "Exercise is defined as the physical activity that is planned, structured, repetitive and purposive in the sense that improvement or maintenance of one or more components of physical fitness is the objectives" (U.S. DHHS, 1996).

Cardio Respiratory Fitness: "Cardio-respiratory fitness id defined as a a health related component of physical fitness that relates to the ability of the of the circulatory and respiratory systems to supply oxygen during sustained physical activity" (U.S. DHHS, 1996).

Duration: "Duration is defined as the length of time in which an activity or exercise is performed. Duration is generally expressed in minutes" (U.S. DHHS, 1996)

Frequency: "Frequency refers to the number of times an exercise or activity is performed. Frequency is generally expressed in sessions, episodes, or bouts per week" (U.S. DHHS, 1996)

Intensity: "Intensity refers to how much work is being performed or the magnitude of the effort required to perform an activity or exercise" (U.S. DHHS)

Lifestyle activities: "Lifestyle activities is a term is frequently used to encompass activities that a person carries out in the course of daily life and that can contribute to sizeable energy expenditure. Examples include taking the stairs instead of using the elevator, walking to do errands instead of driving, getting off a bus one stop early, or parking farther away than usual to walk to a destination" (U.S. DHHS, 1996).

Aerobic Activity: "Aerobic activity is activity in which the body's large muscles move in a rhythmic manner for a sustained period of time. Examples include walking, running, and swimming, and bicycling" (U.S. DHHS, 1996).

Moderate Physical Activities: **"**Moderate physical activities include walking briskly (about 3 ½ miles per hour), hiking, gardening/yard work, dancing, golf (walking and carrying clubs), bicycling (less than 10 miles per hour), weight training (general light workout)" (US DHHS, 1996).

*Vigorous Physical Activities***: "**Vigorous physical activities include running/jogging (5 miles per hour), bicycling (more than 10 miles per hour), swimming (freestyle laps), walking very fast (4 ½ miles per hour), heavy yard work such as chopping wood, weight lifting (vigorous effort), basketball (competitive)" (USDHHS, 1996).

CHAPTER TWO

LITERATURE RIVIEW

Overview

Despite the documented potential health benefits associated with physical activity,

most Americans do not participate in recommended physical activity level that could

promote health. Studies had shown that the lower socioeconomic status population,

ethnic minorities and women over the general population were at increased risk of

physical inactivity and related chronic illness. Therefore interventions to promote

physical activity among these populations were in greater need (Arriaza et al., 1998;

Cauley, Donfield, Laporte and Warhafting 1991; Ford et al., 1991; Lewis, Raczynski,

Heath, Levinson and Cutter 1993; Pate et al., 1995; USDHHS, 1996). The purpose of this

chapter was to review recent studies of programs that promoted physical activity among

"at risk populations" as well as the effectiveness of the programs in changing behavior

and increasing physical activity for improvement of health.

Physical Activity Interventions

The Physical Activity for Risk Reduction (PARR) project was a constituency-

based physical activity promotion program for low-income African American

communities (Lewis et al., 1993). The Housing Authority of the Birmingham District in

Birmingham, Alabama administered this project, conducted with residents of rental

communities. The intervention was developed based on the residents' exercise practice,

beliefs about exercise, and the perceived barriers to physical activity. Two intervention programs were designed for investigation. The basic intervention involved community-based exercise programs, which included walking, aerobic dance, low-impact aerobics, games, sports, and weight lifting. Information on home-based exercise programs was disseminated by pamphlets to residents of the communities, including details of recommended frequency, duration and intensity of exercises, and a how to start walking program. The enhanced intervention involved all components of the basic intervention and also behavioral intervention to increase participation and adherence. Different strategies were incorporated in the enhanced part of the intervention to solicit social support by having community and church leaders emphasize the importance of physical activity. Structured program participation for inter-community and intra-community competition was offered. Group health education programs on topics of interest to the community were organized to improve health knowledge and training in behavior concepts to motivate the individual participants in overcoming barriers was provided to the leaders. The study was implemented for six sessions in two control communities. The intervention was evaluated through self-report surveys and process evaluation. The survey instrument used for this study was the Physical Activity History (PAH), which was developed for the Coronary Artery Risk Development in Young Adult (CARDIA) study and had been validated in a population that included young adult African Americans and had acceptable reliability in this population (Jacob, Hahn, Haskell, Pirie and Sidney, 1989). The primary outcome measure for PARR project did not show any overall significant changes in physical activity behavior in the intervention communities.

According to the author this lack of statistically significant difference in pre-intervention and post-intervention physical activity scores in all intervention communities may be due to the variability in the communities and the leader's organization and commitment to the project because the post intervention activity scores were significantly higher than the pre-intervention scores in the organized communities, a difference that was not found in the unorganized communities.

'Project Joy' was a faith-based cardiovascular health promotion intervention for African American women (Yanek, Becker, Moy, Gittelsohn and Koffman, 2001). The objective of the intervention was to assess the impact of one year of participation in one of the three church-based nutrition and physical activity intervention strategies, which were: a) standard behavioral group intervention, b) standard intervention supplemented with spiritual strategies and c) self help strategies based on cardiovascular risk profiles of African American women ages 40 years and older. The intervention was designed at the individual level to enhance self-efficacy, but implemented with group sessions through the churches for strong support. To determine what kind of nutrition and physical activity would be most appropriate, focus groups were held with women attending churches from the African American community. The intervention was designed based on the focus groups and additional interviews with 53 church-attending women. Questionnaires were tested to assess the nutrition, physical activity, smoking cessation and operational and feasibility aspects of the program implementation. The standard behavioral intervention was comprised of weekly sessions on nutrition and physical activity taught for the first 20 weeks by the health educators from the study staff with the assistance of church lay

leaders. Each session began with a weigh in and group discussion followed by 30 to 45

minutes of nutrition education and 30 minutes of moderate intensity aerobic activity

including brisk walking, water aerobics or Tae Bo which is a form of exercise that

includes aerobics, self defense, and yoga. The sessions were based on social learning

theory to enhance individual self-efficacy. The second group, which was the spiritual

intervention group, received the same sessions as the standard intervention group with the

addition of spiritual components and church contextual components designed by the

Community Expert Panel and the investigators. Physical activity included aerobics to

gospel music or praise and worship dance. Although the standard intervention was

designed without spiritual elements, participating women introduced spirituality in their

sessions by initiating the sessions with prayer and selected their own relevant scriptures.

Thus the standard and spiritual intervention operated almost identically. The third group,

which was the self- help control intervention group included materials from the American

Heart Association on healthy eating, and physical activity. Participants received the same

lay leader's manual as the standard intervention group and a gift box with educational

materials, pamphlets, and self- monitoring materials. No direct help was offered to this

group but a hot line number was available for consultation. The Block Food

Questionnaire, a food frequency instrument, was administered to measure individual

nutrient intake. Physical activity was measured by using the Yale Physical Activity

Survey from which energy expenditure was calculated (Dipietro, Caspersen, Ostfeld and

Nadel, 1993). Behavioral objectives of the interventions included exercising for 30

minutes or more, 5 to 7 days per week, consumption of at least 5 servings of fruits and

vegetables everyday and other recommended nutrient intakes. Weight management was emphasized but achievement of specific weight was not stressed. A near significant change for energy expenditure was reported for the active intervention groups compared with self help group at the one year follow up.

Another intervention study was a center-based program to promote aerobic physical activity among African American families with children in fifth through seventh grades (Baranowski et al., 1990). One of the program goals was to increase the frequency of aerobic activity performance among experimental group participants. To validate the increased activity, cardiovascular fitness was measured. Ninety-four African American families were actively recruited and randomly assigned to experimental and control groups. Both groups participated in a base line assessment clinic. The intervention group participated in a 14-week program of education and fitness activities. The educational sessions included individual counseling, small group education, aerobic activity and a snack component. No contact was made with the control group during the 14 weeks of the program. Immediately following the 14th week of the intervention a post program assessment was conducted on both experimental and control groups. A home-based evaluation interview was conducted with experimental group adults several weeks after the post-assessment. The pre and post assessment obtained activity, anthropometric, cardiovascular and psychosocial measures. The psychosocial measures included tests of knowledge and self -efficacy specially designed to assess achievement of the objectives of this program. Activity was assessed using the Standford Seven Day Physical Activity Recall (Blair et al., 1985) and a frequency of aerobic activity form. The intervention did

not achieve the goal of increased habitual aerobic activity for experimental group families. As the authors explained the final participation rate of 28% was low and this low participation rate could be the reason for no differential effect of the program on habitual activity or on the indicators of cardiovascular fitness. The authors also suggested that the lack of change in documented behavior might be due to the incorrect needs assessment, failure of theory, poor implementation, or inadequate measurement.

'Project Active' (Dunn et al., 1997) was a randomized clinical trial, which compared the effect of a typical gymnasium based structured exercise program with a group based lifestyle physical activity program. The purpose of this study was to examine the effect of psychological strategies used by both lifestyle and exercise groups to reach the level of physical activity recommended by the Centers for Disease Control (CDC) and Prevention and American College of Sports Medicine (ACSM) and then to report the effect of the intervention on cardiovascular disease risk factors. Study participants were 235 healthy sedentary men and women between the age of 35 and 60 years who were equally randomized into either a structured exercise program or a lifestyle physical activity program. The structured group received supervised traditional exercise sessions five days per week for six months. Group leaders helped participants learn to set realistic goals, monitored their physical activity and provided verbal reinforcement. After three weeks of initial instruction participants in the structured exercise group chose the aerobic activities they most enjoyed. As they progressed, participants were encouraged to become self-directed and plan for times with minimal supervision. At the same time, the lifestyle group was advised to accumulate at least 30 minutes of moderate intensity physical

activity on most days of the week, in a way uniquely adapted to each participant's lifestyle. Participants in this group were also advised to achieve this goal in a manner best suited for their particular level of motivational readiness for change. This group in the format of a small group setting met every week for the first 16 weeks and then every other week for weeks 17 to 24; in the groups they learned about cognitive and behavioral strategies appropriate to their level of motivational readiness. Participants had help from the group facilitators to use the problem solving approach to discuss strategies and techniques to initiate, adopt and maintain physical activity program. No structured exercise was performed. To amplify the major point, weekly sessions occasionally integrated moderate intensity physical activity such as mall walking or having a brisk walk while children are engaged in organized sports or walking around the fields while children are playing soccer, finding a friend to walk during lunch or after work etc. Curriculum materials consisting of two or three page handouts with home assignments were developed for each of the weekly sessions. Cognitive and behavioral strategies were used for the topics and targeted skills to increase motivational readiness for change. Cognitive and behavioral measures of change along with changes in lipid and lipoprotein cholesterol concentrations, blood pressure and body composition were assessed both at baseline and six months after the intervention. Results showed that 78% of lifestyle participants and 85% of structured exercise participants met or exceed the CDC/ACSM recommendation of accumulating 30 minutes or more of moderate intensity physical activity on most or all of the week. This finding reconfirmed that structured exercise can improve cardiovascular disease risk factors. What was new about this finding was the

beneficial effect of the lifestyle approach to increasing physical activity. The results demonstrated that sedentary people, who are not at high-risk can make significant improvements in cardiovascular disease risk factors without performing high intensity work-outs or going to the gymnasium. This intervention confirmed by reporting that many health and fitness professionals could use the CDC/ACSM recommendation in combination with all of the cognitive and behavioral strategies to increase physical activity behavior among people who are not motivated to change or to reduce the risk factors of cardiovascular disease.

The Bootheel Heart Health project (Brownson et al., 1996) was a five-year community-based intervention through the development of coalition groups within a six county region of rural Missouri. The main purpose of the study was to determine the effect of community-based intervention on reducing the behavior risk factors for cardiovascular disease. The coalition in all six counties developed walking clubs, aerobic exercise classes, heart-healthy cooking demonstrations, blood pressure and cholesterol screenings, heart-healthy education in sermons on Sundays, poster contests, weekly newspaper columns, and environmental changes such as the construction of a walking path. Physical activity was the most frequent and consistently addressed risk factor in coalition activities. Based on the methods of the Behavioral Risk Factor Surveillance System developed by CDC, two special surveys were conducted to evaluate the project's progress. Although the results for entire Bootheel or statewide samples did not observe any significant changes in physical inactivity, the communities with coalitions showed a significant improvement in the physical inactivity variable compared to communities not

having coalitions. The study relied on a self-reported telephone survey and did not have any comprehensive information on the accuracy of the Behavioral Risk Factor Surveillance System during the study period. As the authors mentioned, even though the results of this study showed decreased physical inactivity along with a stable rate of overweight in active coalition areas, and thus revealed a relation between longitudinal weight gain and low physical activity, larger samples and better measures of intervention would be needed to further clarify this potentially important relationship.

The PATHWAYS project was a church-based weight loss program for urban African American women at risk for diabetes. The program goal was to improve exercise behavior in addition to improving in dietary habits to combat the epidemic of obesity, which is a major risk factor for diabetes and other chronic conditions among African women (Mcnabb, Quinn, Kerver, Cook and karrison, 1997). Thirty-nine obese women were recruited from the urban African American churches and randomized in to experimental and control groups. Baseline data on weight and lifestyle practice were collected. Small group sessions were held weekly for 14 weeks for the experimental group led by trained lay volunteers. The control group was on a waiting list to receive the program at the end of the study period. The PATHWAYS program was developed based on information from the literature and information from the focus group conducted with African American women in the community. The PATHWAYS experimental group was instructed to begin an at home exercise program, generally consisting of recreational walking and also setting a weekly behavior change goal related to eating behavior. Group problem solving techniques were used to help participants identify and overcome

obstacles they had encountered achieving their goals. Data were collected at baseline and one week after the 14-week PATHWAYS program. Along with weight and height and waist measures, data were collected regarding eating behavior by completing a questionnaire. Asking participants about the frequency and duration of exercise during the previous seven days, as well as specifically what they did for exercise assessed exercise behaviors. The PATHWAYS Weight Loss Behavior Index was administered to measure behaviors and attitudes associated with successful weight loss. The index consisted of 56 statements and three separate scores were derived from the instrument which were the positive weight loss behavior score, negative weight loss behavior score by the degree to which subjects engaged in behavior to promote loss and also motivation score pertaining to personal belief and attitudes that influence weight loss effort. After the completion of the 14-week core programs, the PATHWAYS experimental group lost an average of 5% of their body weight and the control group gained an average of 1% of their body weight. The mean difference in weight loss between groups after the completion of the program was significant. The PATHWAYS Behavior Index data reported a post treatment increase in the number of positive eating behaviors and decrease of number of negative eating behavior. The experimental group participants reported greater increases of weekly minutes of exercise than did the control group. The author concluded that future research should focus on whether the weight loss observed in this project could be maintained or enhanced through a longer follow up period.

Another pilot study done by Whitt-Glover, Hogan, Lang and Heil, (2008) reported on the effect of a 3-month faith-based physical activity intervention on daily walking and

moderate and vigorous intensity physical activity among members of a sedentary African American population. Since this study was a pilot study to determine the feasibility and acceptability of the intervention strategy, a pre-intervention and post-intervention assessment with no control group was used. Eighty seven African American adults from four churches participated in eight group sessions, which included discussions of physical activity related topics, instructor led physical activity sessions, and weekly incentives to promote physical activity. The study design and the content of the sessions of this intervention were based on information from in-depth interviews. The intervention was based on social cognitive theory. The weekly sessions focused on behavioral strategies to increase daily moderate and vigorous intensity physical activity. In addition, the weekly sessions incorporated 30 minutes of moderate intensity physical activity, using culturally relevant incentive items such as faith- based aerobic videos, gospel exercise CDs, tote bags or T-shirts with faith-based slogans that fit the intervention theme. A theological perspective with a focus on personal health care was included in the opening sessions. Scriptural references that supported the notion of self-care and negotiating barriers were also used throughout the sessions. All measurements were collected at baseline and after three months except for the daily walking records, which were collected weekly throughout the study by using a pedometer. A modified International Physical Activity Questionnaire was used to assess self -reported participation by minutes per week in moderate and vigorous intensity physical activity. The study observed significant increase in number of steps per day after four weeks and after twelve weeks and also significant changes in the participation of moderate and vigorous intensity physical

activity after twelve weeks. Although this study did not have objective data for participation in moderate and vigorous intensity physical activity, it did provide the preliminary information about the potential for a faith-based program to increase physical activity level over three months period among sedentary African American adults.

"Faith on the Move" was another randomized controlled design pilot study of a faith-based weight loss program for African American women (Fitzgibbon et al., 2005). The goals of the study were to estimate the effects of twelve weeks of culturally tailored, faith based weight loss intervention on weight loss, dietary fat consumption and physical activity. This study was conducted outside of a church setting to recruit a range of women who were interested in a faith-based intervention but who might not have a specific church affiliation. It was also the intention of the study to avoid the use of religious/or spiritual elements by the standard group who used only the culturally tailored standard behavior components, which enabled the study to test the validity of the comparison with the intervention group who used the culturally tailored faith-based components. This intervention was also based on the Social Cognitive Theory. The study emphasized cognitive, behavioral, environmental and cultural aspects of lifestyle changes in diet and physical activity that would result in weight loss. The intervention was delivered in a small group format and met twice weekly for twelve weeks. The weekly meetings had interactive didactic components and exercise components. Fifty-nine overweight and obese African American women were randomized into two groups. One group received the culturally tailored weight loss components of the program. The other group received culturally tailored weight loss intervention and also addressed the faith and spirituality

issues in a structured and systematic manner. Scripture from the Bible was incorporated each week into the content of the intervention for this group. Physical activity data at baseline and post intervention were collected through self-report by using the Stanford Seven Day Physical Activity questionnaire (Blair et, at, 1985). The standard behavioral intervention group showed a significant increase in physical activity whereas the faith-based intervention group did not. The author pointed out that this result could be biased by the self-report and suggested to utilize both self- report and objective measures for future studies to assess accurately the type, duration and intensity of activity.

Another study compared the effect of three home based exercise promotion programs for sedentary African American adults (Newton and Perri, 2004). Sixty sedentary African American adults were randomly assigned to one of the three conditions: standard behavioral exercise counseling, culturally sensitive exercise counseling and physician advice/or recommended care comparison group. The standard behavioral participants were mixed with African American and predominantly Caucasian members receiving ten intervention sessions over six months led by Caucasian leaders. The intervention sessions were conducted in a university hospital setting. At each session, the participants received standard written materials related to the key behavioral components, including goal setting, completion of an exercise log, problem solving to overcome barriers to adherence, and relapse prevention training to negotiate slips and relapse. The culturally-sensitive intervention group was identical to the standard behavioral group with the exception that all participants were African Americans and the session led by African American counselors and sessions were conducted at an African

American community center and with program materials focused on a socio cultural concern for African Americans regarding exercise. The physician-advice group was the minimal treatment group that received recommended exercise guidelines that a health care provider would typically give to a sedentary individual. In the first meeting the physician provided advice on establishing and maintaining an exercise program and after this initial meeting participants were invited to monthly physician led meetings in which various health topics were discussed, some of which were unrelated to eating or exercise behavior changes. The key study outcomes measured at baseline and after six months were physical activity and cardiorespiratory fitness. The seven-day physical activity recall was developed and established for reliability and validity to measure physical activity. Physical activity recall administered at baseline and six months showed no significant difference between the groups at post treatment. However, within group analysis reported the participants in the culturally sensitive and standard behavioral groups significantly increased their days per week of walking from baseline to six months. The author explained this result as the "demand characteristics" of the participants where they act in ways they believe the experimenter wishes. The author also mentioned that self- recorded data is susceptible to recall errors.

Another randomized trial evaluated a six months church-based physical activity intervention for African American women using social cognitive theory constructs (Young and Stewart, 2006). The purpose of this intervention was to determine whether prevalence of physical inactivity would be decreased and daily level of energy expenditure would be increased through "Aerobic Exercise" compared to a "Stretch N

Health" lecture intervention. This study recruited 196 women from 11 churches in Baltimore City and Baltimore County. Churches were randomized to "Aerobic Exercise" or "Stretch N Health" intervention. Regardless of church intervention assignment all participants were given individualized physical activity plans which included target exercise heart rates for maintaining a moderate-intensity effort and recommendations about duration increases each week to reach the goal of 30 minutes of moderate- intensity activity 5 times per week. The content of the classes offered at the church were different by the intervention groups. One hour weekly exercise classes were offered for six months to the churches who were randomized to "Aerobic Exercise" group. The classes for "Aerobic Exercise" group were designed on the basis of social cognitive theory, which included self -efficacy, learning self-management skills, goal setting and modeling experiences. Participants were asked to pair up with buddies to optimize social support. Church randomized to "Stretch N Health" condition received free, alternating weekly low-intensity stretching classes and health lectures, which included healthy eating, stress management skills, meal planning and natural herbal remedies. Newsletters were sent with general health messages and without any motivational messages. The Stanford 7-Day Physical Activity Recall (PAR) (Blair et al., 1985) and the Yale Physical Activity Survey (YPAS) (Dipietro, Caspersen, Ostfeld and Nadel, 1993) were administered to obtain the level of physical activity at baseline and after six months of the intervention. The result showed no difference on the physical activity level between the "Aerobic Exercise" group and the "Stretch N Health" group. As the author mentioned low attendance could be the reason for this result, although regardless of treatment

assignment, physical inactivity decreased in both groups from baseline to follow up and higher baseline social support predicted change in physical activity in both groups.

Another study reported on a Pilot Church Based Weight Loss Program for African American adults using church members as health educators (Kennedy et al., 2005). A randomized trial design was used without a control group. Forty church members were randomized into two groups. One intervention was delivered in a group setting and another intervention was delivered in an individual setting. Both groups received monthly nutrition and physical activity lessons for six months by two trained church members. The anthropometric and laboratory measurements were conducted at baseline and at the end of six month for both intervention groups. Physical activity was assessed with a questionnaire, which was not formally validated. The questionnaire contained questions about the type and frequency of leisure time and sport activity and physical inactivity and television viewing. Thirty-six participants completed the physical activity questionnaire. The study result showed a modest weight loss for treatment groups although the difference between groups was not significant. In general the study participants reported an increase of physical activity and significant improvement in the physical function aspect of quality of life. Although study participants reported increase in leisure time physical activity, the author concluded that the report could be an error or biased since the questionnaire used to assess physical activity in this study was not validated.

To evaluate the effectiveness of modest lifestyle changes in maintaining improvements in glucose tolerance in Obese African Americans, another study was

conducted (Racette, Weiss, Obert, Kohrt and Holloszy, 2001). A total of 45 men and women between the ages of 30 and 70 comprised the intervention group and the 24 participants matched for age, body weight, body composition and degree of glucose tolerance comprised the control group. The intervention group received an energy-restricted diet for one week followed by a lifestyle program of reduced dietary fat and increased physical activity for one year. All control group participants were invited to enroll in the intervention after completion of the study. The dietary goal of the modest lifestyle intervention was to reduce fat intake resulting in an energy deficit. All participants received educational materials and individual recommendations from the study dieticians about ways to achieve this goal. The physical activity goal of the intervention group was to increase daily energy expenditure by daily activities or aerobic exercise. All participants in the intervention group received instruction and handouts on safe and effective ways to increase physical activity every day. Participants were also encouraged to use the track, treadmills, stair climbers, rowing machine, etc in an on-site exercise facility. Subjects in the control group were not invited to the exercise facility. Physical activity was assessed at baseline and after one year using the Minnesota Leisure Time Physical Activity questionnaire (Taylor and Jacob, 1978) and the 7-Day Physical Activity Recall questionnaire (Blair et al., 1985). The baseline report showed no difference between groups for leisure time physical activity but at the end of one year the intervention group showed an increase in daily energy expenditure using the leisure time physical activity questionnaire. The majority of the participants in the intervention group reported that they had incorporated additional physical activity in their daily lives either

in their daily routine activities or in the form of exercise. The outcome result suggested that the intervention approach was effective for reducing body weight and improving glucose tolerance for as long as one year and that a long-term study was needed to evaluate the efficacy of this approach over several years.

Healthy Body Healthy Spirit was another multi component intervention to increase physical activity and consumption of fruits and vegetables (Resnicow et al., 2005). Sixteen churches were randomly assigned to three intervention conditions. Group one received the standard nutrition and physical activity materials, group two received culturally targeted self-help nutrition and physical activity materials, and group three received the same materials as group two plus four telephone counseling sessions based on motivational interviewing. The intervention materials for groups two and three were culturally targeted and were developed based on the most acceptable and salient messages for the African American population derived from the feedback from a series of focus groups. For physical activity intervention materials, a 20 minutes exercise video was developed which documented the effort of selected families who attempted to increase and maintain their activity level. The video also included the pastor's sermon on the importance of exercising and maintaining a healthy body. The main purpose of the video was to motivate the participants. An exercise guide was also developed to accompany the video, which included the core message that it is important to obtain 30 minutes of physical activity on most days of the week. Also activities with greater intensity and duration for the benefit of health were emphasized in the exercise guide. Group three received additional motivational interviewing calls, which were delivered

four times in different weeks. This protocol was developed to encourage participants to think and verbally express their needs, experience, barriers, fears, readiness and reasons for changes. To measure the frequency and duration of the physical activity by the participants, the CHAMPS (Community Health Activities Model Program for Seniors) Physical activity recall (Harada, Chiu, King and Stewart, 2001; Steward et al., 2001) was adopted. The CHAMPS instrument was modified to adjust for this intervention population based on the focus group and pilot testing of the instrument. The CHAPMS instrument was validated against submaximal treadmill test and 24 hours recall conducted in a subsample of participants. The modified CHAMPS instrument was used to measure three indices of activities: total minutes of physical activity per week, minutes of moderate and vigorous activities and 'intentional activities' which was comprised of sports related activities that were not part of daily routine. Physical activity for each of the three indices was measured at the baseline and one-year follow-up. The follow-up measures of the three groups showed a significant increase of total minutes of PA by group two and three compared to group one. But group two and three did not differ on any of the three indices. The overall effect of the intervention was greater for fruits and vegetable consumption but not for physical activity. The author concluded that the social desirability bias and self report measures might have affected these results, although the self reports were significantly correlated at baseline with an objective validity measure, the magnitude of the correlations were small to moderate; thus lower validity and reliability affected the measure of changes.

Generally, there are only a few studies that targeted or included substantial numbers of racial/ethnic minorities or low- income background for the effectiveness of physical activity promotion interventions (Bank and Conn, 2002; Taylor, Baranowski and Young, 1998; Yancy et, al, 2004). A review of racially and/or ethnically inclusive population- based study found that fewer than half of the studies presented outcome data on physical activity behavior change and those revealed few significant effects and modest effect sizes (Yancy et al., 2004). Although more recent studies with racially and /or ethnically inclusive, individually targeted interventions are using larger samples and more rigorous design (Appel et al., 2003) than earlier studies and producing more promising results with physical activity (Fahrenwald, Atwood, Walker, Johnson and Berg, 2004; Jacob et al., 2004), more theory based intervention research is needed, improved methodology must be applied and instruments should be developed that are valid and meaningful for the targeted populations (Bank an Conn, 2002;Taylor, Baranowski and Young, 1998; Yancy et, al 2004).

<u>Physical Activity Measurement</u>

An accurate measurement of physical activity is difficult to obtain because of the diverse lifestyle and complexities of human physical activity. There are many direct and indirect ways to measure physical activity. However there is not one "gold standard" for accurate measurement of physical activity. Direct methods include calorimetric, doubly labeled water, motion sensors, observation, diaries, logs and records. Indirect methods include fitness measures, metabolic measures, heart rate telemetry, self-report

questionnaires and surveys. Each of these methods has its strength and weaknesses. The direct method tends to be extremely precise but assesses current energy expenditure only and also the direct method is expensive to apply with large number of subjects. Indirect methods such as surveys and physiologic measures provide the substitute measures of activity status. Surveys are the most practical approach in large scale studies, and one of the advantages of survey is that they are inexpensive, do not create a large participant or interviewer burden, and can be used to identify the different types of activity performed in different life periods. However the disadvantages of all surveys are that they suffer from significant reporting bias and also they are limited to the number of questions used to assess a specific behavior (Laporte, Montoye and Caspersen, 1985). Motion sensors, in general, offer the most precise direct alternative to assess physical activity because of their ability to capture meaningful indicators of physical activity. On the other hand, direct measures such as calorimeter, doubly labeled water and observation are less feasible due to expense and increased burden on individuals (Tudor-Locke and Myers, 2001).

The use of electronic accelerometers to assess daily physical activity has increased in the last decades (Meijer, Westerterp, Verhoeven, Koper and Ten, 2002; Laporte, Montoye and Caspersen, 1985). Accelerometers provide a direct and objective measure of the frequency and intensity of movements during physical activity by registering the accelerations and decelerations of the body. This is why accelerometers are superior to actometers and pedometers, which are affected by impact or tilt. Some accelerometers can measure tilt and body movements, which also makes them superior to

other motion sensors that cannot measure static characteristics. Enhanced micro-electromechanical system technology makes it possible to manufacture the miniaturized, low cost accelerometers, which demonstrate a high degree of reliability in measurement with little variation overtime (Meijer, Westerterp, Verhoeven, Koper and Ten, 2002; Bouten, Koekkoek, Verduin, Kodde and Jassen, 2002; Hansson, Asterland, Holmer and Skerfving, 2001). Accelerometers have been validated under free-living conditions against calorimetric and doubly labeled water methods (Westerkerp, 1999). Free-living subjects can wear small, light-weight, portable accelerometer without obstructing their movement.

Community Nutrition Education (CNE) Logic Model

When programs are implemented in widely different situations, such as different states implementing the same or different curricula, a common outcome and indicator system is needed to identify national impact and enhanced creditability (Medeiros et al., 2005). Since the trend of obesity and other chronic diseases related to nutrition and physical activity are rising, assessing the effectiveness of nutrition education programs to address these trends is essential. The National Institute of Food and Agriculture (NIFA) and Cooperative Extension Service's administrators became concerned with these trends and with the Extension's ability to assess the effectiveness of nutrition education program that address these trends. These concerns prompted the development of a program management and reporting system for community nutrition education programs. To meet the states' needs, this system had to be flexible, yet consistent enough to give national

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observers an understanding of program accomplishments and the actions needed to create a nutrition education program which is impactful and cost effective. The logic model approach was identified as the best approach among several theories and models explored, to address this system wide need. Using a graphic representation to illustrate a program's theory of change or how day-to-day activities connect with desired program outcomes, the logic model provides a basic framework for evaluation. Creation of the Community Nutrition Education (CNE) Logic Model was a dynamic process conducted by experienced researchers, evaluators, and program managers. The CNE Logic Model applied the socio- ecological approach to support a broad continuum of intervention strategies in three levels of intervention: individual, family or household level; institution, organization or community level; and social structure/policy level. Outcomes are reported as short- term where knowledge is gained and /or skills are developed, medium term where behaviors have been adopted and long- term where health, financial and/ or social conditions have changed. When the model was used to report on the Food Stamp Nutrition Education Program (FSNE) across the country within the Land Grant University System in 2002, it revealed the need for further refinement of the model and development of an online program management and reporting system. After conducting a blind review of the FY 2002 FSNE state reports, a workgroup of individuals with FSNE experience refined and developed the CNE Logic Model version 2 in 2006 and provided guidance to the development of an online program management and reporting system (USDA, NIFA, 2009).

EFNEP and Physical Activity

The Expanded Food and Nutrition Education Program is a unique nutrition education program funded by the National Institute of Food and Agriculture (NIFA), which currently operates in all 50 states and in American Samoa, Guam, Micronesia, Northern Marianas, Puerto Rico and the American Virgin Islands. The curricula developed for EFNEP throughout the states are based on the USDA Dietary Guidelines for Americans, and Myplate (USDA, 2009). The Dietary Guidelines provide science-based advice to promote health and to reduce risk for chronic diseases through diet and physical activity. Based on research and changes in dietary guidelines in 2005, physical activity was added as a new component, since poor diet and physical inactivity, resulting in an energy imbalance (more calories consumed than expended), are the most important factors contributing to the increase in overweight and obesity in U.S.A today (USDA, 2005). To reverse the trend of rising obesity, which is a major risk factor for certain chronic diseases such as diabetes, certain cancer, hypertension and cardio vascular diseases, recommendations for physical activity were included in the Dietary Guidelines for Americans. Recommendations were to include at least 30 minutes of exercise on most days of the week to lower the risks of all chronic diseases mentioned above. Recommendations were also made to include 60 minutes of moderate or vigorous physical activity on most days of the week to manage weight and to prevent unhealthy weight gain. To lose weight and to keep the weight off, the guidelines recommended for 90 minutes of modest exercise every day.

Thus, EFNEP developed lessons based on these recommendations to encourage its audience to change behavior and increase their level of physical activity. The Community Nutrition Education Logic model approach is adopted by EFNEP as a framework of the program evaluation. The current research on developing items/scales for assessment of physical activity behavior change among members of the EFNEP audience will be an addition to the EFNEP web based evaluation system, which will enable EFNEP to evaluate the program more effectively nationwide.

Physical Activity Interventions and Theories of Behavior Change

Strategic planning to develop and manage programs and meaningful evaluation to achieve desired program outcomes can help people maintain and improve health, reduce disease risks and manage chronic illness. Throughout this process, health behavior theory plays a critical role. Theory is a set of concepts, definitions and propositions that explain the dynamics of health behaviors and suggest processes to achieve behavior change by providing tools to design the appropriate interventions and evaluate their success (Glanz and Rimer, 2005). Several theory-based studies found that physical activity interventions are effective in influencing the physical activity behavior (Bock, Marcus, Pinto and Forsyth, 2001; Dunn et al., 1997; Marcus, Owen, Forsyth, Cavill and Fridingert, 1998). Theoretical frameworks that were most commonly used in physical activity interventions are social cognitive theory (SCT), the trans-theoretical model (TTM), theory of reasoned action (TRA), and theory of planned behavior (TPB).

Social cognitive theory is based on the concept of reciprocal determinism, which is a dynamic interplay among personal factors, the environment, and behavior. Reciprocal determinism postulates that changing one of these factors will change them all. The factors of reciprocal determinism are affected by many constructs of social cognitive theory. *Self-efficacy* is the most important factor of behavior change. People can overcome obstacles and change behavior if they have a sense of self-efficacy. When people have the skill and knowledge, they feel confident and overcome barriers. *Observational learning* is another factor of SCT, which influences people to change behavior through the experience of observing others rather than their own experience. *Expectation* can also influence behavior. People will be motivated to change behavior if they anticipate an outcome from the behavior change and also if expected positive outcomes are maximized more than negative outcomes (*Expectancies*). *Reinforcement* is another construct of SCT, which determines whether or not people will repeat the behavior. People are inclined to do the behavior if they find others are rewarded to do so (Glanz and Rimer, 2005).

According to the trans-theoretical model (TTM), behavior change occurs as people move through the stages in very specific sequences. There are five stages of change: *pre-contemplation* is the first stage of change when people are not participating in any particular behavior and are not intending to change the behavior in the next six month. The *Contemplation* stage occurs when people move from pre-contemplation to a recognition of the problem and form an intention to change behavior within six months. In the *Preparation* stage, people intend to take action within the next thirty days and take

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some behavioral steps in this direction. Once preparation is complete, the *Action* stage begins where behavior has changed but for less than six months. *Maintenance* is the final stage of change when people work to prevent relapsing to old behavior and maintain changed behavior for more than six months (Glanz and Rimer, 2005).

The theory of reasoned action (TRA) and the theory of planned behavior (TPB) postulate, that *behavioral intention* is the most important determinant of behavior. According to these models, behavioral intention is influenced by a person's *attitude* towards performing a behavior and by beliefs about whether individuals who are important to the person approve or disapprove of the behavior (*subjective norm)*. Both TRA and TPB postulate that all other factors such as culture, environment, etc., operate through the models' construct and do not independently explain the likelihood that a person will behave in a certain way. TPB has one construct more than TRA: *perceived behavioral control,* which is people's belief that can control a particular behavior (Glanz and Rimmer, 2005).

A review study (Lewis, Marcus, Pate and Dunn, 2002) found the most common theoretical constructs investigated by several studies in the literature to increase physical activity are self-efficacy (e.g. becoming confident of being physically active), cognitive process of changes (e.g. increasing knowledge), behavioral process of changes (e.g. rewarding oneself), decisional balance (e.g. weighing pros and cons related to physical activity), social support, enjoyment of physical activity, outcome expectancy (e.g. having expectations for the out come of physical activity and for the value of the outcome), and also self regulations (e.g. utilizing skill to carry out the intention of doing physical

activity and overcome barriers). Major limitations of these existing studies that investigated the importance of theory in physical activity interventions are the inconsistency of measures administered across studies, which created difficulty in comparing findings in the studies. Also using a part or adopted version of the previously validated measures without validating the new version of the measures made it difficult to measure the effectiveness or outcome of the physical activity interventions. A recommendation was made to use a psychometrically sound measurement tool to achieve expected outcome of the program

Summary

Over forty years, EFNEP, a federally funded programs, has developed and implemented a variety of nutrition educational materials, curricula and strategies to educate adults who have limited income and also are ethnically and racially diverse to acquire knowledge, develop skills and attitudes necessary to change behavior and build a healthier life for themselves and their families. To determine the effectiveness of EFNEP and to document the achievements of the program objectives for continued federal funding, accurate assessment of the program is essential. In order to enhance the current evaluation methods used by the adult EFNEP, it was proposed that valid and reliable items/scales needed to be developed to measure the physical activity behavior change among EFNEP adults. By having valid and reliable items/scales, which would embrace the core elements and efforts of adult EFNEP, this research would be able to improve the quality of EFNEP program evaluation and demonstrate the effectiveness of the program

in influencing behavior change among adults in a more accurate, consistent and reliable

manner.

CHAPTER THREE

METHODOLOGY

Overview

The goal of the study was to develop, pilot test and validate self-report physical activity items that could be potentially included in the EFNEP Behavior Checklist. The specific aim was to develop physical activity items based on behavioral theories, relevant to curricula content, Dietary Guidelines for Americans (DGA) and My Plate, which could reach the short-term outcomes of the Community Nutrition Education (CNE) logic model (Appendix A) with an acceptable level of reliability and validity. It is important to note that, this study also aimed to develop items that are practical to respond and to administer among low-income/low-literate audiences. The detailed methods and procedures for this study are described as follows:

Research Questions and Research Methods

The table below displays the research questions and methods of this study.

Table 1. Overview of the research questions and methods of this study

Research Questions	Research Methods
Which content areas related to physical activity behavior were addressed in adult EFNEP curriculum?	Content analysis of several curricula utilized by the adult EFNEP program across and within the states.
To what extent do the items/scales reflect the contents/or indicators of physical activity that are taught in adult EFNEP program?	Content validity (reviewed by an expert panel).
To what extent are the items/scales understandable by the target audience?	Cognitive testing (individual interviews).
To what extent do the items/scales measure what they purport to measure?	Construct validity by administering the items/scales to a larger sample.
To what extent do the items/scales correlate with measures obtained on some external criterion?	Predictive validity by comparing physical activity items with objective measures-accelerometer.
To what extent do the items/scales have the same responses when measured with the same groups of participants on two different occasions without intervention?	Test - retest reliability by completing the survey on two different occasions and one week apart with no intervention.

Population, Sample and Study Location

The target population for this research study consisted of EFNEP-eligible, limited-income mothers who had at least one child under the age of 19 living in the household. Participants were of diverse races and ethnicities and could read, write and speak English. The study was conducted in six rural counties of South Carolina: Richland, Saluda, Aiken, Sumter, Chester and Lancaster Counties. Recruitment was conducted at the Department of Social Services (DSS) offices and Department of Health and Environmental Control (DHEC) offices in Aiken, Sumter and Richland Counties, while participants were waiting to register for the Supplemental Nutrition Assistance Program-Education (SNAP-Ed) and Women, Infants and Children (WIC) programs at those facilities. Recruitment was also conducted at different Housing Authority Complexes in Saluda, Chester and Lancaster Counties.

Staff Training

Since solely the researcher conducted the data collection, no formal training was conducted. During the process of data collection six EFNEP Nutrition Educator Assistants were informed and explained about different elements of data collection such as recruitment methods, consent forms, administration of surveys, accelerometers, and incentives. These Nutrition Educator Assistants helped researcher with recruiting the clients and any support or help the researched needed during the data collection process. Prior to recruiting the participants for data collection, six personnel from DSS, DHEC offices and Housing Authority Complex from the counties were contacted, and

information regarding data collection procedures was explained. These personnel assisted the researcher in securing meeting rooms and providing other necessary support services for data collection.

<u>Scale Development</u>

Measuring the impact of behavior change with low-income adults participating in nutrition education programs like EFNEP is important. Since questionnaires are the primary means of data collection needed to evaluate the program, it is critical that measures in the survey instrument are valid and reliable. To accomplish this goal, the researcher followed a systematic process to develop and test the scales/items of the survey instrument.

The following phases were undertaken to accomplish the goals and specific aims of the research study:

Phase 1. Curricula Review and Identification of Contents and/or Indicators

The main objective of curriculum review was to identify the concepts/contents related to physical activity addressed within EFNEP Nutrition Education curricula.

Curricula Identification

A survey was sent to all the EFNEP State Coordinators in fifty states and its territories through the EFNEP Coordinators list-serve to identify and collect physical activity lessons or curriculum developed for EFNEP adult audiences. Forty-two State Coordinators responded to the survey and provided information as requested in the

survey. Using information from the survey, twelve EFNEP curricula, including physical activity lessons/components were identified and reviewed by this study.

Curriculum Review Process

        A review team consisting of two EFNEP Area Coordinators, one faculty from the Clemson University Department of Public Health Sciences, and three graduate students from Clemson University Department of Food, Nutrition, and Packaging Sciences were recruited and trained to assist with the curricula review. Members of the review team were familiar with the core components of EFNEP program and had expertise in disciplines related to physical activity, nutrition education, health promotion, public health and evaluation.

Review Tools

        A data-recording sheet (Appendix B) was developed for this study based on indicators from the Community Nutrition Education Logic Model, previous curricula review, and a list of hypothesized mediators of physical activity that an EFNEP lesson or curricula should address in order to answer the following evaluation questions (EQ): EQ1: How was the physical activity content presented across curricula? (e.g. lecture, interactive activity, discussion, reinforcement); EQ2: How much time (estimated) was dedicated to address each physical activity content area/specific topic?; EQ3: How many times was a physical activity content discussed? (e.g. one time or repeatedly throughout the lesson).

Review Process

Each reviewer was assigned to at least one curricula or physical activity lesson, and then they were asked to read each lesson/activity thoroughly and provide qualitative data for each variable listed on the data-recording sheet. At the end, each team member prepared a summary sheet (Appendix C) with general characteristics of the different curriculums, organized by the following questions:

a) Was any theory used as the framework of the curriculum? List specific constructs or elements used to guide the lesson.

b) What goals and objectives were addressed about physical activity in the curriculum?

c) How many lessons were in each curriculum regarding physical activity and what was the length of the time for each lesson?

d) What impact or outcome do you expect from the participants as a result of attending the physical activity lesson and why?

Qualitative Analysis

To analyze the qualitative data collected individually by each reviewer, the review team met and evaluated collectively all the contents that the researcher compiled from the individual data-recording and summary sheets. After discussing independent reviews, consensus was established based on following criteria: a) the number of curriculum addressed the specific content; b) the level of methods used to address the content. (e.g., Level 1 denoted that only a lecture was used, Level 2 specified that a lecture and

discussion format was used and Level 3 identified whether the content was presented via lecture, interactive activity or discussion., and c) the frequency of addressing the content by each curriculum (e.g., once or repeatedly throughout the curriculum). By following these criteria, the review team was able to identify a number of specific contents/constructs from the wide variety of contents that could be measured for physical activity behavior change.

Phase 2. Conceptual Framework and Item Generation

The next phase of this study was to generate items/scales that would clearly reflect each of the concepts this research study was attempting to measure.

Conceptual Framework

To incorporate appropriate and meaningful items into an EFNEP Behavior Checklist to measure physical activity behavior change, this research was based on the following components: a) findings from the content review conducted with adult EFNEP curriculums e; b) Community Nutrition Education Logic Model (CNE) (USDA, NIFA, 2009); c) National guidelines from MyPlate (USDA, CNPP, 2011); d) 2010 Dietary Guidelines for Americans (DGA) (USDA, CNPP, 2010); and d) 2008 Physical Activity Guidelines for Americans (USDHHS, 2008). Each of these components provided the conceptual framework to focus the survey development/design process.

Item generation: Once the conceptual framework was established, the researchers conducted a literature review to identify physical activity measures and items/questions

that could be potentially included in the first draft of the survey items/scales (sallies.ucsd.edu/measures_accelmanual.html; CDC-BRFSS, 1984-2009; IPAQ, 2002). After the literature review, researchers develop new items and/or modified items as appropriate for EFNEP low-income audiences. The basic guiding principles used during the selection items were: a) Items should capture the essence of the identified physical activity contents and indicators to be measured; b) the larger the item pool, the better so the researcher could eliminate some items based on lack of clarity, questionable relevance or undesirable similarity to other items; c) items should be appropriate to the reading level of target population; d) items should not be exceptionally long since length usually increases complexity and diminishes clarity; e) Double-barreled items should be avoided because it would be difficult for respondents to endorse one part of the item without endorsing the other which might not be consistent with the first; and f) wording of the items should follow certain rules of grammar to avoid ambiguity and response bias (DeVellis, 2003).

Following these guidelines, the first draft of the item/scale (Appendix D) was developed and organized. Each item was developed by the researcher with the help of the research committee based on the criterion mentioned above. The first draft included sixty-three physical activity items organized within the following concepts: General Physical Activity (four items), Motivation (eighteen items), Factual Knowledge (five items), Behavioral Skill Building (twenty two items), Self-Regulation/Monitoring (twelve items) and Social-Environmental (two items). A minimum of three items per measure was established to ensure that the length of the items/scales was long enough for

reliability purposes and short enough for reducing response burden (DeVellis, 2003).

Self-report format was utilized in designing the items/scales so that it would be

convenient for paper-pencil administration during pre and post interventions. The

response categories for most of the questions included five points Likert Scale response

options (e.g., 'Not Applicable', 'Do not do', 'Seldom', 'Sometimes' 'Most of the time',

'Almost always') as well as binomial scales 'Yes' or 'No'. Five point Likert Scale

response options were aligned to the ones currently used with the EFNEP Behavior

Checklist. The new EFNEP web based evaluation system (Web-NEERS) has flexibility

of using the binominal scale response options, as well.

Phase 3. Expert Reviews and Content Validity

Content validity refers to the degree that the instrument covers the content that it

is supposed to measure (Yaghmaie, 2003). To ensure content validity of the items/scales

for this research, eight experts were invited by a letter (Appendix E) and/or e-mail

invitation to review the initial draft of the items. These experts were selected based on

their knowledge of EFNEP, their expertise in physical activity, health promotion,

evaluation and research, specifically with low-income audiences Each reviewer was

asked to provide qualitative feedback about: a) item relevancy in terms of EFNEP

curricula contents, CNE logic model and 2010 DGA; b) wording appropriateness and

clarity; d) item difficulty and suggestions for alternative item wording; and e) general

recommendations to add, delete, modify or improve items.

Qualitative findings from the expert review were shared and discussed with the dissertation committee members and items were modified, deleted and/or added based on discussions and suggestions for survey development improvement.

Phase 4. Revision of Items/Scales

In this phase, the researcher compiled all the comments and suggestions received from the reviewers by each item and/or each concept. The researcher shared this information with research committee members for further discussion to revise and improve the items/scales. Upon reviewing all suggestions and comments for each item and/or concept area, the committee's consensus was that while EFNEP Behavior Checklist items were behaviorally focused and items on actual behavior were needed to determine the impact of EFNEP, some items should also be developed on pre-behavioral mediators. Literature revealed that many interventions might have only indirect effects or produce their effects on intermediate causal variables. Therefore, behavioral scientists need to study these mediating variables, which might influence the mechanism between interventions and physical activity behavior change (Baranowski et al., 1998). In addition, Baron et al. articulated that a mediator in behavior research was necessary to complete the causal process, which makes a connection between physical activity interventions and behavior (Baron & Kenny, 1986). It was also determined that these pre-behavioral mediator items be theoretically grounded as literature suggested when theoretical model could predict the behavior at an adequate level and interventions could

modify mediating variables at a satisfactory or acceptable level, there would be a reasonable chance for the intervention to be more effective (Taylor et al., 1998).

Based on these discussions, all the core concepts from curriculum content analysis, CNE logic model, MyPlate and DGA, were reviewed again. This review helped researcher to revise, delete and/or modify items by using the following methods:

1) Identifying key concepts from curriculum content analysis to determine the pre-behavioral mediators;

2) Using a theory as a guiding framework;

3) Using theoretical constructs to revise and/or modify items.

Theory of Reasoned Action (TRA) and Theory of Planned Behavior Control (TPB) were used as a guiding theoretical framework for item revision, deletion and/or modification. TRA and TPB propose that behavior is based on the concept of 'intention'. Intention is the extent to which someone is ready to engage in a certain behavior (Aijen & Fishbein, 1980). Intention in the TRA/TPB is influenced by the following constructs: attitude, subjective norms and perceived behavioral control (Aijen, 1988).

After determining the guiding theory and theoretical constructs, 17 new items were developed by the researcher, with the help of the research committee, on psychosocial mediating variables for physical activity behavior. During this process, a thorough literature review was conducted to consult different measures on psychosocial mediating variables based on TRA/TPB constructs in order to implement ideas of how to ask questions on attitude, subjective norms, perceived behavior control and intention (Francis et al., 2004; Hagger et al., 2001; Wayne & Todd, 2011; Glanz et al., 2008).

Measures from different physical activity interventions were also reviewed from James Sallis's website during this process (sallies.ucsd.edu/measures_accelmanual.html). Jim F.Sallis is a distinguish professor of Family and preventive Medicine at the University of California, San Diego and Director of active living research. His primary research interests are promoting physical activity, understanding policy and environmental influences on physical activity, nutrition and obesity. He has made contribution to the areas of measurement, correlates of physical activity, intervention and advocacy. The website was reviewed and consulted because the website is a searchable database which provides detailed information on measures that were developed to use in different physical activity intervention projects.

As a rule of thumb, at least four to five items per construct were developed since some might be eliminated during the course of analysis. A minimum of three items was deemed necessary for supporting each factor (Hatcher, 2009). In all, four items were generated on attitude, four on subjective norm, four on perceived behavior control and five on intentions.

For actual behavioral change, a total of twelve items were generated in four dimensions of physical activity such as home, yard, walk and work. At least three items per dimension were developed to ensure that the items were long enough for reliability purposes and short enough to reduce the burden of respondents (DeVellis, 1991). Questions from the Behavior Surveillance System (CDC, 1984-2009) and International Physical Activity Questionnaire (IPAQ, 2002) were consulted to adopt items/scales on

actual behavior around multiple dimensions. Caution was taken to ensure that the items/scales were appropriate for EFNEP audiences.

One item was adopted from 'Exercise: Stages of Changes: Short Form' to measure the audiences' stage of physical activity behavior in order to compare it with their actual behavior (Norman et al., 1998; Marcus et al., 1992).

For psychosocial mediating variable items/scales, five point Likert scales were adopted for response options ('Strongly Disagree', 'Disagree', 'Neither Agree or Disagree', 'Agree', 'Strongly Agree'). For behavioral items specific response options were applied (One Day, Two Days, Three Days, Four Days, Five Days. Six Days, Seven Days, Not Applicable (N/A) and I Don't Know). Moreover, specific response options were adopted for the Stages of Changes question ('Yes, I have been for more than 6 months', 'Yes, I have been for less than 6 months', 'No, but I intend to in the next 30 days', 'No, but I intend to in the next 6 months' and 'No, I do not intend to in the next 6 months') (Appendix F).

Generating items based on the re-evaluated objectives, the researcher presented the items/scales to the research committee for further review, comments and approval. The research committee collectively discussed the items several times and agreed to approve the items/scales for the next phases including cognitive testing.

Phase 5. Cognitive Testing

The objective of this phase was to assess whether the respondents for whom the items/scales were developed understood them clearly and were able to respond as

expected. The cognitive testing was conducted with a subsample of the eligible EFNEP population. A convenience sample of 14 limited-resource mothers of young children was recruited from Sumter and Aiken Counties. The Institutional Review Board of Clemson University approved this study (Appendix G). Participants signed consent forms (Appendix H) on the day of cognitive testing before the interviews. Participants received EFNEP water bottles as an incentive for participating in the testing.

The cognitive interview guide (Appendix I) was prepared based on a protocol found in the literature. (Shafer & Lohse, 2006) The researcher conducted the individual interviews using a standardized script for the cognitive testing. Each interview was held separately in the Clemson Extension offices in Aiken and Sumter Counties. Several recording methods, such as audiotape, notes, and observations, were employed for collecting information.

The process began by explaining the purpose of the interview. Each item was then read aloud. Participants were asked to use the *"think aloud"* approach to respond to each questionnaire item. For each item on the questionnaire, a set of probing questions was used as follows: "Tell me what you think the question is asking?" "Do you like the wording of the question?" "Is this how you would ask someone this question?" "Is there any word in this question that is confusing or strange to you?" "Is there a better way to ask the question?" "What is your answer to the question?"

To conduct cognitive testing, EFNEP Nutrition Educator Assistants in Sumter and Aiken County recruited 14 total participants by making personal contact. Each interview lasted approximately 30 minutes. The aim of this qualitative analysis of the item/scales

was to identify the problem associated with item design, to assess clarity and wording, as well as the response options and layout of the items/scales. To enhance this analysis, all the comments from the cognitive interviews, audiotapes and notes were summarized per item on the questionnaire. Based on the results of the cognitive testing, wording of the items was changed to enhance clarity and meaning and review by the research committee members. Suggestion was made for a follow-up cognitive interview with a few of the same participants who participated the cognitive testing first time. Five participants were contacted from Sumter and Aiken County who participated in the process before and the interview was conducted again in a similar process with these five participants. The participants approved the changes that were made to the items/scales after first cognitive testing. The approval from follow- up cognitive testing allowed researcher to use the items/scales to collect actual data in the field.

Phase 6. Psychometric Testing and Analysis

The purpose of this phase was to determine the construct and criterion-related validity and test-retest reliability of the items/scales. The following steps were conducted in this phase.

Step 1. Construct Validity

Construct validity refers to whether a scale measures what it purports to measure. (DeVellis, 2003). After revisions were made based on the cognitive interviews, the next step was to administer the survey to a larger sample to examine the construct validity.

Specifically, the sample size was determined by the number of questions per item/scale that was developed for the survey. For scale development, the researcher must ensure that data are collected from a sample of adequate size to appropriately conduct subsequent analysis. The recommendations for the item-to-response ratio ranges from 1:4 to 1:10 for each set of scales to be factor analyzed. (DeVellis, 2003)

Participants (Sample 1, n = 302) were being drawn from Richland, Sumter, Aiken, Chester and Lancaster Counties. Directors of local WIC offices at DHEC and SNAP program directors at local DSS offices in each county were contacted, informed about the research project and asked for assistance in recruiting participants. Appointments were made to recruit participants during registration of the clients into the WIC and SNAP Programs. The survey was administered in these respective offices as the client waited to register in that particular program. The Clemson Institutional Review Board approved consent form signed by each client allowed participation in the survey (Appendix H). EFNEP water bottles were given as an incentive for participation.

Step 2. Criterion-Related Validity

Criterion-related validity was examined to demonstrate the accuracy of a measure by comparing it with another measure, which has been demonstrated as valid. In order to have criterion-related validity, an item or scale is required to have only an empirical association with some criterion or "gold standard" (DeVellis, 2003). Predictive and concurrent are the two types of criterion-related validity. Predictive validity is a measurement of how well a test predicts future performance (DeVellis, 2003). It is a form

of criterion validity in which the validity of a test is established by measuring it against known criteria. Concurrent validity is a measure of how well a particular test correlates with a previously validated measure. The two measures may be for the same domain of behavior or for different, but presumably related, domains. No previously validated measure similar to this research project was found, so the concurrent validity for this project could not be assessed.

Sample Size. To determine the predictive validity of the items/scales in this study, a subsample of 50 total (Sample 2, n = 50) EFNEP-eligible adults were chosen from Sample 1 to compare physical activity measures from the survey with accelerometer data.

Data Collection. During this phase the subsample of participants wore an Actical Accelerometer for seven days to measure actual activity. By using an Actical Accelerometer (Mini Meter Company, Inc., 2003), a participant's actual activity count was assessed. The accelerometer was calibrated and initialized before data collection and set to measure activity counts in one-minute epochs time and attached on an elastic belt. On the day of data collection, informed consent was obtained from each participant. Data was collected at the Clemson Extension Service office in each county. Upon arrival, the participants' height and weight were measured and entered into the Actical system. The participants were then fitted with an Actical accelerometer on the right hip and asked to wear the accelerometer continuously for seven days, except for bathing and swimming.

After seven days, the accelerometer was collected from each participant and its raw data downloaded and saved.

Data Management. To prepare the raw data for analysis, Monitor Data Analysis Software was used. It was developed by Danlhos Computer Consulting and operates on a Windows platform (Microsoft.NET 1.1). The raw activity data were downloaded and saved to a PC. Minute by minute activity counts were uploaded to the Monitor Data Analysis Software. By using this program, the raw accelerometer data was reduced to time spent with specific metabolic equivalent (METs) categories, i.e. sedentary, light, moderate, and vigorous physical activity based on Actical cut-points used in calibration studies with demographically similar participants (Giffuni et al., 2012). The specific cut-points were <1824 for sedentary to light and ≥1824 for moderate to vigorous (Giffuni et al., 2012). Daily time spent in each MET category was averaged across the monitoring period and operationalized as average time spent at each Met level.

Data Analysis. Participants with a minimum of four days of data with seven hours or more of activity counted on each day were included in the data analysis. A complete day was defined as ≥7 hours of data (Robertson et al., 2011). Based on these criteria, accelerometer data from all 50 participants were possible to include in the analysis. The mean daily minutes spent in light-to-moderate and moderate-to-vigorous physical activities were included as the variables of interest. These variables were output into a .CSV file and which was then imported into a SAS version (CSV, stands for 'comma

separated value', which is a file format that store data in a structured table of lists.

Spreadsheet program such as Microsoft Excel allows to saving files in a CSV format).

Using Statistical Analysis System (SAS) the data was analyzed to find the correlation of

psychosocial scales and physical activity behavior scale with mean of SLPA (sedentary to

light physical activity) and MVPA (moderate to vigorous physical activity). Figure 1

displays the systematic process used with accelerometer data.

Figure 1. Actical Data Collection/Management/Analysis Process
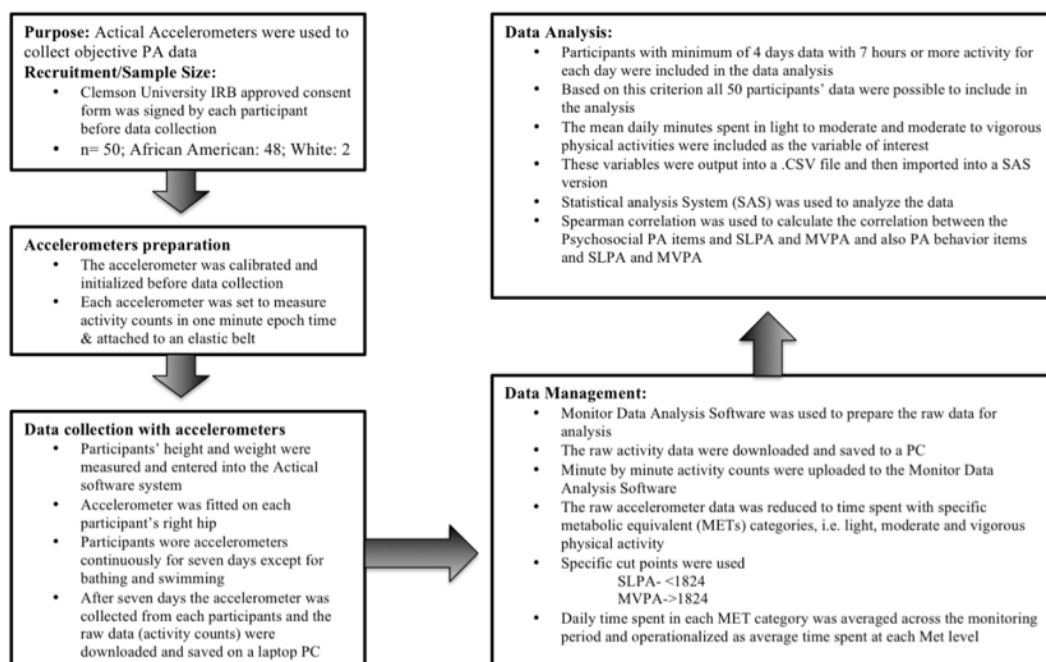
Step 3. Test-Retest Reliability

　　　　Reliability was examined to determine temporal consistency of the measures. A

test is considered reliable if the same result is obtained repeatedly. The test-retest

reliability is a method of testing the stability and reliability of an instrument over time. (DeVellis, 2003)

To determine the test-retest reliability in this research, the same 50 participants from Sample 2, who wore the Actical Accelerometer, completed the research survey on two different occasions one week apart with no intervention. The stability of the measure was determined from the correlation between the scores of the measures at the two separate time points. An informed consent was obtained from each participant before participating in the study. The participants from Sample 2 received a $25 gift card from Wal-Mart for wearing the accelerometer and completing the survey on two different occasions.

Demographic Information. An "EFNEP Client Enrollment Form" (Appendix J) was used to collect demographic information: age, race, gender, ethnicity, highest grade level achieved, total household income, number of children living in the household and their ages, number of adults in the household, and name and number of public assistance received by the participants.

Statistical Analysis

Demographic characteristics. The demographic characteristics of sample 1 (n = 302) were analyzed with SAS (version 9.2) by using descriptive statistics (frequencies and percentages).

Exploratory Factor Analysis. This analysis was conducted on the 17 items for psychosocial measures by using Statistical Analysis System (SAS, version 9.2, Cary NC). The purpose of using the Exploratory Factor Analysis (EFA) was to determine the number of underlying factors in the items/scales. EFA was also used as a strategy of item reduction, which enables the study to keep only those items that best measure each factor (DeVellis, 1991). The extraction methods used in the Exploratory Factor Analysis was Promax. Promax rotation was used because it is a specific type of oblique rotation, which generally results in factors that are correlated with one another (Hatcher, 2009; Costello & Osborne, 2005). Though the research hypotheses identified a four-factor solution for Exploratory Factor Analysis, six factors were actually measured to confirm that there were no more than four for the items. The number of meaningful factors retained was determined by three criteria:

- Eigenvalue-one criterion: any factor with an eigenvalue greater than 1.00 was retained.

- Scree-plot test: by looking at the plot of the eigenvalue associated with each factor and at the break between the factors with relatively large eigenvalue, and those with smaller eigenvalue, any that appeared before the break were observed to be meaningful and retained for rotation.

- Proportion of variance: Any factor that accounted for at least 5 to 10 percent of common variance was retained. The proportion was calculated by dividing the eigenvalue of factor of interest with the total eigenvalue of Correlation Matrix. (Hatcher, 2009)

The interpretation of rotated factor patterns was verified by factor loading of each item with .40 or greater and confirming that at least three items with significant loading of each item retained one factor (Hatcher, 2009). Any item loaded in more than one factor (cross-loading) was omitted.

After meaningful factors were retained, a new variable was obtained by summing up the final items within each factor. By using SAS (version 9.2), mean scores and standard deviations for the new variables were calculated. Figure 2 displays the systematic process used for conducting the factor analysis.

Figure 2. Data Collection and Process for Conducting a Factor Analysis on the Physical Activity Items

Recruitment:

- Recruitment was conducted at DSS and DHEC offices for six days and about 48 hours while participants were waiting to register for the SNAP-ED and WIC program at those facilities
- Recruitment was also conducted at three different Housing Authority- Complexes in the Counties

Sample Size: n = 302
African American: 215, Whites: 75, Hispanic: 7, Amer India: 4, Native Hawaiian: 1

Study Location:
South Carolina Counties: Aiken, Chester, Lancaster, Richland, Saluda & Sumter

Survey Implementation Process in the Field:

- The Clemson University IRB approved consent form signed by each participant allowed participation in the survey
- The survey was administered to the participants at WIC and SNAP-Ed offices while the participants were waiting to register in the particular program. Participants completed the survey on their own

Reliability Analysis:

Internal Consistency of the final factors:
- Cronbach's α
- Acceptable α .70 or greater

Test retest relibility of the final items: Spearman Correlations Weak (.1 to .39), moderate (.40 to . 59), strong (.60 and above)

Exploratory Factor Analysis:
- Software used: Statistical Analysis System (SAS)
- Final rotation method: Promax
- Number of factors ran: Six, five, four, three, two
- Factor extraction criterion: Factor with eigenvalue >1; Scree plot test; Proportion of Variance (at least 5 to 10 percent); and Content interpretability
- Item deletion criterion: factor loaded < 0.40; cross loading; and loaded on incorrect theorized factor
- Number of factors identified: 3
- Labeling of the factors according to the theory behind

Data Registration and Data Management:
- Number of surveys collected- 302
- Missing Data- None
- Data registration – all data were registered and coded in excel spread sheet

Internal Consistency. Cronbach's alpha formula was used to calculate and measure the internal consistency of each psychosocial item. The items with Crobach's alpha of .70 or greater were considered acceptable. (Nunnally & Bernstein, 1994)

Test-Retest Reliability. Test-retest reliability was determined using Spearman's Correlations in SAS (version 9.2). Correlation strength was ascertained by using both Cohen's (1988) and Evan's (1996) correlation strength guidelines: a) Weak = .1 to .3; Moderate = >.3 to .5; Strong = > .5; and b) weak = .20 to .39; Moderate = .40 to .59; Strong = .60 to .79; Very Strong = .80 to 1.00, respectively.

Predictive Validity. Predictive validity was determined by the accelerometer data from all 50 participants that were included in the analysis. The Spearman Correlation analysis in SAS (version 9.2) was used to calculate the correlation between the physical activity psychosocial items and SLPA and MVPA; and also by calculating the correlation between physical activity behavior items and SLPA and MVPA with *p*-values less than .05.

CHAPTER FOUR

RESULTS

Findings from Curriculum Content Analysis

A description of the general characteristics of the Physical Activity curriculum or lessons can be found in Table 2. The name of the twelve curricula and the states, which developed the reviewed curricula were summarized. The objective of each curriculum, information on the theoretical background or theory based constructs found in the curricula, number of lesson/lessons on physical activity and impact indicator suggested by each state for evaluation purpose was also tabulated.

The findings from content analysis of EFNEP Physical Activity curriculum, CNE logic model, My Plate and DGA are found in Table 3. Several different concepts evolved from these four sources about physical activity. The table also indicates the number of curricula that addressed physical activity concept/contents; level of methods the physical activity content was addressed; and how many times the physical activity concept/content were addressed. The major concepts found in the curricula were:

- **Motivational:** Recognizing the importance and benefit of being physically active every day as it relates to health and weight control. All twelve curricula addressed the benefit and importance of being physically active everyday. This concept was addressed repeatedly by means of lecture and discussion (level 2).

- **Factual Knowledge:** Knowing the recommended amount of physical activity and choosing ways to decrease sedentary activities while increasing the intensity, time

and duration of physical activity. All curricula addressed the recommended amount of physical activity. Some curricula addressed the information of choosing a variety of physical activity and ways to increase physical activity. Most of the curricula addressed the information about the intensity, frequency and duration of physical activity. These concepts were addressed once or twice by lecture and discussion methods (level 2).

- **Behavioral:** Practicing appropriate levels of moderate or vigorous physical activity, including aerobic, stretching and flexibility exercises, as well as warm up and cool down periods. Most of the curricula addressed these concepts repeatedly or once or twice based on specific activities by means of lecture, discussion and interactive activity (level3).

- **Self-Regulation and Monitoring:** Developing a personal plan to increase physical activity that includes setting goals, how to overcome obstacles and create solutions to barriers. Most of the curricula addressed this concept repeatedly by means of lecture, discussion and interactive activity (level 3).

- **Environmental:** Learning how to involve family and other supporters. This concept was addressed by some of the curricula once or twice by lecture and discussion (level 2).

Table 2. General Characteristics of the Analyzed EFNEP Curricula

Name of the Curriculum	State Developed the Curriculum	Objectives of the Curriculum	Theoretical Frame work or Concepts	Number of lesson/lessons on Physical Activity	Impact Indicator suggested by each State
'Eating Smart Being Active'	Colorado & California	PA can be done on their own or with the family at home. Ways to become active/goal setting.	Social Learning Theory, Adult Learning Theory	Eight Nutrition lessons and each lesson incorporated physical activity.	Participant's attitude towards PA will be improved. Participants will feel confident. Participants will show changes of activity level from baseline to completion of the program. Frequency and amount of time spent in doing PA.
'Eat Right for Life'	Florida	Health benefit/barriers of PA; ways to add PA in daily life. Personal plan to increase PA. Difference between sedentary, moderate & vigorous level of PA.	Knowledge, goal setting or personal plan, attitude.	One lesson	How many adults find ways to increase physical activity in their daily life? On a typical day how much physical activity do you get? How often are you physically active for at least 30 minutes on 4 or more days of the week?
'EFNEP Families Eating Smart Moving More'	North Carolina	Benefit & daily needs of PA. Strategies to incorporate more movements throughout the day.	Knowledge.	Four lessons particularly on Physical activity.	Change in daily physical activity from baseline to completion of the program
'Walk Ways'	Maryland	Increase PA up to 30 minutes most days of the week.	Goal setting, success, barriers. Social support, Family and peers. Behavioral counteracting. Stages of Changes	Four lessons	Plan to change now. Plan to change in next six months.
'Pean'	Puerto Rico	Difference between PA & exercise, health benefits & daily needs.	Knowledge, increase awareness	Four lessons	Show increase amount of PA per day per adult participants

Table 2. (continued)

Name of the Curriculum	State Developed the Curriculum	Objectives of the Curriculum	Theoretical Frame work or Concepts	Number of lesson/lessons on Physical Activity	Impact Indicator suggested by each State
'Loving Your Family Feeding their Future'	USDA	Get at least 30 minutes of moderate intensive physical activity most of the days of the week	Knowledge, increase awareness	One lesson	Increase in time spent in daily physical activity to meet recommended level.
'Parent's Guide to Healthy Eating and Physical Activity'	Washington State	Importance of PA. Goal setting, ways to increase PA.	Knowledge, increase awareness, goal setting, planning	One lesson	Increase in the number of minutes/day or week of PA.
'Eating Right Is Basic'	Michigan	Develop knowledge, skill and attitude to change behavior.	Experiential learning, observational learning	One lesson	Increase knowledge, skill and change attitude to increase daily physical activity behavior.
'Choices/Steps towards Health'	Massachusetts	Experience different kind of Physical activities, importance of PA and ways to increase PA. Goal setting to increase PA in daily life.	Knowledge, attitude, skill, planning and goal setting.	One lesson	Participants spend more time being physically active for themselves and with their families.
'Being active'	Iowa	Client's knowledge will be increased about PA and Clients will increase their level of PA.	Knowledge, attitude, goal setting and social support	Eight lessons	How many clients increased PA from baseline to completion of the program.
'Small Steps-Big Changes'	Rhode Island	Benefit and importance of PA. Increase knowledge, skill and attitude and change PA behavior	Knowledge, goal setting, overcoming barriers, behavioral capabilities.	Five lessons	Time spent in PA at home, work, outside of home etc.
'Food Talk'	Georgia	Increase the awareness and importance of PA. Identify PA for both parents and children to participate together	Health belief Model. Develop self-efficacy for doing physical activity.	Three lessons	Frequency of exercising using different measures. Increasing awareness of the PA.

Table 3. Content Analysis of the Physical Activity Component of EFNEP Curricula

Concept/Content Addressed	Number of Curriculum Addressed the Concept/content	Level of methods the content was addressed	Was the content area addressed once or repeatedly
Motivational Concept			
Importance/benefits of being physically active everyday	All	Level 2	Repeatedly
Risk & safety about PA	Most	Level 2	Some once, some repeatedly
Factual Knowledge Concept	All	Level 2	Some once, Some repeatedly
Recommended amount of Physical activity	Some	Level 2	
Choosing variety of PA	Some	Level 2	Repeatedly
Frequency, duration	Most	Level 2	Once or Twice
Intensity (Moderate/Vigorous)	Most	Level 2	Some once, some repeatedly
Ways to increase PA	Some	Level 2	Repeatedly
Water: Before, during and after PA	Most	Level 2	Repeatedly
Calorie in & Calorie out	Some	Level 2	Some once, some repeatedly
Screen Time (TV/Video game)			
Behavioral-skill building Concept	Most	Level 3	Some once, some repeatedly
Stretching/Flexibility	Most	Level 3	Once or twice
Strength	Most	Level 3	Once or twice
Aerobic	Some	Level 3	Some once, Some Repeatedly
Warm up/Cool down			
Self-Regulation/Monitoring Concept	Most	Level 3	Repeatedly
Goal setting, personal planning & preparation	Some	Level 3	Repeatedly
Obstacle, barrier and solutions	Some	Level 3	Repeatedly
Monitor progress in altering PA goals			
Social-Environmental Concept	Most	Level 2	Some Once, some Repeatedly
Family involvement & other support			

All=12 Curriculum; Most= 6-11 Curriculum; Some= 1-5 Curriculum
Level 3= Lecture, Discussion, Interactive Activity; Level2= Lecture & Discussion; Level1= Lecture

Findings from Expert Review

All the reviewers provided qualitative suggestions on different concepts, items/scales and/or response options in terms of relevancy, clarity and ambiguity to revise, delete and/or add new items. This review served to maximize the content validity of the scale. The insightful comments from the reviewers about why certain items were ambiguous provided a new perspective on how to measure the content area. Reviewers then evaluated the clarity and conciseness of each item. They also pointed out difficult or confusing items and suggested alternative wording. Following are the summary of reviewer's feedback on each concept:

- **General concept of physical activity and exercise:** Most of the reviewers commented that physical activity was an abstract concept for a lower education audience. It was suggested that a definition about physical activity and exercise be included at the beginning of the survey.

- **Motivational concept and/or items:** Three of the reviewers noted that the usefulness of the motivational data was somewhat unclear because the percentage of participants who increased their physical activity in order to reduce the risk of particular disease and motivation for exercise was unknown. Experts indicated that it would be more valuable to know how many participants thought about increasing their physical activity than to know how many engage in physical activity for a particular reason, such as to improve appearance, control weight or reduce the risk of health problems. Comments were also provided about the inappropriateness of using a *"How often"*

format for the items that addressed rationale and motivations for participation in physical activity.

- **Factual knowledge concept:** One of the reviewers commented that items identified as ways to increase physical activity had more to do with the participant's physical or financial circumstances rather than anything taught in EFNEP. Therefore, the validity of the data used for measuring the program's impact would be questionable. The ambiguity of the concept related to choosing activities over sedentary time and the likelihood of confusion by participants in understanding this also drew concern of two other reviewers. Suggestions were made on how to alleviate the ambiguity by identifying examples in the participants' current activities of daily living that would apply if those baseline activities were increased. It was also recommended that items about the amount of time sitting or being sedentary in different domain, such as at leisure or on the job, be addressed.

- **Behavioral concept:** Four reviewers indicated that the behavioral items were too specific for EFNEP audiences, while other activities such as gardening, yard work, or swimming, might be overlooked by this same audience. Three of the reviewers suggested to including items on walking since most adults walk for exercise. Noting that the reading level of some items was too high, suggestions were made by most of the reviewers for rewording of the items. Overall, most of the reviewers commented that typically it is difficult to ask people to provide a daily estimate of time devoted to physical activity and to ask for an estimate of a week would be even more challenging. Suggestions were made to consult Behavioral Risk factor Surveillance

System (BRFSS) or National Health and Nutrition Examination Survey (NHANES) instruments for different kind of activities and examples. These examples should also identify time periods throughout the day, such as 10, 20 or 30 minutes for different activities with response options for the number of days in a week these activities were performed. Items with a "discreet response" format should be as specific as possible so people could actually respond to the question with some validity. For example, "How many days last week did you walk for exercise?" Avoid global questions like "Do you usually meet the guideline?" Items on muscle strengthening were too specific to be useful in a behavior checklist for adults in EFNEP programs.

- **Self-Regulation and Monitoring Concept:** Three concepts evolved from the *Self - Regulation and Monitoring Concept:* goal setting, personal planning, and preparation. Suggestions were made by most of the reviewers to including items on this concept that focused mainly on intent, planning, preparation and goal setting for physical activity.

- **Environmental Concept:** Rewording of the items on family support was suggested by one of the reviewers because measuring participation in physical activity events may be inconsistent due to seasonal variations, the lack of organized events in many rural communities, or limited short-term intervention programs like EFNEP. As a result of these variables, items in this concept might not produce any valid data.

Overall, the expert review revealed that many of the concepts and items generated therein were nebulous, especially for participants of limited income and minimal

education. Motivation and social environment concepts were not very practical for EFNEP audiences. Suggestions were made to examine scientific literature to identify important behaviors to measure. The addition of questions that specifically measure if or how often participants take part in physical activity in their free time would be appropriate. Suggestions were also made to include items on participant's 'intention' of doing physical activity. To strengthen the survey as a measuring tool, recommendations were made to add items geared toward participants' pre-contemplation or contemplation stages for physical activity (Trans-Theoretical Model). Majority of the reviewers noted that if only 'action' was measured, then the opportunity to assess important changes that may take place in a fairly low-dose intervention program like EFNEP would be lost. The term *"how often"* in the survey was cited, as being difficult or confusing for many items. Suggestions were made to adopt a more direct response format that would better utilize each major component of the survey instrument.

Research Committee Suggestions

Based on all the comments and suggestions made by the expert reviewers and curriculum content analysis, the research committee made following suggestions:

- Items should be added on pre-behavioral mediating variables.
- Item should be revised and new items would be added on self-regulation and monitoring concept (Goal setting, Planning and Preparation).

- Items on behavioral skill building concepts would also be revised and new items will be added.

- Items on motivational concepts and social environmental concepts would be deleted since experts suggested the validity of the data on these concepts would be questionable. Also these concepts were not addressed by the curricula as much as the other two concepts.

- Item should be theoretically grounded.

As the reviewers suggested to include items on intent, the research committee came to an agreement that while goal setting, personal planning, and preparation support the construct of Social Cognitive Theory (Hayden, 2009), it would be more practical for EFNEP purposes if the Theory of Reasoned Action (TRA) an the Theory of Planned Behavior (TPB) (Fishbein & Aijen, 1980) were applied to this research in revising the items/scales on pre- behavioral mediating variables.

The research committee also suggested that by using these two theories it could be predicted that this study would be able to evaluate the impact of EFNEP at more individual level of the study participants rather than at the environmental or organizational level since EFNEP curricula did not address these components (environmental and organizational) as much as self monitoring and regulation concepts of the participants. This would also permit the short-term impact indicators of the CNE logic model to be measured, which in turn, would impact medium- and long-term indicators in the future. For actual Behavioral Concept, the decision was made to revise items to measure total physical activity around multiple dimensions (i.e. home, yard, walk, work).

Results of Cognitive Testing

Table 4 presents the demographic characteristics of cognitive testing participants. Fourteen women participated in cognitive testing for this research study. Majority of the participants (85.7%) were African American while 14.2% were white. The mean and range of the participants' age was 33.0. Mean and range of the number of children in the household was 2.2, the mean and range of public assistance received by the participants was 1.8, the frequency and percent of educational attainment of the participants was: 1) Attained less than 12th grade- 21.4 percent; 2) Attained 12th grade- 35.7 percent; and 3) Attained 0-4 years college- 42.8 percent.

Table 4. Cognitive Testing Sample Demographics

Demographic Characteristics	Participants (n=14)
Gender (Frequency & Percent)	
Female	14 (100%)
Race (Frequency & Percent)	
Black	12 (85.7%)
White	2 (14.2%)
Education (Frequency & Percent)	
<12th Grade	3 (21.4)
12th Grade	5 (35.7)
0-4 Yrs. College	6 (42.8)
Age (Mean & Range)	33.0 (16-56)
Number of Children (Mean & Range)	2.2 (0-4)
Number of Public Assistance (Mean & Range)	1.8 (0-4)

Table 5 presents the main changes made to the items/scales after the cognitive testing. For the psychosocial items (1-17), the main changes were wordings and the format of the items/scales. For items 1, 2, 10 and 12 the words 'physical activity' and 'exercise' were interchanged as they fit the conceptualization of the items. The formatting of items 2, 3, 5, 6, 7, 8, 9, 11, 15 and 17 was changed to reduce the ambiguity and maximize the clarity of the sentences. No change was made for the item # 18 about the 'stages of changes' question. Changes made to item 19-30 relate to the specific number of minutes dedicated to each activity to improve respondents' ability to provide an accurate answer to each item.

Table 5. Summary of Cognitive Testing Results (n=14)

Original Items	Final Changes (Significant changes in bold)
1. Participating in Physical activity is boring	1. **Exercise** is boring.
2. Getting regular exercise is healthy	2. **Being physically active regularly** is healthy.
3. Being physically active regularly over the next month would be useless	3. Being physically active regularly over the next month would **not benefit me.**
4. Regular exercise over the next month would be a good thing for me to do.	4. Regular exercise over the next month would be a good thing for me to do.
5. Being physically active is something my family believes I should do.	5. **People in my family believe that it is important to be physically active.**
6. Getting regular exercise is something my friends think I should do.	6. **My friends think that exercise is a good thing to do.**
7. People who are important to me would want me to be physically active.	7. People **I know** would want me to be physically active

Table 5. (Continued)

8. In my opinion those who are most important to me would favor me exercising regularly.

8. **Those who are close to me would support** me exercising regularly.

9. If I want to, I can exercise several times a week over the next month.

9. **I can exercise several times a week over the next month, if I want to.**

10. It is mostly up to me whether or not I do physical activity several times a week over the next month.

10. It is mostly up to me whether or not **I exercise** several times a week over the next month.

11. I have a very little control of being physically active several times a week over the next month.

11. I have **very** little **control** being physically active several times a week over the next month.

12. Participating in physical activity several times a week over the next month would be hard for me.

12. **Exercising** several times a week over the next month would be hard for me.

13. I intend to be physically active regularly over the next month.

13. I intend to be physically active regularly over the next month.

14. I plan to exercise several times a week over the next month.

14. I plan to exercise several times a week over the next month.

15. I aim to be physically active several times a week over the next month.

15. **My goal is** to be physically active several times a week over the next month.

16. I have it in my mind that I will exercise regularly over the next month.

16. I have it in my mind that I will exercise regularly over the next month.

17. I definitely want to be physically active over the next month.

17. I **really** want to be physically active over the next month.

18. Do you exercise regularly?

18. Do you exercise regularly?

19. How many days last week did you increase your heart rate and breathing for a total of at least 10 minutes but less than 20 minutes while doing home activities such as cleaning sweeping, mopping or vacuuming?

19. How many days last week did you increase your heart rate and breathing for at least 10 minutes while doing home activities such as cleaning sweeping, mopping or vacuuming?

20. How many days last week did you increase your heart rate and breathing for a total of at least 20 minutes but less than 30 minutes while doing home activities such as cleaning, sweeping, mopping or vacuuming?

20. How many days last week did you increase your heart rate and breathing for at least 20 minutes while doing home activities such as cleaning, sweeping, mopping or vacuuming?

21. How many days last week did you increase your heart rate and breathing for 30 minutes or more while doing home activities such as cleaning, sweeping, mopping or vacuuming?

21. How many days last week did you increase your heart rate and breathing for 30 minutes or more while doing home activities such as cleaning, sweeping, mopping or vacuuming?

Table 5. (Continued)

22. How many days last week did you increase your heart rate or breathing for a total of at least 10 minutes but less than 20 minutes while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?

22. How many days last week did you increase your heart rate or breathing for at least 10 minutes while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?

23. How many days last week did you increase your heart rate or breathing for a total of at least 20 minutes but less than 30 minutes while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?

23. How many days last week did you increase your heart rate or breathing for at least 20 minutes while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?

24. How many days last week did you increase your heart rate or breathing for 30 minutes or more while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?

24. How many days last week did you increase your heart rate or breathing for 30 minutes or more while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?

25. How many days last week did you increase your heart rate and breathing for a total of at least 10 minutes but less than 20 minutes while walking?

25. How many days last week did you increase your heart rate and breathing for at least 10 minutes while walking?

26. How many days last week did you increase your heart rate and breathing for a total of at least 20 minutes but less than 30 minutes while walking?

26. How many days last week did you increase your heart rate and breathing for at least 20 minutes while walking?

27. How many days last week did you increase your heart rate and breathing for 30 minutes or more while walking?

27. How many days last week did you increase your heart rate and breathing for 30 minutes or more while walking?

28. How many days last week did you increase your heart rate or breathing for a total of at least 10 minutes but less than 20 minutes while doing activities at work?

28. How many days last week did you increase your heart rate or breathing for at least 10 minutes while doing activities at work?

29. How many days last week did you increase your heart rate or breathing for a total of at least 20 minutes but less than 30 minutes while doing activities at work?

29. How many days last week did you increase your heart rate or breathing for at least 20 minutes while doing activities at work?

30. How many days last week did you increase your heart rate or breathing for 30 minutes or more while doing activities at work?

30. How many days last week did you increase your heart rate or breathing for 30 minutes or more while doing activities at work?

Factor Analysis and Reliability Findings

The characteristics of the Factor Analysis Sample demographics are presented in Table 6. The total number of participants who completed questionnaires for factor analysis was 302. All participants were female and had at least one child living in the household. Respondents' ethnicity was Africa-American (71 percent), White (24.8 percent), Hispanic (2.3 percent), American Indian (1.3 percent), and Native Hawaiian (.3 percent). The mean age of respondents was 34.4; mean number of children in the household was 1.9; and mean number of public assistance allotments was 1.4. Respondents' educational level varied from less than 12th grade to post graduate; 14.9 percent attained less than a 12th grade education, 38 percent attained 12th grade, 42.4 percent attained 0-4 years of college, and 4.63 percent attained post-graduate.

Table 6. Factor Analysis Sample Demographics

Demographic Characteristics	Participants (N=302)
Gender (Frequency & Percent)	
Female	302 (100%)
Race (Frequency & Percent)	
Black	215 (71.1%)
White	75 (24.8%)
Hispanic	7 (2.3%)
Amer India	4 (1.3%)
Native Hawaiian	1 (.3%)
Education (Frequency & Percent)	
<12th Grade	45 (14.9%)
12th Grade	115 (38.0%)
0-4 Yrs. College	128 (42.4%)
Post Grad	14 (4.63%)
Age (Mean & Range)	34.4 (16-69)
Number of Public Assistance (Mean & Range)	1.4 (0-4)

The Promax method was applied in 17 items for the psychosocial constructs of physical activity. This method produced three factors based on eigenvalue, scree plot and proportion of variance. Table 7 showed rotated factor pattern of the items by Promax rotation.

Table 7. Rotated Factor Pattern of the Items: Promax Rotation

Items	2 Factors		3 Factors			4 Factors			
	F_1	F_2	F_1	F_2	F_3	F_1	F_2	F_3	F_4
1.Exercise is boring.	.23	.7	.4	.5	.38	.5	.6	**.42**	-.16
2. Being physically active regularly is healthy.	.6	**.46**	.4	**.46**	.4	.2	**.42**	-.3	.31
3. Being physically active regularly over the next month would not benefit me.	.10	.9	-.11	.7	**.41**	-.11	.6	**.40**	.6
4. Regular exercise over the next month would be a good thing for me to do.	.12	**.69**	.11	**.69**	.2	.10	**.67**	.0	.15
5. People in my family believe that it is important to be physically active.	.6	**.62**	.6	**.62**	-.1	.5	**.61**	-.2	.11
6. My friends think that exercise is a good thing to do.	-.3	**.76**	-.1	**.76**	-.5	-.1	**.76**	-.2	-.2
7. People I know would want me to be physically active	-.8	**.80**	-.8	**.81**	-.2	-.7	**.81**	.1	-.3
8. Those who are close to me would support me exercising regularly.	-.3	**.77**	-.1	**.78**	-.5	-.1	**.78**	-.2	-.2
9. I can exercise several times a week over the next month, if I want to.	**.46**	.39	.39	.37	.16	.38	.35	.12	.28
10. It is mostly up to me whether or not I exercise several times a week over the next month.	.36	**.43**	.29	**.42**	.13	.28	.38	.7	.28
11. I have a very little control being physically active several times a week over the next month.	.28	-.2	-.3	-.6	**.62**	-.4	-.8	**.56**	.22
12. Exercising several times a week over the next month would be hard for me.	.38	-.3	.11	-.6	**.53**	.11	-.5	**.56**	-.8
13. I intend to be physically active regularly over the next month.	**.68**	.18	**.69**	.18	.0	**.69**	.18	.3	-.5
14. I plan to exercise several times a week over the next month.	**.83**	.3	**.87**	.2	-.4	**.88**	.4	.2	-.19
15. My goal is to be physically active several times a week over the next month.	**.88**	-.2	**.89**	-.3	.1	**.88**	-.3	.1	.1
16. I have it in my mind that I will exercise regularly over the next month.	**.92**	-.10	**.96**	-.11	-.6	**.96**	-.11	-.7	.4
17. I really want to be physically active over the next month.	**.72**	.7	**.73**	.7	.0	**.71**	.3	-.5	.24

Table 8 shows the 3 -factor model summary by Promax rotation. The first factor

that emerged was 'Intention.' It had simple structure with high factor loading for each item, eigenvalue of 6.26, and proportion of variance explained was 74 percent. The internal consistency reliability coefficient was .92. Test-Retest Reliability r_s *value* was .47 and *P value* .0006. The second factor that emerged was a combination of items from the factors 'Positive Attitude' (two items) and 'Positive Social Norm' (four items) and 'Perceived Behavior Control' (one item) with eigenvalue of 1.47 and proportion of variance explained at 17 percent. The internal consistency reliability for these items was high (α= .85) and strong test-retest reliability was found with r_s *value* .70 and *P value* < .0001.

The third factor emerged was a combination of item from the factors Negative Attitude (one item) and Negative Perceived Behavior Control (two items) with factor loading between .41 and .62 and eigenvalue .78 and proportion variance of 9 percent. The internal consistency reliability for these items was low (α= .51), but the test-retest reliability was moderate to strong with r_s *value* .59 and *P value* < .0001. Two items, one on Negative Attitude and one on Positive Perceived Behavior Control, were discarded because of low factor loading less than .40.

Table 8. Three Factor Model Summary: Promax Rotation

Item Number	Items	F1	F2	F3
	Intention			
13	I intend to be physically active regularly over the next month.	.69		
14	I plan to exercise several times a week over the next month.	.87		
15	My goal is to be physically active several times a week over the next month.	.89		
16	I have it in my mind that I will exercise regularly over the next month.	.96		
17	I really want to be physically active over the next month.	.73		
	Positive Attitude/Positive Social Norm/Positive Perceived Behavior Control			
2	Being physically active regularly is healthy		.46	
4	Regular exercise over the next month would be a good thing for me to do.		.69	
5	People in my family believe that it is important to be physically active.		.62	
6	My friends think that exercise is a good thing to do.		.76	
7	People I know would want me to be physically active.		.81	
8	Those who are close to me would support me exercising regularly.		.78	
10	It is mostly up to me whether or not I exercise several times a week over the next month		.42	
	Negative Attitude/Negative Perceived Behavior Control			
3	Being physically active regularly over the next month would not benefit me.			.41
11	I have a very little control being physically active several times a week over the next month.			.62
12	Exercising several times a week over the next month be hard for me.			.53

Intention: Cronbach's α= .92; Eigenvalue= 6.26; Proportion of Variance Explained=74%; Test-Retest: r_s= .47; *p*-value= 0.0006
Positive Attitude/Positive Social Norm/Positve Perceived Behavior Control: Cronbach's α= .85; Eigenvalue= 1.47; Proportion of Variance Explained= 17%; Test-Retest: r_s= .70; *p*-value= < .0001
Negative Attitude/Perceived Behavior Control: Cronbach's α= .51; Eigenvalue= .78; Proportion of Variance Explained=9% Test-Retest: r_s= .59; *p*-value= < .0001

Predictive Validity Results

The results of correlation between psychosocial mediating factors of physical activity derived from Promax rotation and accelerometer data of actual physical activity behavior of the respondents (Sample 2, n = 50) are presented in Table 9. No significant association was found between the psychosocial items and MVPA or SLPA.

Table 9. Correlation Between Psychosocial Variables & Objectively Measured PA Variables (n=50)

Factor derived from Promax Rotation	MVPA	SLPA
Intention	r_s= .21 p-value= .14	r_s=.02 p-value= .88
Positive Attitude/Positive Social Norm/Positive Perceived Behavior Control	r_s= -0.08 p- value= .55	r_s=.08 p-value= .59
Negative Attitude/Negative Perceived Behavior Control	r_s= .14 p-value= .31	r_s= -0.08 p-value= .60

Table 10 shows the results of correlation between the physical activity behavior questions (12 items) and accelerometer data of actual behavior of the respondents (Sample 2, n = 50). There was no significant association found between the physical activity behavior items and MVPA or SLPA data.

Table 10. Correlation Between Self -Reported Physical Activity Variables and MVPA (n=50)

Items	r_s	P-Value
19. How many days last week did you increase your heart rate and breathing for *at least 10 minutes* while doing home activities such as cleaning sweeping, mopping or vacuuming?	.18	.23
20. How many days last week did you increase your heart rate and breathing for *at least 20 minutes* while doing home activities such as cleaning, sweeping, mopping or vacuuming?	-0.12	0.46
21. How many days last week did you increase your heart rate and breathing for *30 minutes or more* while doing home activities such as cleaning, sweeping, mopping or vacuuming?	-0.31	.08
22. How many days last week did you increase your heart rate or breathing for *at least 10 minutes* while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?	.11	.67
23. How many days last week did you increase your heart rate or breathing for *at least 20 minutes* while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?	.03	.91
24. How many days last week did you increase your heart rate or breathing for *30 minutes or more* while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?	.20	.48
25. How many days last week did you increase your heart rate and breathing for *at least 10 minutes* while walking?	.14	.36
26. How many days last week did you increase your heart rate and breathing for *at least 20 minutes* while walking?	.14	.43
27. How many days last week did you increase your heart rate and breathing *for 30 minutes or more* while walking?	-0.01	.96
28. How many days last week did you increase your heart rate or breathing for *at least 10 minutes* while doing activities at work?	.17	.35
29. How many days last week did you increase your heart rate or breathing for *at least 20 minutes* while doing activities at work?	.07	.71
30. How many days last week did you increase your heart rate or breathing for *30 minutes or more* while doing activities at work?	-0.28	.14

Appendix K shows accelerometer data from validation sample. According to the stages of change model, only one person was in the *pre-contemplation* stage whose average number of days/week of physical activity was 7.0, average number of hours/week of physical activity was 21.7, average minutes of sedentary and light physical activity was 1300.4 and average minutes of moderate and vigorous physical activity was 1.2 minutes.

Ten people were determined to be in *contemplation* stage and engaged in physical activity on average 6.6 days for 16.9 hours per week. Their average sedentary and light physical activity for the week was 1014.3 minutes and average moderate and vigorous physical activity for the week was 3.6 minutes.

Fifteen people were determined to be in the *preparation* stage. Their average number of days of physical activity per week was 6.1 for 14.9 hours. Their average sedentary and light physical activity per week was 895 minutes and average moderate and vigorous physical activity per week was 2.0 minutes.

Sixteen people were in the *action* stage whose average number of days of physical activity was 6.6 days and 14.1 hour per week. Their average sedentary and light physical activity per week was 844.7 minutes per week and average moderate and vigorous physical activity per week was 6.7 minutes.

Eight people were in the *maintenance* stage. Their average number of days of physical activity was 6.7 days and 15.6 hours per week. On an average, they were engaged in sedentary and light physical activity for 928.6 minutes and their average moderate and vigorous activity for the week on average was 8.1 minutes.

Overall results of the accelerometer data of the validation sample showed that 78% people were in preparation to action stages and their average minutes of moderate to vigorous physical activities were less than expected (2-8 minutes of moderate to vigorous activities only within 15 hours of activities per week).

Test Retest Reliability Results

Test retest reliability was calculated on the individual items by using Spearman's correlation coefficient (r_s). Table 11 presents the demographic characteristics of test retest samples (n=50). Ninety six percent of the participants were African American and only 4 percent were white. Eight percent attained less than 12th grade education, twenty two percent attained 12th grade, sixty two percent attained 0-4 years of college and eight percent attained post graduation. The mean and range of age of the participants was 38.5. The mean and range of number of children in the house- hold was 1.8. The minimum number of public assistance received by the participants was one.

Table 11. Test Retest Sample Demographics

Demographic Characteristics	Participants (n=50)
Gender (Frequency & Percent)	
Female	50 (100%)
Race (Frequency & Percent)	
Black	48 (96.0 %)
White	2 (4 %)
Education (Frequency & Percent)	
<12th Grade	4 (8%)
12th Grade	11 (22%)
0-4 Yrs. College	31 (62%)
Post Grad	4 (8%)
Age (Mean & Range)	38.5 (18-69)
Number of Children (Mean & Range)	1.8 (0-6)
Number of Public Assistance (Mean & Range)	1.0 (0-4)

Table 12 shows the test retest reliability of the physical activity psychosocial items. According to Cohen's and Evan's correlation guidelines, item one was found to have a stronger reliability ($r_s = .74$ and P value $< .0001$). Item two had a moderate reliability ($r_s = .47$ and $P = .0006$). Item three had also moderate reliability ($r_s = .52$ and P value $< .0001$). Item four had a moderate to weak reliability ($r_s = .32$ and P value $.0208$). Item five had strong to moderate reliability ($r_s = .56$ and P value $< .0001$). Item six had moderate to weak reliability ($r_s = .32$ and P value $.0197$). Item seven had moderate reliability ($r_s = .47$ and P value $.0004$). Item eight had moderate reliability ($r_s = .42$ and P value $.0019$). Item nine had strong to moderate reliability ($r_s = .55$ and P value $< .0001$).

Item ten had strong to moderate reliability (r_s = .59 and *P* value < .0001). Item eleven had moderate reliability (r_s = .41 and *P* value .0029). Item twelve had strong reliability (r_s = .64 and *P* value < .0001). Item thirteen had moderate to weak reliability (r_s = .32 and *P* value .0193). Item fourteen had moderate reliability (r_s = .44 and *P* value .0013). Item fifteen had moderate to weak reliability (r_s = .34 and *P* value .0154). Item sixteen had moderate reliability (r_s = .48 and *P* value .0004). Item seventeen had weak reliability (r_s = .23 and *P* value .1001). Item eighteen had strong to moderate reliability (r_s = .59 and *P* value .0001).

Thus the overall result of test- retest reliability of psychosocial items showed majority of the items had a strong to moderate temporal stability. Two items one on negative attitude and one on negative perceived behavior control had a very strong temporal stability with r_s value .74 and .64 respectively. Four items one on subjective norm and two on positive perceived behavior control and one on stages of changes showed strong to moderate temporal stability with r_s value between .55 to .59. Seven items one on positive attitude and one on negative attitude, two on subjective norm, one on negative perceived behavior control, two items on intention had moderate temporal stability with r_s value 0.32 to 0.52. Four items one on positive attitude, one on subjective norm and two on intention showed moderate to weak temporal stability. Only one item on intention showed very weak temporal stability with r_s value.23.

Table 12. Test-Retest Reliability of Physical Activity Psychosocial Items

Item	Time 1 M (SD)	Time 2 M (SD)	r_s	P-Value	Cohen's correlation strength guidelines	Evan's correlation strength guidelines
1. Exercise is boring.	1.6 (.76)	1.5 (.76)	.7462	< .0001	Strong	Strong
2. Being Physically active regularly is healthy.	4.8 (.47)	4.5 (.71)	.4711	.0006	Moderate	Moderate
3. Being physically active regularly over the next month would not benefit me.	1.9 (1.2)	1.9 (1.2)	.5252	< .0001	Moderate	Moderate
4. Regular exercise over the next month would be a good thing for me to do.	4.6 (.71)	4.5 (.71)	.3262	.0208	Moderate	Weak
5. People in my family believe that it is important to be physically active.	4.1 (.85)	4.2 (.72)	.5643	< .0001	Strong	Moderate
6. My friends think that exercise is a good thing to do.	4.2 (.76)	4.4 (.53)	.3289	.0197	Moderate	Weak
7. People I know would want me to be physically active.	4.4 (.90)	4.3 (.63)	.4799	.0004	Moderate	Moderate
8. Those who are close to me would support me exercising regularly.	4.3 (.82)	4.3 (.56)	.4279	.0019	Moderate	Moderate
9. I can exercise several times a week over the next month, if I want to.	4.3 (.52)	4.3 (.61)	.5510	< .0001	Strong	Moderate
10. It is mostly up to me whether or not I exercise several times a week over the next month.	4.4 (.61)	4.3 (.59)	.5994	< .0001	Strong	Moderate
11. I have very little control being physically active several times a week over the next month.	2.0 (.88)	1.9 (.81)	.4133	.0029	Moderate	Moderate
12. Exercising several times a week over the next month would be hard for me.	2.1 (1.0)	2.0 (.95)	.6434	< .0001	Strong	Strong
13. I intend to be physically active regularly over the next month.	4.1 (.73)	4.1 (.65)	.3299	.0193	Moderate	Weak
14. I plan to exercise several times a week over the next month.	3.9 (.91)	4.2 (.65)	.4434	.0013	Moderate	Moderate
15. My goal is to be physically active several times a week over the next month.	4.2 (.74)	4.3 (.66)	.3408	.0154	Moderate	Weak
16. I have it in my mind that I will exercise regularly over the next month.	4.2 (.79)	4.3 (.67)	.4818	.0004	Moderate	Moderate
17. I really want to be physically active over the next month.	4.3 (.77)	4.4 (.54)	.2352	.1001	Weak	Weak
18. Do you exercise regularly?	4.0 (4.3)	4.0 (4.1)	.5959	.0001	Strong	Moderate

Cohen, 1988; weak= .1 to .3; Moderate= .3 to .5; Strong= >.5
Evans, 1996; weak= .20 to .39; Moderate= .40 to .59; Strong= .60 to .79; Very Strong= .80 to 1.00

Table 13 presents the test retest reliability of self- report physical activity items. Item nineteen had strong to moderate reliability (r_s = .56 and P value < .0001). Item twenty had strong reliability (r_s = .68 and P value < .0001). Item twenty-one had strong reliability (r_s = .65 and P value .0003). Item twenty-two, had very weak reliability (r_s = .24 and P value .4757). Item twenty-three, had moderate to weak reliability (r_s = .35 and P value .3078). Item twenty- four had strong reliability (r_s = .60 and P value .0388).

Item twenty -five had moderate reliability (r_s = .40 and *P* value .0118). Item twenty-six had strong reliability (r_s = .64 and *P* value < .0001). Item twenty-seven had strong reliability (r_s = .72 and *P* value < .0001). Item twenty-eight had moderate reliability (r_s = .48 and *P* value .0071). Item twenty-nine had moderate reliability (r_s = .46 and *P* value .0213). Item thirty had moderate to weak reliability (r_s = .31 and *P* value .1263).

The overall results of test-retest reliability of self report physical activity items showed majority of the items had a strong to moderate temporal stability. Five items two on home activities for 20-30 minutes, one item on yard work for 30 minutes and two items on walk for 20-30 minutes showed strong temporal stability with r_s value between .64 and .72. One item on home activities for 10 minutes had a strong to moderate temporal stability with r_s value .56. Three items one on walking for 10 minutes and two on activities at work for 10 to 20 minutes had moderate temporal stability with r_s value 0.40 to 0.48. Two items one on yard work for 20 minutes and one on 30 minutes activities at work had moderate to weak temporal stability with r_s value .35 and .31 respectively. Only one item on Yard work for 10 minutes had a very weak temporal stability with r_s value .24 only.

Table 13. Test-Retest Reliability of Self- Report Physical Activity Items

Item	Time 1 M (SD)	Time 2 M (SD)	r_s	P-Value	Cohen's correlation strength guidelines	Evan's correlation strength guidelines
19. How many days last week did you increase your heart rate and breathing for a at least 10 minutes while doing home activities such as cleaning sweeping, mopping or vacuuming?	3.6 (1.8)	3.6 (2.0)	.5641	< .0001	Strong	Moderate
20. How many days last week did you increase your heart rate and breathing for at least 20 minutes while doing home activities such as cleaning, sweeping, mopping or vacuuming?	3.2 (1.9)	3.3 (1.9)	.6845	< .0001	Strong	Strong
21. How many days last week did you increase your heart rate and breathing for 30 minutes or more while doing home activities such as cleaning, sweeping, mopping or vacuuming?	3.0 (2.0)	3.7 (2.2)	.6591	.0003	Strong	Strong
22. How many days last week did you increase your heart rate or breathing for at least 10 minutes while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?	3.0 (1.7)	3.5 (2.0)	.2408	.4757	Weak	Weak
23. How many days last week did you increase your heart rate or breathing for at least 20 minutes while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?	6.4 (15.9)	3.7 (2.1)	.3594	.3078	Moderate	Weak
24. How many days last week did you increase your heart rate or breathing for 30 minutes or more while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?	2.1 (1.4)	3.2 (2.2)	.6008	.0388	Strong	Strong
25. How many days last week did you increase your heart rate and breathing for at least 10 minutes while walking?	4.0 (1.9)	3.6 (1.9)	.4095	.0118	Moderate	Moderate
26. How many days last week did you increase your heart rate and breathing for at least 20 minutes while walking?	3.7 (1.9)	3.2 (1.8)	.6474	< .0001	Strong	Strong
27. How many days last week did you increase your heart rate and breathing for 30 minutes or more while walking?	3.3 (2.2)	3.3 (2.2)	.7233	<. 0001	Strong	Strong
28. How many days last week did you increase your heart rate or breathing for at least 10 minutes while doing activities at work?	4.6 (1.4)	4.1 (1.8)	.4888	.0071	Moderate	Moderate
29. How many days last week did you increase your heart rate or breathing for at least 20 minutes while doing activities at work?	4.6 (1.4)	4.1 (1.8)	.4674	.0213	Moderate	Moderate
30. How many days last week did you increase your heart rate or breathing for 30 minutes or more while doing activities at work?	4.2 (1.9)	3.8 (1.8)	.3141	.1263	Moderate	Weak

Cohen, 1988; weak= .1 to .3; Moderate= .3 to .5; Strong= >.5
Evans, 1996; weak= .20 to .39; Moderate= .40 to .59; Strong= .60 to .79; Very Strong= .80 to 1.00

CHAPTER FIVE

DISCUSSION

The main objective of this research was to develop and test the validity and reliability of items/scales to assess physical activity behavior of adult participants in the Expanded Food and Nutrition Education Program (EFNEP). The theoretically grounded (TRA/TPB) items/scales were developed based on the most appropriate and practical concepts derived from curriculum content analysis, MyPlate, DGA and short-term indicators of CNE logic model. This study indicated that the content analysis was important to identify and select appropriate concepts/contents within the program scope and program logic model and provided a basic foundation to develop the items/scales to evaluate the outcome of the program for physical activity behavior. Knowing the common concepts/content and how they were addressed across the curricula assisted the researcher in determining the important measures to include in the outcome evaluation tool for physical activity behavior. It also ensured the content validity of the items/scales during the developmental stage of item generation for physical activity behavior. The content validity measures the comprehensiveness and representativeness of the content of the scales (Yaghmaie, 2003).

This study also demonstrated that it was important to obtain judgments from both experts and the respondents in order to accurately assess the content validity of the items/scales. Findings from the expert review determined the content validity of the items by providing the qualitative suggestions and advices about the relevancy, clarity,

simplicity and ambiguity of the items/scales (Yaghmaie, 2003). By selecting eight experts from different areas of expertise on physical activity behavior research and EFNEP, this study provided a valuable method to revise and edit the items/scales and also helped documenting and interpreting the content validity results in an applicable manner (Yaghmaie, 2003).

Cognitive testing in this research study was also very beneficial in creating and assessing the quality of the items/scales. This process provided a clear understanding of what the items/scales were measuring from the perspective of the respondents. It also helped clarify the meaning of specific item words for respondents. It proved useful in determining the best item form and response categories.

The majority (85.7%) cognitive testing respondents for this study were low-income African American mothers of young children living only in two counties of South Carolina (Aiken and Sumter). The results could not be generalized to other racial or ethnic groups in other region of South Carolina or the United States and its territories because that would have required administering cognitive tests to other racial and ethnic groups in diverse population in other regions, states or territories in order to understand how these physical activity items were understood by these groups (Alaimo et al., 1999).

The psychometric analysis of the items/scales included factor analysis, internal consistency, test retest reliability and predictive validity. As a result of this analysis, certain psychosocial mediating items/scales demonstrated factorial validity with adequate factor loading (.40 and above), eigenvalue (>1) and proportion of variance between 5 -10 percent.

The Exploratory Factor Analysis identified 'Intention' as an intact factor because of simple structure with high factor loadings and high internal consistency reliability and very high percentage of proportion of variance explained and with moderate test-retest reliability. This result supports the Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB) that identifies intention as the most clearly measurable determinant of behavioral performance and goal attainment (Thomas & Paschal, 2006).

Empirical support from reviews and meta analysis also demonstrated the predictive power of intention, which indicated that intention accounts for medium to large effect size with 20% to 40% of the explained variance of physical activity behavior (Godin & Kok, 1996; Hagger et al., 2002; Downs & Hausenblas, 2005).

The second factor identified by the Promax method has the two items from positive attitude and four items from positive social norm and one item from positive perceived behavior control with acceptable factor loadings and acceptable range of proportion of variance explained. This second factor, even though it had items from three different constructs, the majority of the items were from positive attitude and subjective norm. Only one item was from positive perceived behavior control and if we drop this one item, the mediating variable emerged as 'attitude', as a second factor, which can be a significant predictor of physical activity. It was a combination of attitude on individual level and attitude from significant others about physical activity participation. 'Attitude' being the predictor of physical activity behavior is consistent with the findings of previous studies (Dzewaltowski et al., 1990; Kimiecik, 1992; Theodorakis, 1994; Wankel et al., 1994).

The third factor identified from the Promax method was one item from negative attitude and two items from negative perceived behavior control with acceptable factor loading and acceptable range of proportion of variance explained but low internal consistency reliability. The test retest reliability for these three items was found as moderate to strong. Although there is a factorial validity with acceptable factor loading on three items and significant test retest reliability, due to lower internal consistency and content interpretability, this factor demands further investigation for consistency of conceptual representation.

The results from the predictive validity of the final psychosocial items/scales did not support the expected results that the study hypothesized. Neither intention nor the positive attitude/positive subjective norm/positive perceived behavior control showed any correlation with SLPA or MVPA even though accelerometers were used to objectively measure participants' physical activity behavior. Mitigating factors, such as age of the participants, may have accounted for this result. Several studies suggested that age was a factor that could influence the intention-behavior and PBC- behavior relationships. A meta-analysis study found a significantly weaker relationship in the 25 and under age category as compared to the over 25-age category (Hagger et al., 2002). Another study showed a larger intention behavior association for older adults between the ages of 65 and 80 than for adults ages 26-64 (Down & Hausenblas, 2005). As the average age for participants in the present study was 34.4, its outcome may be similarly affected.

The potential justifications for these results could be that older people have more established life style and their intention and attitude are more aligned with their behavior,

whereas younger adults have more disruptions in life and unstable situation, which may results in lower intention, attitude and behavior relationship for physical activity (Amireault et al., 2008).

A mediating effect of income on the perceived behavior control and physical activity behavior was also reported in the literature. It found that individuals with a higher income level were able to demonstrate true control over their physical activity behavior because they faced a fewer barrier or have more ability to overcome such barriers to physical activity (Amireault et al., 2008). This report warrants further investigation for this research since the study participants for this research study were low-income.

Furthermore the result of predictive validity of the behavior items did not correlate with the MVPA data obtained by accelerometer. The possible explanation of this result could be the format of the items/scales. Activities were grouped by activity domain and intensity to estimate the total activity for the week. Thus, much deliberation was required of participants in order to answer the questions. Further investigation of the format is needed to develop a process by which participants can think and respond to the items in a straightforward manner.

Another possible explanation of this result could be that the participants were influenced by social desirability responses. Study participants might have over reported the frequency and the intensity of their physical activity behavior. Several other studies have found that participants were influenced by social desirability responses when they were being asked to response on their competence and socially sensitive topics like

physical activity level (Mortel, 2008; Adams et al., 2005).

A review study comparing direct measure versus self–report measure of physical activity identified that studies which categorized physical activity by level of exertion demonstrated a trend of reporting a higher category level of intensity (i.e. vigorous activity) than low to moderate level. Also, the self -report measure might be problematic for participants' ability to interpret and recall (Prince et al., 2008).

In addition previous studies found an overestimation of energy expenditure from the self –record method was higher with female than male participants and with a person with higher BMI level (> 25 kg/m^2) than with a lower BMI level (Ferrari et al., 2007). Further investigation is recommended to determine whether a bias exists.

Another factor possibly affecting the result was that the participants wore the accelerometer only for one week. During that week, many factors such as illness, injury or inclement weather might have influenced their participation during that week of wearing the accelerometer. Although previous studies suggested having same time period between self-report and direct measure to assess the physical activity, further investigation is needed to modify this limitation (Prince et al., 2008).

Also it is important to understand that although accelerometers demonstrate a good relative validity among a variety of criterion measures from direct observation to self report, there are some activities that cannot be adequately recorded by an accelerometer especially those which use the upper extremities (Swartz et al., 2000). Therefore accelerometer data might not have recorded all the activities that participants may have engaged.

Like many other studies this study used correlation coefficient to test the relationship between self-report and direct measures. Previous studies suggested that the test result by correlation coefficient was limited since correlation only measured the strength of the relationship between the two measures (Bland & Altman, 1986). A recommendation was made by the author for more useful approach to assess the agreement between the self–report and direct measures by obtaining mean difference between the two measures and the limits of agreement. If there was a good agreement between the two measures and the same parameter of physical activity was possessed by the two measures then the self–report method would be a valid substitute for direct method (Bland & Altman, 1986). This approach was out of the scope of this study since the unit of measures was different for self-report and direct measures and warranted further investigation for future studies.

Strengths/Limitations

The underscore advantage of this research was that the methodology of this research study was guided by a theory (TRA/TPB). Furthermore a very comprehensive and step-by-step process was utilized to conduct the entire study. Extensive research was completed to develop the items/scales by conducting content analysis, expert review and cognitive testing. The content analysis was used to identify and select appropriate content for the program logic model outcomes. The result of the content analysis served as a conceptual basis to develop, identify and/or select items/scales for physical activity behavior that matched the program scope and content. By knowing the common content

elements and how behavior change was commonly addressed across the curricula helped researcher to prioritize which core items/scales could be potentially included to evaluate physical activity behavior of adults in EFNEP. By assessing the type, frequency and intensity of contents used in the curricula for physical activity behavior change, the researcher were enable to have insight not only about the curricula content and specific themes but also about which essential mediating variables related to physical activity behavior change were commonly addressed across curricula.

Expert review was another strength of this research study. It provided a strong guidance to assess the quality of the items/scales and confirmed the content validity of the items/scales by addressing the redundancy, lack of relevancy, language problem and specificity. Also by having several experts (8) on diverse areas and with expertise on physical activity research and EFNEP, the measurement, interpretation and documentation of the content validity of this study was improved. The cognitive testing was another strength of this research study. By pilot testing of the items/scales with cognitive interviews, the researcher had an in depth understanding of the respondent's item interpretation, response and developmental skills towards answering the items/scales. The research team were able to carefully address the problems identified by the respondents of cognitive interview such as misinterpretation of content, construct of interest, lengthy items, lack of familiarity with specific terms, high response burden etc. and thus the understandability of the items/scales were maximized. Several psychometric testing was done in validating the items/scales. The large sample size (n= 302) was one of the strengths of the testing process of Exploratory Factor Analysis. The study sample was

comprised of ethnically diverse participants from low-income population and representative of the EFNEP audience. For validity and reliability measures multiple testing were conducted such as, construct validity and predictive validity, test-retest and internal consistency reliability. Recommended method of rotation 'Promax' was applied because this method is used when factors are supposed to correlate with one another. Different criteria (eigenvalue, scree plot, factor loading and proportion of varinace) were applied to determine the best factor, that influences physical activity behavior.

There were several limitations of the study. The convenience sampling was adopted for data collection. Also the study was conducted in only six South Carolina counties. Therefore study results could not be the generalized to the entire state's EFNEP low-income population. Further validation study should be considered to test the items with a larger population from various geographical locations in this state as well as in other states. The age range for the sample was really broad ranging from 16-69 years, which might have affected the study result since previous studies demonstrated varying results by different age group for the psychosocial influence towards physical activity behavior (Hagger et al., 2002; Down & Hausenblas, 2005; Amireault et al., 2008). Future study should consider testing the items with a specific age group.

Another limitation of the study was the racial/ethnic background of the sample population. Although the study sample was ethnically diverse the majority of the participants were African American and the proportion of other ethnic group was not large enough to generalize the study results among all ethnic group. It will be important to test the items with diverse ethnic groups proportionate with other groups.

Also because the format of the physical activity behavior items/scales was not straight forward, participants could not easily respond directly. Further testing configurations should be considered for modifying the format of the items/scales. The average durations (minutes/day) of participants' light, moderate and vigorous activities using metabolic equivalent (MET) should have been calculated for the self-report measures of this study. For a better agreement between self-report and direct measures future study should utilize same units for both measures (Prince et al., 2008).

Another limitation of the study was not being able to ask a variety of questions per construct to find out which one is a better item. Only four items per construct was asked to reduce the response burden.

Conclusions

The result of this study found that developing a tool to accurately measure the physical activity behavior for a low-income population was a great challenge. Many mitigating factors, as discussed earlier, could have contributed to the contradictory outcome as opposed to those anticipated in the study's hypotheses. Limitations of the study warrant further investigations.

This initial effort for developing and testing items/scales to measure physical activity behavior among EFNEP adults produced a solid foundation upon which to build a stronger platform for future research and analyses. It also demands credit for providing future investigators with a conceptual basis and acknowledged essential elements to measuring physical activity behavior among low-income populations.

CHAPTER SIX

DISSERTATION SUMMARY

This chapter will summarize the main results produced in this research, which was associated with the objectives and questions of the research study. This chapter will also provide recommendations for future studies.

<u>Summary</u>

The main objective of the research was to develop self-report items/scales with an acceptable level of reliability and validity to measure physical activity behavior of adults in EFNEP. This study developed items/scales based on the Theory of Planned Behavior and Theory of Reasoned Action with relevance to the content of the EFNEP curriculum, Dietary Guidelines for Americans (DGA) and My Plate, and the short-term goals and indicators of the Community Nutrition Education (CNE) logic model.

To accomplish the goals and objectives of this research study, a step by step procedure was used which included the following phases: a) curriculum Review and identification of contents/concepts; b) conceptual frame work & item generation; c) expert review & content validity; d) revision of items & scales; e) cognitive testing; f) psychometric testing & analysis which included construct validity, internal consistency, test-retest reliability and predictive validity.

Following are the major findings from the research study:

Curriculum Review and Identification of Contents

Concepts identified from Physical Activity curriculum analysis were: Motivational, Factual Knowledge, Behavioral, Self-Regulation and Monitoring and Environmental.

The Motivational concept recognized the importance and benefit of being physically active everyday as it relates to health and weight control.

The Factual Knowledge concept emphasized knowing the recommended amount of physical activity and choosing ways to decrease sedentary activities while increasing the intensity, time and duration of physical activity.

The Behavioral concept identified appropriate levels of moderate or vigorous physical activity, including aerobic, stretching and flexibility exercises as well as warm up and cool down periods.

The Self-regulation and Monitoring concept aided in the development of personal plan and preparation to increase physical activity that includes goal setting, how to overcome obstacles and create solution to barriers.

The Environmental concept introduced ideas in how to involve family and other supporters in the activities.

Identification of the common physical activity content taught in all EFNEP curricula provided the conceptual foundation for developing items/scales for physical activity.

Major Findings of Content Validity

Following components were used as a framework to incorporate appropriate and meaningful items/scales to measure physical activity; a) Content analysis of several adult EFNEP curriculums nationwide, b) Community Nutrition Education Logic Model (ref), c) National guidelines from MyPlate, d) Dietary Guidelines for Americans (DGA). Essential elements commonly found in these components were used to develop the first draft of the items and reviewed by experts. The expert review provided the content validity of the items/scales by identifying the appropriate constructs of interest demonstrated by content analysis. The expert review further maximized the content validity by selecting the appropriate theory (Theory of Reasoned Action and Theory of Planned Behavior) and it's constructs that align the concepts of interest demonstrated by content analysis. Thus items/scales were revised based on the constructs of these theory which was 'attitude', 'subjective norm', 'perceived behavior control' and 'intention' to measure the impact of EFNEP more at the individual level of physical activity behavior than at the environmental or organizational level. Both environmental and organizational components were least addressed components found during content analysis.

Major Findings of Cognitive Testing

The cognitive testing allowed the study to revise the items/scales based on the comments of EFNEP eligible mothers (n=14, 85.percent African American and 14.2 percent white) with at least one children living in the household. The major findings of the cognitive testing centered mostly, on wording and the format of the items/scales. The

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wording of the most of the item/scale was revised and format was changed as suggested by the participants to enhance clarity and meaning and understandability of the items/scales.

Major Findings of Construct Validity

The construct validity was conducted with a sample of 302 participants (71.15 African American, 24.8 percent white, 2.3 percent Hispanic, 1.3 percent American Indian and .3 percent Native Hawaiian). Exploratory Factor Analysis (EFA) demonstrated 'intention' as a simple structure with adequate factor loadings (at least .40), eigenvalue 6.26 and 74 percent proportion of variance explained. The second factor evolved was a combination of items from Positive Attitude (two items), Positive Social Norm (Four Items) and Positive Perceived Behavior Control one item) with eigenvalue 1.47 and 17% proportion of variance explained. The third factor emerged from this analysis was also combination of item from Negative Attitude (one item) and Negative Perceived Behavior Control (two items) with factor loading .40 and greater, eigenvalue .78 and 9 percent proportion of variance explained. The new factors were: 1) "Physical Activity Intention" (five items); 2) Physical Activity 'Positive Attitude/Positive Subjective Norm/Positive Perceived Behavior Control' (seven items); and Physical Activity 'Negative Attitude/Negative Perceived Behavior Control' (three items).

Fifteen items were retained based on the analysis. Two items (one on negative attitude and another one on positive perceived behavior control) did not meet the criterion of construct validity and were deleted.

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Findings of Internal Consistency of the Final Psychosocial Items

Cronbach's alpha was used to determine the internal consistency reliability of the final psychosocial items/scales. The items with Cronbach's alpha .70 or greater were considered acceptable. The internal consistency analysis of the factor 'intention' was .92 and for 'Positive Attitude/Positive Subjective Norm/Positive Perceived Behavior Control was .85. The internal consistency of the third factor "Negative Attitude/Negative Perceived Behavior Control' was low with Cronbach's alpha .51.

Findings of Test-Retest Reliability

Test- retest reliability was conducted to assess the reliability of the psychosocial items and behavioral items using sub sample (n=50, 96 percent African American and 4 percent White). The stability of the measure was determined from the correlation between the scores of the measures on two different occasions one week apart with no intervention. The results for psychosocial items provided a modest stability for 'intention' (r_s= .47; p = .0006) and stronger stability for 'Positive Attitude/Positive Subjective Norm/Positive Perceived Behavior Control' (r_s= .70; p =< .0001). Moderate to strong stability was found for the factor 'Negative Attitude/Negative Perceived Behavior Control (r_s= .59; p=< .0001).

Findings of the Predictive Validity of the Psychosocial Items & Physical Activity Behavior Items

Spearman correlation was calculated to determine the predictive validity of the psychosocial items and physical activity behavior items with the Moderate& Vigorous

activity measures (MVPA) of accelerometer data from same sub sample of test retest reliability (n=50). No significant association was found between the psychosocial items and MVPA. Also no significant association was found between physical activity behavior items and MVPA.

Conclusions

The study highlights the importance of systematic approach for developing and testing the items/scales to measure the program impact of certain behaviors. This study demonstrated the importance of using behavioral theory and content analysis as a framework to identify concepts and indictors to develop items for behavior change. The study also demonstrated the necessity of expert review and cognitive testing for identifying appropriateness of the constructs and to enhance the clarity and meaning of the items and scales.

The significance of large sample size (1:4 to 1:10) and ethnically diverse sample was also emphasized in this study. The importance of psychometric analysis of the items/scales, which included construct validity, internal consistency, test-retest reliability and predictive validity, was also underscored. In addition this study demonstrated the merit of using criterion for determining the best factor structure (eigen value, scree plot and proportion of variance explained).

Although the results of this study demands further investigation for using the items/scales to evaluate the impact of EFNEP on physical activity behavior of adults, this study provided an important first step in developing and testing items/scales with

conceptual foundation and acknowledged essential elements to measure physical activity

behavior of low-income population.

<u>Recommendations for Future Research</u>

- Future investigation is recommended to verify the content validity of the final version of the items/scales

- Future investigation is recommended to test the items/scales in other geographical areas of South Carolina as well as other states and U.S. territories to determine if they would be appropriate to use for the overall EFNEP population.

- Future investigation is needed to conduct the testing with the sample of specific age group of EFNEP adults to better predict the association of psychosocial measures and physical activity behavior of the participants.

- Future investigation is recommended to conduct the testing with proportional size of different ethnic groups to determine if any generalizations of the items exist between groups.

- Future investigation is recommended to reconsider the format of the items/scales for self- report data of physical activity behavior in order to decrease response burden and increase predictive validity.

- Future investigation is needed to determine the appropriate method to calculate the moderate and vigorous physical activity by self–report data, which might contribute to positive results for predictive validity.

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APPENDICES

Appendix A: The Community Nutrition Logic Model

The Community Nutrition Education (CNE) Logic Model, Version 2 – Detail

Outcomes and Indicators – Diet Quality & Physical Activity		
Short Term	**Medium Term**	**Long Term**
Individuals, Families, Households Level		
Outcomes		
Individuals/families/households gain awareness, knowledge and/or skills: • Improved attitudes about healthy eating and physical activity • Increased knowledge of healthy food choices • Improved skill in selection of healthy foods • Increased awareness/knowledge of benefits of physical activity (achieve/maintain a healthy weight, increase stamina, improve cardiovascular health, reduce risk of disease – cancer, diabetes, etc., improve personal appearance) • Increased awareness/knowledge of physical activity recommendations for health	*Individuals/families/households apply skills and/or change behaviors:* • Increased adoption of healthy food practices • Increased adoption of recommended diet-related practices for disease prevention and management • Participation in regular physical activity [formal – exercising] • Participation in community events that involve physical activity (informal community activities – sports, entertainment)	*Individuals/families/households experience:* Fewer risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity • Fewer complications of chronic diseases that are affected by diet and physical activity
Indicators		
___ *(number) of* ___ *(total number) of individuals/families/households* <u>demonstrate increased knowledge and ability:</u> • Plan menus and choose foods according to MyPyramid and the Dietary Guidelines [DQ-01] • Adjust recipes and/or menus to achieve certain goals (reduced calories, fat, sodium, etc., or increased nutrients and fiber) [DQ-02] • Use MyPyramid as a basis for selecting low-cost foods [DQ-03] • Write a personal plan to adjust physical activity for health and fitness [DQ-04] ___ *(number) of* ___ *(total number) of individuals/families/households* <u>indicate intent to change:</u> • Adopt one or more healthy food/nutrition practices (choose foods according to MyPyramid and the Dietary Guidelines [DQ-05] • Adjust recipes and/or menus to achieve certain goals (reduce calories, fat, sodium, etc., or increase nutrients and fiber) [DQ-06] • Begin or increase physical activity [DQ-07]	___ *(number) of* ___ *(total number) of individuals/families/households* <u>report/demonstrate adoption of healthy eating practices with respect to MyPyramid and the Dietary Guidelines:</u> • Eat nearer to the recommended number of ounce equivalents from the Grains Group [DQ-08] • Eat nearer to the recommended number of cup equivalents from the Vegetables Group [DQ-09] • Eat nearer to the recommended number of cup equivalents from the Fruit Group [DQ-10] • Eat nearer to the recommended number of cup equivalents from the Milk Group [DQ-11] • Eat nearer to the recommended number of ounce equivalents from the Meat and Beans Group [DQ-12] • Eat nearer to the recommended number of teaspoons from the Oils Group [DQ-13] • Eat nearer to the discretionary calorie allowance [DQ-14] • Eat nearer to the MyPyramid amounts (unspecified) [DQ-15] • Improve their intake of selected nutrients [DQ-16] • Increase their frequency of eating breakfast [DQ-17] ___ *(number) of* ___ *(total number) of individuals/families/households* <u>report/demonstrate adoption of increased time in physical activity practices:</u> • Engage in regular physical activity, such as walking, hiking, bicycling, etc. [DQ-18] • Increase participation in games and play that involve physical activity [DQ-19] • Reduce time spent in sedentary activities (such as watching TV and playing video games) [DQ-20] • Engage in physical activity to the level recommended by MyPyramid [DQ-21]	*Data shows improvements in nutrition-related health conditions:* • Reduced number/percentage of individuals/families/households with chronic disease risk factors [DQ-22] • Reduced number/percentage of individuals/families/households with chronic disease complications [DQ-23] • Increase number/percentage of individuals/families/households who achieve/maintain healthy weight or lose as much as 5% of body weight (if needed) [DQ-24]

Appendix B: EFNEP Curriculum Content Analysis Physical Activity Lessons for Adults Data Recording Sheet

Name of the curriculum

_____

Name of the state developed the
curriculum_____

Benefit & Importance	Recommended Amount of Physical Activity for Adults	Goal Setting to increase Physical Activity	Choosing Variety of Physical Activity	Intensity, Moderate Or Vigorous	Time	Frequency	Duration	Stretching	Strength	Flexibility

Aerobic	Warm-up & Cool down	Screen Time TV/Video Games	Risk & Safety	Family Involvement & Other support	Obstacles, Barriers & Solution	Ways to Increase Physical Activity	Monitor Progress In Altering Physical Activity Goals	Water: Before During & After Physical Activity	Calorie In & Calorie Out	Other

Appendix C: EFNEP Curriculum Content Analysis Summary Sheet

1. Theoretical frame work of the curriculum (if any):

2. Goal of the curriculum regarding physical activity lesson:

3. Objective of the curriculum regarding physical activity lesson.

4. What impact or outcome do you expect from the participants as a result of attending the physical activity lesson?

5. Other comments about the physical activity lessons:

Appendix D: 1st Draft of the Items/Scales

Topics Addressed about Physical Activity	CNE Logic Model	My Pyramid	2010 Dietary Guidelines	EFNEP Curriculum
Regular PA				
1. How often do you engage in physical activity on most days of the week?	X			
2. How often do you engage in physical activity events in your community?	X			
3. How often do you participate in individual games and play that involve physical activity?	X			
4. How often do you set aside time to do physical activity?				X
Planning				
1. How often do you carry out a personal plan for regular physical activity?	X			X
2. How often do you plan to do at least 30 minutes of physical activity in a day?	X	X	X	X
3. How often do you plan to look for information about physical activity?				X
4. How often do you plan to try a new physical activity?				X
5. How often do you plan to try different types of physical activity so that you have more options to choose from?				X
6. How often do you make a personal plan to be physically active for your health?				X
7. How often do you write a personal plan to be physically active for your fitness?	X			
8. How often do you write a personal plan to be physically active for weight control?	X			
Intent & Goal				
1. Do you intent to increase your time in daily physical activity?	X			X
2. Do you plan to increase the number of days each week you engage in physical activity?	X			X
3. Do you set goals to do at least 30 minutes of physical activity in a day?				X
4. Do you set goals to do more than 30 minutes of physical activity in a day?				X
Motivation				
1. How often do you engage in physical activity because you want to eat certain foods?		X	X	X
2. How often do you engage in physical activity to increase your energy levels?			X	X
3. How often do you engage in physical activity to improve your appearance?			X	X
4. How often do you engage in physical activity to improve your general well being?			X	X
5. How often do you engage in physical activity to improve your self-esteem?			X	X

Topics Addressed about Physical Activity	CNE Logic Model	My Pyramid	2010 Dietary Guidelines	EFNEP Curriculum
Health Reason				
1. How often do you engage in physical activity to increase your stamina?			X	X
2. How often do you engage in physical activity to improve your cardiovascular health?			X	X
3. How often do you engage in physical activity to reduce your risk of cancer?			X	X
4. How often do you engage in physical activity to reduce your risk of diabetes?			X	X
5. How often do you engage in physical activity to improve your fitness level?			X	X
6. How often do you engage in physical activity to build and maintain bones, muscles and joints?			X	X
7. How often do you engage in physical activity to build endurance and muscle strength?			X	X
8. How often do you engage in physical activity to improve your flexibility?			X	X
9. How often do you engage in physical activity to reduce your risk of heart disease?			X	X
10. How often do you engage in physical activity to help control blood pressure?			X	X
11. How often do you engage in physical activity to reduce your feelings of depression and anxiety?			X	X
Weight Control				
1. How often do you engage in physical activity to burn calories?	X	X	X	X
2. How often do you engage in physical activity to manage weight?	X	X	X	X
Decrease sedentary/ways to increase PA				
1. How often do you engage in physical activity to decrease sedentary time?				X
2. How often do you use stairs instead of taking the elevator?				X
3. How often do you walk instead of driving short distances?				X
4. How often do you park away from your destination so you have to walk more?				X
5. How often do you choose to be physically active instead of watching TV or surfing on the internet?	X			X
Family Participation				
1. How often do you and your family participate together in individual games and play that involve physical activity?	X			X
2. How often you and your family participate together in physical activity events in you community?	X			X

Topic Addressed about Physical Activity	CNE Logic Model	My Pyramid	2010 Dietary Guidelines	EFNEP Curriculum
Aerobic Physical Activities				
1. How often do you do walk for exercise?				X
2. How often do you do dance for exercise?				X
3. How often do you ride a bike for exercise?				X
4. How often do you walk on a treadmill for exercise?				X
5. How often do you ride a stationary bike for exercise?				X
Moderate Physical Activity				
Moderate physical activity includes things you do that challenge your heart and lungs and increases your heart rate and breathing to some extent. Think about an activity that would rate as 5 or 6 on a 0-10 point difficulty scale.				
1. How often do you engage in moderate physical activity for at least 10 minutes (a non-stop session) on most days of the week?		X	X	X
2. How often do you engage in moderate physical activity for 30 minutes on most of the day of the week?		X	X	X
3. How often do you engage in moderate physical activity for at least 60 minutes (total across the entire day) on most days of the week?		X	X	X
4. How often do you engage in moderate physical activity for 90 minutes (total across the entire day) on most days of the week?		X	X	X
5. How often do you engage in moderate physical activity for at 150 minutes (2 hours and 30 minutes) in a whole week (7 day period)?		X	X	X
6. How often do you engage in moderate physical activity for between 150 minute (2 hours and 30 minutes) and 300 minutes (5 hours) in a whole week (7 day period)?		X	X	X
Vigorous Physical Activity				
Vigorous physical activity includes things you do, which challenges your heart and lungs and increase your heart rate and breathing to a great extent. Think about an activity that would rate as 7 or 8 on a 0-10 point difficulty scale.				
1. How often do you engage in vigorous physical activity at least 75 minutes (1 hours and 15 minutes) in a whole week (7 day period)?		X	X	
2. How often do you engage in vigorous physical activity for minimum of 25 minutes on at lest three days per week?		X	X	
3. How often do you engage in vigorous physical activity between 35-40 minutes on at least 2 days per week?		X	X	

Topic Addressed about Physical Activity	CNE Logic Model	My Pyramid	2010 Dietary Guidelines	EFNEP Curriculum
Muscle Strengthening				
Muscle strengthening physical activity includes things you do that challenge your muscle strength and endurance 1. How often do you engage in muscle strengthening activity that involves the major muscle groups (legs, hips, back, abdomen, chest, shoulders and arms) in you body?		X		
2. How often do you lift weights two or more days per week?		X		
3. How often do you workout with a resistance band?		X		
4. How often do you do exercise that use your body weight for resistance (e,g,. push-ups, sit-ups, etc.)?		X		
5. How often do you do heavy gardening, digging or shoveling?		X		
6. How often do you do yoga?		X		
Lifestyle Physical Activity				
1. During the last seven days did you do moderate activities like carrying light loads, sweeping, washing windows or raking in the garden or yard for at least 10 minutes at a time?			X	
2. During the last seven days did you do vigorous physical activities like heavy lifting, chopping wood, shoveling snow or digging in the garden or yard do at least 10 minutes at a time?			X	
1) The response category for all the questions starting with 'how often' are 'Not Applicable', ' Do not do', 'seldom','sometime', 'Most of the time', 'Almost Always'. 2) The response category for the highlighted questions are "Yes" and "No".				

<center>**Appendix E: Expert Review Letter**</center>

To:

From: Tarana Khan, Coordinator, EFNEP, Clemson University.

Subject: Items to review for Physical Activity Behavior Checklist in EFNEP

Dear

I am Tarana Khan from Clemson University Cooperative Extension Service. I work under Dr. Katherine Cason to coordinate the Expanded Food and Nutrition Education Program (EFNEP) in South Carolina. Currently, I am also a doctoral student in the Food and Nutrition Department in Clemson University. Dr. Cason serves as the Chairperson and Dr. Joel Williams, Assistant Professor in the Department of Public Health Sciences, serves as Co-Chair of my dissertation committee.

For my dissertation, I am conducting a research project to identify items that could be used to measure physical activity related construct among EFNEP adults. The project will also assess the reliability (test-retest) and validity (factorial construct) of the physical activity items. Physical activity is newer focus area in the EFNEP program and we intend to develop, test and recommend items for the EFNEP Behavior Checklist, the pre/post program evaluation measure use in every state and territory of the U.S. Please find attached the draft of items we developed. The items were developed based on physical activity content found in the Community Nutrition Education (CNE) Logic Model, 2010 Dietary Guidelines for Americans, My Pyramid/My Plate and concepts we identified through content analysis of the most commonly used EFNEP curricula in the U.S. The first phase of the review of the items were done by a panel of review team and conducted the review in two steps: first each reviewer reviewed the lesson or curriculum independently to specify the full domain of contents that are relevant to the behavior change of physical activity. During the second step the review team reviewed collectively all the contents that researcher compiled from the individual review process and came to a consensus on review based on following criteria:

- What was addressed in most of the EFNEP curriculum, CNE logic model; My Pyramid/My Plate and 2010 Dietary Guide lines;
- Methods of addressing the content;
- Amount of time dedicated to each content area;
- Frequency of addressing the content by each curriculum.

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In order to maximize the content validity, I need expert reviewers like your-self, to provide feedback on the following points:

- Rate the relevance of each item to physical activity content taught in the adult EFNEP program based on the CNE logic model, 2010 Dietary Guidelines, My pyramid/My Plate and core physical activity concepts of physical activity taught in EFNEP around U.S;
- Comment on individual items as you see fit. Your insightful comments about each item wording will facilitate an appropriate list of items; Asses the clarity an conciseness of each item;
- Point out awkward and confusing items and suggests alternative wording;
- List any important concepts you think we have failed to include.

Please review the items attached by July 15th, 2011, if possible.

Thank you in advance for your help. If you have any question or concern, please contact me at taranak@clemson.edu or call me at 803-237-0775.

Appendix F: Final Items/Scales for Cognitive Testing

We are interested in **physical activity** and **exercise** you do that makes your heart beat faster or makes you breathe faster. Some of these *may* even make you sweat.

Physical Activity is a word we use that means any type of movement of the body. Let us give you a few examples. This body movement may happen when you are at your job, have free time, or are working around the house or in the yard or garden. It could also happen when you walk or dance.

Exercise is one type of physical activity that a lot of people think of when they hear the word physical activity. Exercise includes working out, going to an exercise class, and also type of physical activity that is planned, structured, and repetitive to improve health and maintain fitness.

Items/Scoring	1	2	3	4	5
1. Participating in Physical activity is boring					
2. Getting regular exercise is healthy					
3. Being physically active regularly over the next month would be useless					
4. Regular exercise over the next month would be a good thing for me to do.					
5. Being physically active is something my family believes I should do.					
6. Getting regular exercise is something my friends think I should do.					
7. People who are important to me would want me to be physically active					
8. In my opinion those who are most important to me would favor me exercising regularly.					
9. If I want to, I can exercise several times a week over the next month.					
10. It is mostly up to me whether or not I do physical activity several times a week over the next month.					
11. I have a very little control of being physically active several times a week over the next month.					
12. Participating in physical activity several times a week over the next month would be hard for me.					
13. I intend to be physically active regularly over the next month.					
14. I plan to exercise several times a week over the next month.					
15. I aim to be physically active several times a week over the next month.					
16. I have it in my mind that I will exercise regularly over the next month.					
17. I definitely want to be physically active over the next month.					

Scoring: 1=Strongly Disagree; 2= Disagree; 3=Neither Agree or Disagree; 4=Agree; 5=Strongly Agree

Items/Scoring	Yes, I have been for more than 6 months	Yes, I have been for less than 6 months.	No, but I intend to in the next 30 days	No, but I intend to in the next 6 months	No, and I do not intend to in the next 6 months.
18. Do you exercise regularly?					

Items/Scoring	One Day	Two Days	Three days	Four Days	Five Days	Six Days	Seven Days	N/A
19. How many days last week did you increase your heart rate and breathing for a total of at least 10 minutes but less than 20 minutes while doing home activities such as cleaning sweeping, mopping or vacuuming?								
20. How many days last week did you increase your heart rate and breathing for a total of at least 20 minutes but less than 30 minutes while doing home activities such as cleaning, sweeping, mopping or vacuuming?								
21. How many days last week did you increase your heart rate and breathing for 30 minutes or more while doing home activities such as cleaning, sweeping, mopping or vacuuming?								
22. How many days last week did you increase your heart rate or breathing for a total of at least 10 minutes but less than 20 minutes while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?								
23. How many days last week did you increase your heart rate or breathing for a total of at least 20 minutes but less than 30 minutes while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?								

Items/Scoring	One Day	Two Days	Three days	Four Days	Five Days	Six Days	Seven Days	N/A
24. How many days last week did you increase your heart rate or breathing for 30 minutes or more while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?								
25. How many days last week did you increase your heart rate and breathing for a total of at least 10 minutes but less than 20 minutes while walking?								
26. How many days last week did you increase your heart rate and breathing for a total of at least 20 minutes but less than 30 minutes while walking?								
27. How many days last week did you increase your heart rate and breathing for 30 minutes or more while walking?								
28. How many days last week did you increase your heart rate or breathing for a total of at least 10 minutes but less than 20 minutes while doing activities at work?								
29. How many days last week did you increase your heart rate or breathing for a total of at least 20 minutes but less than 30 minutes while doing activities at work?								
30. How many days last week did you increase your heart rate or breathing for 30 minutes or more while doing activities at work?								

Appendix G: Clemson University Institutional Review Board Approval

August 16, 2011

CLEMSON
U N I V E R S I T Y

Dr. Katherine Cason
Clemson University
Department of Food Science & Human Nutrition
255 Poole Agricultural Center
Clemson, SC 29634

OFFICE OF
RESEARCH COMPLIANCE

Clemson University
321 Calhoun Drive
Room 223 Brackett Hall
Clemson, SC
29634-5704

P 864-656-1525
F 864-656-4475

SUBJECT: IRB Protocol # **IRB2011-234**, entitled **"Development and
            Testing the Validity and Reliability of Items and Scales to
            Assess Physical Activity Behavior of Adults in the Expanded
            Food and Nutrition Education Program"**

Dear Dr. Cason:

The Institutional Review Board (IRB) of Clemson University reviewed the above-mentioned study using Expedited review procedures and has recommended approval. Approval for this study has been granted as of **August 4, 2011.** Please find enclosed with this letter your original, stamped consent document to be used with this protocol.

Your approval period is **August 4, 2011 to August 3, 2012.** Your continuing review is scheduled for July 2012. Please refer to the IRB number and title in communication regarding this study. Attached are handouts regarding the Principal and Co-Investigators' responsibilities in the conduct of human research. The Co-Investigator responsibilities handout should be distributed to all members of the research team. The Principal Investigator is also responsible for maintaining all signed consent forms (if applicable) for at least three (3) years after completion of the study.

No change in this approved research protocol can be initiated without the IRB's approval. This includes any proposed revisions or amendments to the protocol or consent form. Any unanticipated problems involving risk to subjects, any complications, and/or any adverse events must be reported to the Office of Research Compliance immediately. Please contact the office if your study has terminated or been completed before the identified review date.

The Clemson University IRB is committed to facilitating ethical research and protecting the rights of human subjects. Please contact the Office of Research Compliance at 656-6460 if you have any questions.

Sincerely,

Laura A. Moll, M.A., CIP
IRB Administrator

www.clemson.edu/research/compliance

Appendix H: Clemson University Institutional Review Board
Approved Consent Form

Information about Being in a Research Study
Clemson University

Development and testing the validity and reliability of items and scales to assess physical activity behavior of adults in the Expanded Food and Nutrition Education Program

Description of the Study and Your Part in It

Principal investigator, Dr. Katherine Cason, along with Tarana Khan (PhD candidate) is inviting you to take part in a research study. Tarana Khan is leading this study under the direction of Dr. Katherine Cason, a professor in the Department of Food, Nutrition, and Packaging Sciences. The purpose of this research is to develop and validate an evaluation tool to assess physical activity behavior of adults in the Expanded Food and Nutrition Education Program (EFNEP).

Your participation will involve meeting with our staff 1-3 times depending on which part of the study you agree to participate. Nutrition Educator Assistants with EFNEP program will arrange this meeting. During this meeting you will complete a self- report survey, which will collect the following information:

1. Your opinion about each question's wording and responses. The interviewer will be taking notes and audiotape the interview to appropriately capture all the comments.
2. Basic demographics (e.g. age, gender, race, number of children in the household etc,)
3. Your physical activity behavior for everyday.

We will also randomly select some of you to wear, for one week, a small device called an accelerometer (which is about the size of a match box), on a belt around your waist. This device will measure your physical activity (how often you move, the strength of each movement).

Some of you will be selected to complete the self-report survey on two occasions three or four weeks apart to measure the stability of the survey.

It will take you about 30 minutes to complete the survey and interview.

Risks and Discomforts

We do not know of any risks or discomforts to you in this research study. However if any question makes you feel uncomfortable, you are free to skip it. If you are randomly selected to wear the accelerometer, there is a slight risk for skin irritation if you wear the accelerometer belt directly against your skin. Yet we will instruct you to wear those belts on top of your clothes not directly against the skin.

This form is valid only if the
Clemson University IRB
stamp of approval is shown here:

CLEMSON UNIVERSITY
IRB CONSENT FORM
APPROVED 8-4-11
EXPIRES 8-3-12

Page 1 of 3

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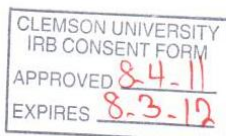
Possible Benefits

We do not know of any way you would benefit directly from taking part in this study. However, this research may help us to make improvements to the questionnaire.

Incentives

You will receive a small incentive worth of $2-$10 if you participate (Water bottle and/or Pedometer).

Protection of Privacy and Confidentiality

We will do everything we can to protect your privacy and confidentiality. We will not tell anybody outside of the research team that you were in this study or what information we collected about you in particular. Your identity will not be revealed in any publication that might result from this study. All forms will be kept in a locked location up to 5 years, following federal regulations and Clemson University policies. In rare cases, a research study will be evaluated by an oversight agency, such as the Clemson University Institutional review board or the federal Office for Human Research Protections that would require that we share the information we collect from you. If this happens, the information would only be used to determine if we conducted this study properly and adequately protected your rights as a participant in the study.

Choosing to Be in the Study

You do not have to be in this study. You may choose not to take part and you may choose to stop taking part at any time. You will not be punished in any way if you decide not to be in the study or to stop taking part in the study.
You may choose to stop taking part in this study after today. If you do, we will not collect any more information from you. However, we would keep and use the information we had already collected from you.

Contact Information

If you have any questions or concerns about this study or if any problems arise, please contact Dr. Katherine Cason at Clemson University at (864) 723-4520 or Tarana Khan at (803)-237-0775. If you have any questions or concerns about your rights in this research study, please contact the Clemson University Office of Research Compliance (ORC) at 864-656-6460 or irb@clemson.edu. If you are outside of the Upstate South Carolina area, please use the ORC's toll-free number, 866-297-3071.

This form is valid only if the
Clemson University IRB
stamp of approval is shown here:

CLEMSON UNIVERSITY
IRB CONSENT FORM
APPROVED 8-4-11
EXPIRES 8-3-12
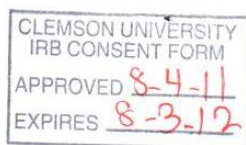
Page 2 of 3

Consent

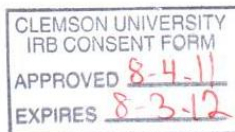**I have read this form and have been allowed to ask any questions I might have. I agree to take part in this study.**

Participant's signature: _____ Date: _____

Witness's Signature: _____ Date: _____

A copy of this form will be given to you.

This form is valid only if the
Clemson University IRB
stamp of approval is shown here:

CLEMSON UNIVERSITY
IRB CONSENT FORM
APPROVED 8-4-11
EXPIRES 8-3-12

Page 3 of 3

Appendix I: Cognitive Interview Guide

1. **Participating in Physical activity is boring.**

   Tell me what do you think the question is asking?

   Do you like the wording of the question? Is this how you would ask someone this question?

   Is there any word in this question that is confusing or strange to you?

   Is there a better way to ask the question?

   What is your answer to the question?

2. **Getting regular exercise is healthy.**

   Tell me what do you think the question is asking?

   Do you like the wording of the question? Is this how you would ask someone this question?

   Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

3. **Being physically active regularly over the next month would be useless.**

   Tell me what do you think the question is asking?

   Do you like the wording of the question? Is this how you would ask someone this question?

   Is there any word in this question that is confusing or strange to you?

   Is there a better way to ask the question?

   What is your answer to the question?

4. **Regular exercise over the next month would be a good thing for me to do.**

   Tell me what do you think the question is asking?

   Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

5. **Being physically active is something my family believes I should do.**

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

6. **Getting regular exercise is something my friends think I should do.**

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that are confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

7. **People, who are important to me would want me to be physically active.**

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that are confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

8. **In my opinion those who are most important to me would favor me exercising regularly.**

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

9. **If I want to, I can exercise several times a week over the next month.**

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

10. It is mostly up to me whether or not I do physical activity several times a week over the next month.

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

11. I have a very little control of being physically active several times a week over the next month.

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

12. Participating in physical activity several times a week over the next month would be hard for me.

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

13. I intend to be physically active regularly over the next month.

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

14. I plan to exercise several times a week over the next month.

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

15. I aim to be physically active several times a week over the next month.

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

16. I have it in my mind that I will exercise regularly over the next month.

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

17. I definitely want to be physically active over the next month.

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

18. Do you exercise regularly?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

19. How many days last week did you increase your heart rate and breathing for a total of at least 10 minutes but less than 20 minutes while doing home activities such as cleaning, sweeping, mopping or vacuuming?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

20. How many days last week did you increase your heart rate and breathing for a total of at least 20 minutes but less than 30 minutes while doing home activities such as cleaning, sweeping, mopping or vacuuming?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

21. How many days last week did you increase your heart rate and breathing for 30 minutes or more while doing home activities such as cleaning, sweeping, mopping or vacuuming?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

22. How many days last week did you increase your heart rate or breathing for a total of at least 10 minutes but less than 20 minutes while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

23. How many days last week did you increase your heart rate or breathing for a total of at least 20 minutes but less than 30 minutes while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

24. How many days last week did you increase your heart rate or breathing for 30 minutes or more while doing activities out side of home such as gardening, digging, shoveling, raking leaves or mowing lawn?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?
Is there a better way to ask the question?

What is your answer to the question?

25. How many days last week did you increase your heart rate and breathing for a total of at least 10 minutes but less than 20 minutes while walking?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

26. **How many days last week did you increase your heart rate and breathing for a total of at least 20 minutes but less than 30 minutes while walking?**

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?
Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

27. How many days last week did you increase your heart rate and breathing for 30 minutes or more while walking?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?
Is there a better way to ask the question?

What is your answer to the question?

28. How many days last week did you increase your heart rate or breathing for a total of at least 10 minutes but less than 20 minutes while doing activities at work?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

29. How many days last week did you increase your heart rate or breathing for a total of at least 20 minutes but less than 30 minutes while doing activities at work?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

30. How many days last week did you increase your heart rate or breathing for 30 minutes or more while doing activities at work?

Tell me what do you think the question is asking?

Do you like the wording of the question? Is this how you would ask someone this question?

Is there any word in this question that is confusing or strange to you?

Is there a better way to ask the question?

What is your answer to the question?

EFNEP Client Enrollment Form

Today's Date: _____

Name: _____

Street Address: _____

_____

City: _____

Zip Code: _____ Phone Number: _____

Age: _____ Sex: _____ Female _____ Male

Maternal & Child:

Are you pregnant? _____ Yes _____ No

Are you nursing? _____ Yes _____ No

Where Do You Live?
_____ Farm
_____ Towns Under 10,000 & Rural Non-Farm
_____ Towns & Cities 10,000-50,000
_____ Suburbs of Cities over 50,000
_____ Central Cities over 50,000

Highest Grade:
_____ Last Grade Completed (please specify)
_____ Grade 12 or GED
_____ Some College
_____ Graduated 2 Year College
_____ Graduated 4 Year College
_____ Post Graduate

Income:

Please list your income: _____/month

Lesson Type: _____ Group _____ Individual

Number of Lessons: _____

Number of Contacts: _____

How many children are living with you? _____

_____ Age _____ Age

_____ Age _____ Age

_____ Age _____ Age

How many other adults live with you?
_____
(do not count yourself)
Subgroups: EFNEP

Do you consider yourself Hispanic/Latino?

_____ Yes _____ No

Which race category do you identify with? (check all that apply)

_____ American Indian or Alaskan Native

_____ Asian

_____ Black or African American

_____ Native Hawaiian or Other Pacific Islander

_____ White

Race/Ethnic Subcategory: NONE

Public assistance at Entry:

_____ Child Nutrition (Free School Lunch)

_____ FDPIR

_____ Food Stamps

_____ Head Start

_____ TANF

_____ Temporary Emergency Foods

_____ Commodity Foods

_____ WIC

For Office Use Only
Type of Instruction: _____ Group _____ Individual
Extension Staff Member: _____
Entry Date: _____
Participant ID: _____
Person Entering into computer and date: _____

Appendix K: Accelerometer Data from Validation Sample

	Stages of Changes	Average # of Days				Average # of Hours				Sedentary Physical Activity				Light Physical Activity				Sedentary & Light Physical Activity			
		Mean	Std	Min	Max	Mean	Std	Min	Max	Mean	Std	Min	Max	Mean	Std	Min	Max	Mean	Std	Min	Max
N=50	All	6.5	1.0	3.0	7.0	15.4	3.3	9.0	22.4	673.1	178.5	357.1	1107.8	243.2	101.3	36.2	493.0	916.3	196.5	562.5	1322.3
n=1	Pre-contemplation	7.0	.	7.0	7.0	21.7	.	21.7	21.7	1107.9	.	1107.9	1107.9	192.6	.	192.6	192.6	1300.4	.	1.3	1.3
n=10	Contemplation	6.6	.52	6.0	7.0	16.9	3.8	11.3	21.9	740.9	167.2	550.4	960.8	273.3	158.7	36.1	493.0	1014.3	226.0	679.0	1303.7
n=15	Preparation	6.1	1.3	3.0	7.0	14.9	3.1	9.3	20.4	699.9	177.2	395.0	1025.1	195.1	56.4	106.2	336.2	895.0	188.1	562.5	1228.0
n=16	Action	6.6	1.0	3.0	7.0	14.1	2.3	10.9	19.8	597.7	150.1	357.1	1013.4	247.0	87.3	88.3	470.8	844.7	142.2	649.6	1192.1
n=8	Maintenance	6.7	.70	5.0	7.0	15.6	3.5	10.6	22.4	634.5	161.8	379.5	952.7	294.1	84.6	171.5	444.2	928.6	206.4	629.5	1322.2

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	Stages of Changes	Moderate Physical Activity				Vigorous Physical Activity				Moderate & Vigorous Physical Activity			
		Mean	Std	Min	Max	Mean	Std	Min	Max	Mean	Std	Min	Max
N=50	All	4.5	4.9	0	18.4	0.3	0.8	0	4.6	4.8	5.5	0	23.0
n=1	Pre-contemplation	1.2	.	1.2	1.2	0	.	0	0	1.2	.	1.2	1.2
n=10	Contemplation	3.5	3.6	0	10.4	.14	.36	0	1.1	3.6	3.8	0	10.4
n=15	Preparation	1.9	2.5	0	7.5	.08	.20	0	.71	2.0	2.6	0	8.2
n=16	Action	6.2	5.5	0	16.5	.49	.84	0	2.8	6.7	6.1	0	18.2
n=8	Maintenance	7.3	6.2	.60	18.4	.75	1.5	0	4.5	8.1	7.5	.60	23.0