

THE EFFECT OF MODERATE REGULAR PHYSICAL ACTIVITY ON MOOD  
REGULATION IN THE OLDER ADULT

A Thesis by

Cynthia M. Tosh

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The following faculty members have examined the final copy of this thesis for form and content, and recommend that it be accepted in partial fulfillment of the requirement for the degree of Master of Arts in Gerontology.

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Nicole L. Rogers, Committee Chair

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Michael Palmiotto, Committee Member

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Michael E. Rogers, Committee Member

DEDICATION

*I dedicate this Thesis to my brother-Fredrick Jacob Underwood 1985-2007*

*-The sun will never shine as bright as your smile-*

## AKNOWLEDGEMENTS

I owe a debt of gratitude to my advisor Dr. Nicole Rogers. Thank you for allowing me to be a part of your research team for the WELL REP Program. Thank you for your direction and advice. Your friendship and leadership has helped me grow as a student and individual over the past two in half years. Thank you, Dr. Michael Rogers for allowing me to write columns for Active Aging Today. Thank you to my family. Mom and Dad thank you for all your support, love, and encouragement. Without it I would not have been able to complete this study. Elizabeth, thank you for being my sister, you always fill me with inspiration. David you are the most wonderful thing in the world. You bring me peace and joy nothing else in this world could offer me. You amaze me every day. Your curious and inventive nature assures me you will grow up to be something great one day. Chance, you are always there for me through thick and thin. No one could ask for a greater husband. Thank you.

## ABSTRACT

The positive impact of physical activity is well-documented (Rejeski, Shannon, and Mihalko, 2001). Sedentary living takes the risk of morbidity and mortality from coronary heart disease and stroke and doubles it (Troisi, Heinold, Vokonas, & Weiss, 1991). In addition to the health benefits related to physical activity there are also positive psychological implications associated with regular physical activity. In fact, physical activity can help off-set the daily stressors of life. Mood can be enhanced and anxiety reduced through participation in aerobic exercise. Many studies have explored ways that exercise can promote psychological health by improving mood and reducing anxiety (Johannson, 2007). This purpose of this project was to determine the impact a regular physical activity program can have on older adult's mood regulation. Twenty-eight women ( $X = 71 \pm 5$  yrs) were recruited. Individuals voluntarily chose to participate in the Well-Rounded Exercise Program (WellREP) and agreed to complete the questionnaires related to their current mood state. Participants were screened using the EASY (Exercise And Screening for You) Screening tool in order to determine the appropriateness of their participation. The *Well-Rounded Exercise Program*, a 4-component routine to increase physical activity, was the intervention. The program includes four components: cardio-respiratory, flexibility, strength, and balance. Mood was evaluated using five concepts: quality of life, well-being, satisfaction with life, self esteem, and happiness. Of the 28 participants who started the study, 15 completed both pre and post testing, thus the program experienced a large amount of attrition which was attributed to the nature of the questionnaires. Result revealed significant improvement in physical activity and *one* measure of mood – happiness. The lack of improvement on the majority of the mood measures may be attributed to a ceiling effect in which participants were a relatively happy group leaving little room for improvement.

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# CHAPTER 1

## INTRODUCTION

The positive impact of physical activity is well-documented (Rejeski, Shannon, and Mihalko, 2001). Sedentary living takes the risk of morbidity and mortality from coronary heart disease and stroke and doubles it. This risk is comparable to the risk associated with hypertension, hyperlipidaemia and smoking (Troisi, Heinold, Vokonas, & Weiss, 1991). In addition to the health benefits related to physical activity there are also positive psychological implications associated with regular physical activity. In fact, physical activity can help off-set the daily stressors of life. Mood can be enhanced and anxiety reduced through participation in aerobic exercise. The general increase in prevalence rates of musculoskeletal disorders, anxiety, and depression is often attributed to the widespread low levels of overall health in society. It is possible to manage stress by improving health through regular physical activity. Many studies have explored ways that exercise can promote psychological health by improving mood and reducing anxiety (Johannson, 2007).

Physical activity provides one of the greatest opportunities for people to extend their years of active independent life and reduce functional limitations (Cress, Buchner, Prohaska, Rimmer, Brown, Macera, DePeitro, Chodzko-Zajko, 2006). The American College of Sports Medicine recommends aerobic activity of moderate intensity for 30 minutes, 5 or more days per week and resistance training 2 to 3 days per week. Unfortunately, few older adults meet this current physical activity recommendation (Prohaska, Belansky, Belza, Buchner, Marshall, McTigue, Satariano, and Wilcox, 2006).

## **1.1 Variables**

The independent variable for this study was the Well-Rounded Exercise Program (WellREP) intervention that the older adults participated in 2 days per week for 16-weeks. The dependent variables for this study were the psychological variables of quality of life, well-being, satisfaction with life, self esteem, and happiness and the Functional Fitness measures of: 30-sec arm curl, 30-sec chair stand, chair sit and reach, scratch test, 8-foot up & go, and 12-min walk;

## **1.2 Research Hypothesis**

This project was designed to determine the impact a regular physical activity program can have on older adult's mood regulation.

## **1.3 Assumptions**

It was assumed that participants would not participate in any additional physical activity outside the study. It was assumed the participants did not experience any outside mental distress such as a death in the family during the research study. It was assumed the participants would always wear their pedometers in order to track their overall physical activity.

## **1.4 Limitations**

The participants were recruited from a convenience sample. Their mood was generally positive. This may have led to a ceiling effect on questionnaires. This study was only 16-weeks long. A longer study may have resulted in more positive outcomes. This study had no control group and results of the study are limited.

## 1.5 Definitions

1. Mood: Mood is affected by many aspects of one's interaction with their environment. Five concepts that could easily be included under the rubric of mood include: quality of life, well-being, satisfaction with life, self esteem, and happiness. A Scale has been developed for each of these dimensions of mood in order to fully grasp its multifaceted nature.
2. The World Health Organization - Quality of Life Scale- BREF. The WHOQOL-BREF was developed from the WHOQOL-100. The WHOQOL BREF consists of two individual questions exploring overall self-rated quality of life and satisfaction with health, and 24 items, which measure the following broad domains: physical health, psychological health, social relationships, and environments. Domain scores range from 3 to 40 with higher scores denoting higher quality of life.
3. General Well-Being Scale (GWB): This scale measures positive and negative emotions one may feel within six dimensions (maximum scores are indicated parenthetically, higher scores indicate higher well-being): anxiety (25), depression (20), positive well-being (10), general health (15), self control (20), and vitality (15) over the past month. These reference standards categorize respondent states into severe distress (score of 0—60), moderate distress (score of 61—72), and positive well-being (score of 73—110).
4. Satisfaction with Life (SWLS): This scale measures global life satisfaction by assessing one's overall feelings toward life based on a comparison of life circumstances to one's standards. The scale includes 5 questions which are rated on a 5-point Likert scale ranging from strongly agree

to strongly disagree. A score of 20 represents the neutral point of the scale, equally satisfied and dissatisfied. A score between 21-25 represents slightly satisfied with life, 15-19 represents slightly dissatisfied with life, 26-30 represents satisfied and 5 to 9 are indicative of being extremely dissatisfied with life.

4. Rosenberg Self Esteem Scale (RSES): The Rosenberg self-esteem scale, developed by Morris Rosenberg, is a widely-used self-esteem measure in social science research. This scale measures one's feelings of worthiness and self-perceived productivity levels (Fox, Stathi, McKenna, & Davis, 2007). The scale is a ten-item "Likert scale" with items answered on a four-point scale ranging from "strongly agree" to "strongly disagree". The scale ranges from 0-30. Scores between 15 and 25 are within normal range; scores below 15 suggest low self-esteem.

5. Scale of Happiness - MUNSON Memorial University of Newfoundland: The Scale of Happiness is a questionnaire consisting of 24 questions used to measure happiness in terms of "yes", "no", or "don't know" questions. The 3-item Happiness Scale measures self-perception and self-accomplishment. The scale allows for an assessment of internal consistency while not overburdening respondents or threatening its unidimensional structure with numerous items.

6. Aerobic Activity: Aerobic activity is defined as any physical activity that increases heart rate for a period of time, such as 30 minutes or more.

7. Well-Rounded Exercise Program (Well-REP): A 4-component routine to increase physical activity. The program includes four components: cardio-respiratory, flexibility, strength, and

balance. Flexibility, strength and balance were addressed during class sessions, while cardiorespiratory was addressed on an individualized basis outside of class.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Benefits of Physical Activity**

Sedentary behavior is more prevalent for women (30.7% vs. 26.5% of men), older adults (38.2% of mean 75 years or older and 50.5% of women 75 years or older vs. 18.9% and 25.4% of men and women in the 18 to 29 year age group) (Marcus, Forsyth, Stone, Dubbert, McKenzie, Dunn, & Blair, 2000). Research seeking to document the benefits of exercise as a deterrent to illness has spawned from the decline of physical fitness in America coupled with the increase in lifestyle related illnesses (DiPietro, 2001). Improvement of cardio respiratory function, reduction in risk for coronary artery disease, and significantly lower risk of chronic disease are just three of the benefits of regular physical activity suggested by current research studies. Increasing interest in the positive physical benefits of exercise within the last 30 years has created a fitness movement and subsequently increased curiosity over the potential for psychological well-being as an added benefit of exercise. Improved mental health is a natural outcome of exercise (Levasseur, Desrosiers, & Tribble, 2008). Current research studies have indicated that exercise appears to be useful in the management of emotional regulation, anxiety, depression, anger, tension, reaction to stress, self-efficacy, and self-esteem.

#### **2.2 Physical Activity as a Preventative Strategy: Neurological Implications**

Dementia, a widespread age related health problem is characterized by the decline in cognitive functioning. The most common type of dementia is known as Alzheimer's disease. Dementia is often the result of Alzheimer's disease. Approximately 1.9-4 million persons are

currently living with Alzheimer in the United States. The established risk factors for Alzheimer's disease include: advancing age, family history of dementia, educational level, and presence of the apolipoprotein E genotype. Luckily, there is a growing amount of evidence that suggests physical activity as a means to maintain cognitive performance. This is because neuronal plasticity is preserved through physical activity. It also increases synapses and dendritic receptors following injury and releases hormonal factors that may assist in neuronal creation and function (brain-derived neurotrophic factor, epinephrine). Physical activity lowers cardiovascular risk, decreases blood pressure, and increases high density lipoprotein cholesterol levels and glucose tolerance. Each of these things is related to neuronal integrity and cognitive function. It is also suggested that a more enriched social environment is promoted from engaging in physical activity, which may decrease dementia risk. In addition to these findings, enhanced neurocognitive function has been reported in several randomized trials following exercise training. Observational studies have shown an inverse association between physical activity and cognitive decline among older adults. Physical activity serves as a surrogate for overall "life engagement." It has been supported through various studies that a person with more developed social networks has lower risk of all-cause mortality than a person who is socially isolated and social support attenuates the rate of cognitive decline in older adults (Podewils, Guallar, Kuller, Fried, Lopez, Carlson, Lyketsos, 2005).

### **2.3 Physical Activity and Quality of Life**

Quality of life includes psychological health, satisfaction with social relationships, satisfaction with material or environmental aspects of life (Levasseur, Desrosiers, & Tribble, 2008). Physical activity has a direct impact on one's quality of life (Levasseur, Desrosiers, &

Tribble, 2008). Kanning and Schlicht (2010) explored this theory using an ambulatory assessment of mood and physical activity. The subscales used to measure mood were valence, energetic arousal, and calmness. Thirteen participants completed a standardized physical activity diary throughout a 10-week period. Following a bout of physical activity, the participants rated their mood. All three dimensions of mood: valence, energetic arousal, and calmness were shown through to be positively impacted by physical activity (Kanning & Schlicht, 2010).

Levasseur, Desrosiers, and St-Cyr Tribble (2008) also test this theory using a cross-sectional design. One hundred and fifty six older adults aged 74-79 were recruited using a three leveled activity limitation design (none, slight to moderate and moderate to severe). The Quality of Life Index was used to measure quality of life. Assessment of Life Habits and environment was used to measure the quality of environment. Based on the outcomes of this study, the authors concluded that the higher one's physical activity level, the greater one's quality of life (Levasseur, Desrosiers, and St Cyr Tribble, 2008). Activity level relates to an older adult's QOL. The study demonstrated the higher one's activity level the higher level of QOL was experienced. Factors affecting such activity level include perceived obstacles and environmental.

#### **2.4 Physical Activity and Well-Being**

Physical activity has a direct impact on one's well-being (Strawbridge, Deleger, Roberts, & Kaplan, 2008). Well-being is defined as "a good or satisfactory condition of existence; a state characterized by health, happiness, and prosperity" (Dictionary.com). Well-being can encompass the concepts of anxiety, depression, general health, positive well-being, self control, and vitality. In the past decade, the "feeling good, "warm glow", or "exercise high" phenomenon has been widely reported. The contribution of exercise to mental health was first

published in 1987 within the US National Institute of Mental Health consensus workshop statements. Since then, there have been scores of published research articles and meta-analytical reviews along with several books dedicated to the topic.

Preventing disease and premature death can indirectly improve one's subjective well-being and life quality. Through improved mood and self-perceptions, exercise can be effective in improving an older adult's mental well-being. There is even good evidence suggesting exercise is effective as a treatment for clinical depression and anxiety. Fox (2007) suggest there are four areas in which physical activity can contribute to improving mental health problems: 1) treatment of mental health and disorders; 2) prevention mental health and disorders; 3) improvement of mental and physical well-being of those with mental illness, and 4) improvement of mental well-being for the general population.

Recent research suggests that aerobic and resistance exercises are effective in treating depression (Strawbridge, Deleger, Roberts, & Kaplan, 2002). This effectiveness is reported to be of the same magnitude as psychotherapeutic interventions. After engaging in several weeks of an exercise program on both state and trait anxiety (predisposition to react nervously) were investigated (Strawbridge, Deleger, Roberts, & Kaplan, 2002). Similarly, Davis found that the effect of single exercise sessions and exercise programs have been tested on the psychosocial and psycho-physiological receptivity to a subsequent psychological stressor such as a complex mental task or public speaking. Fox suggests moderate association between physical activity and indices of subjective well-being are confirmed through large scale surveys in several countries using different methods and criteria. The experimental studies supported a positive effect on mood for moderate intensity exercise (Davis, Fox, McKenna, & Stathi 2007).

## **2.5 Physical Activity and Self-Esteem.**

When examining well-being, it is also important to consider self-esteem. “Self-esteem is important for a successful and satisfying life and is a central aspect of psychological well-being” (Rosenberg, 1965). Due to its close association with emotional stability and adjustment, low self-esteem is a characteristic underlying many forms of mental illness. Interestingly low self-esteem is also associated with poor health behaviors, e.g. lack of physical activity. Some psychologist’s suggest self-esteem is the core of mental health as it represents our self-rating of overall worth. Research evidence suggests participation in physical activity can positively change a person’s perception of their physical self and identity (Silverstein, Barrett-Connor and Corbeau 2001).

Numerous researchers have examined physical activity influences on self-esteem, and self-esteem is considered to be an important component of positive self-evaluations. In the Exercise and Self-Esteem Model (EXSEM), changes in physical activity and related physical parameters (e.g., fitness, weight) that are brought about by exercise interventions are suggested to have indirect effects on changes in global self-esteem. In the EXSEM model, changes in self-efficacy associated with changes in activity are proposed to influence subdomain measures of physical esteem, particularly perceptions of physical conditioning, attractive body, and strength. In turn, these more specific perceptions are theorized to be associated with physical self-worth, which is the immediate precursor of global esteem. McAuley and colleagues (2000) (McAuley, Blissmer, Katula, Duncan, & Mihalko, 2000) reported support for most of the hypothesized relationships among the model over a 6-month exercise intervention in a sample of older adults. One of the most interesting findings was the idea that physical activity and self-efficacy directly affected esteem, rather than physical activity indirectly influencing esteem through its effect on efficacy.

Li, Harmer, Chaumeton, Duncan, and Duncan (2002) also provided support for the relationships between subdomain, domain, and global esteem in the context of a 6-month randomized controlled trial of Tai Chi effects on older adults. Although Li and colleagues reported the relationships among these variables to hold up in the manner hypothesized by the EXSEM, it is unclear whether enhanced levels of self-esteem resulted directly from improvements in physical parameters or indirectly through enhanced perceptions of individuals' capabilities or self-efficacy.

## **2.6 Physical Activity and Satisfaction with Life**

Satisfaction with life is a measure of well-being. It represents how satisfied people feel with their life in general, as contrasted with positive affect (sometimes referred to as 'happiness'), which represents an individual's feelings at a single point in time. Life satisfaction involves people thinking about their life as a whole, including factors such as whether they are achieving their goals, are doing as well as other people around them, and are happy in general rather than at a specific point in time.

## **2.7 Physical Activity and Happiness and Depression**

Happiness is a state of mind or feeling characterized by contentment, love, satisfaction, pleasure, or joy (Cambridge Advanced Learner's Dictionary (accessed 2010-Dec-10)). In contrast to happiness is depression. Depression is a common mental disorder that is characterized by depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration. These problems can become chronic or recurrent and lead to substantial impairments in an individual's ability to take care of his or her everyday

responsibilities. At its worst, depression can lead to suicide. Depression is a major public health problem. Three large, community-based studies reported physical activity to have a protective effect on the prevalence of depression (Strawbidge, Deleger, Roberts, and Kaplan, 2002).

Depression was measured among the 1,947 community-dwelling participants, using criteria from the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. An eight-point scale was used to measure physical activity; odds ratios were based upon a one-point increase on the scale. Even with adjustments for age, ethnicity, financial strain, sex, chronic conditions, disability, body mass index, alcohol consumption, social relations, and smoking, greater physical activity was protective for both prevalent depression and incident depression over 5 years. These findings supported the protective effect of physical activity on depression for older adults (Strawbidge, Deleger, Roberts, and Kaplan, 2002).

Dilorenzo Bargman, Studcky-Ropp, Brassington, Frensch, and LaFontaine had 82 adult participants complete the Beck Depression Inventory, Profile of Mood States, State-Trait Anxiety Inventory, and the Tennessee Self-Concept Scale after completing a 12-week aerobic fitness program (and through 12 months of follow-up). There was a positive fitness change and psychological improvement within the exercise participants over the initial 12-week program compared to a control group. In addition, physiological and psychological benefit remained significantly improved from baseline at a 1 year follow-up. Maintenance of the psychological improvements occurred concurrent with equal or lesser amounts of exercise. The authors concluded that exercise-induced increases in aerobic fitness have beneficial short-term and long-term effects on psychological outcomes (Dilorenzo, Bargman, Stucky-Ropp, Brassington, Frensch, & LaFontaine, 1999).

Silverstein, Barrett-Connor, and Corbeau examined cross-sectional and prospective associations of exercise with depressed mood in a community-based sample of older men and women (aged 50-89 years) in southern California. In addition to physiological mechanisms, several psychological effects of exercise have been alleged such as increased feelings of self-efficacy, self-perceptions of control and master, reduced psychological responses to stress, and beneficial effects o neurotransmitters such as increased serotonin and endorphins (Silverstein, Barrett-Connor and Corbeau 2001).

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 Participants**

Twenty-eight women ( $X = 71 \pm 5$  yrs) were recruited from local community centers, senior centers, retirement communities, other senior-based programs and media publications. Individuals voluntarily chose to participate in the Well-Rounded Exercise Program (WellREP) and agreed to complete the questionnaires related to their current mood state.

The study protocol was approved by the Wichita State University Institutional Review Board. Prior to the study, all participants signed an informed consent document (Appendix A). In the event where the EASY screening suggested a physician referral participants received written permission from their personal physician (Appendix B).

#### **3.2 Screening**

Potential participants were screened using the EASY (Exercise And Screening for You) Screening (Resnick, et al., 2006) tool (Appendix C) in order to determine the appropriateness of their participation. An expert panel of interdisciplinary researchers and clinicians developed this tool from experience establishing physical activity programs for older adults. While considering known risk factors, the tool provides recommendations for safe and appropriate activities. The older adult should consult their healthcare provider if the screening indicates to do so. Than physician consent is required for program participation.

### **3.3 Physical Activity Intervention Protocol**

The multi-component physical activity class was conducted twice a week for 16 weeks at Senior Services, Inc. Downtown Senior Center. The *Well-Rounded Exercise Program (WellREP)*, a 4-component routine to increase physical activity, was the intervention. The program includes four components: cardio-respiratory, flexibility, strength, and balance. Flexibility, strength and balance were addressed during class sessions, while cardiorespiratory was addressed on an individualized basis outside of class. Instructors progressed through the program at a pace deemed appropriate for participants. Participants progressed through the program as instructors added new fitness components and additional exercises during each class session until participants were performing all 3 components during each class session. Participants begin with flexibility and strength and progressed to balance activities. Balance activities were started at approximately the 2 week mark. Participants began balance exercises on the floor and progressed to the Thera-band stability trainers. As an added safety measure, chairs were positioned near participants to provide stability, if needed, during balance exercises.

### **3.4 Mental Assessments**

Five questionnaires were completed prior to implementation of the intervention and after 16 weeks. Assessments were conducted at the Senior Services, Inc of Wichita's Downtown Senior Center. Time required to administer questionnaires was approximately 30 minutes. Participants were verbally encouraged to do their best, but not to push to the point of over exertion or beyond what they feel is safe for them complete all answers, but were told if they were uncomfortable with any questionnaire or question they were not required to complete them.

### The World Health Organization - Quality of Life Scale- BREF

The WHOQOL-BREF was developed from the WHOQOL-100. The WHOQOL BREF consists of two individual questions exploring overall self-rated quality of life and satisfaction with health, and 24 items, which measure the following broad domains: physical health, psychological health, social relationships, and environments. Domain scores range from 4 to 20 with higher scores denoting higher quality of life.

### General Well-Being Scale (GWB)

This scale measures positive and negative emotions one may feel within six dimensions (maximum scores are indicated parenthetically, higher scores indicate higher well-being): anxiety (25), depression (20), positive well-being (10), general health (15), self control (20), and vitality (15) over the past month. These reference standards categorize respondent states into severe distress (score of 0—60), moderate distress (score of 61—72), and positive well-being (score of 73—110).

### Satisfaction with Life (SWLS)

This scale measures global life satisfaction by assessing one's overall feelings toward life based on a comparison of life circumstances to one's standards. The scale includes 5 questions which are rated on a 5-point Likert scale ranging from strongly agree to strongly disagree. A score of 20 represents the neutral point of the scale, equally satisfied and dissatisfied. A score between 21-25 represents slightly satisfied with life, 15-19 represents slightly dissatisfied with life, 26-30 represents satisfied and 5 to 9 are indicative of being extremely dissatisfied with life.

### Rosenberg Self Esteem Scale (RSES)

The Rosenberg self-esteem scale, developed by Morris Rosenberg, is a widely-used self-esteem measure in social science research. This scale measures one's feelings of worthiness and self-perceived productivity levels (Fox, Stathi, McKenna, & Davis, 2007). The scale is a ten-item "Likert scale" with items answered on a four-point scale ranging from "strongly agree" to "strongly disagree". The scale ranges from 0-30. Scores between 15 and 25 are within normal range; scores below 15 suggest low self-esteem.

### 5. Scale of Happiness - MUNSON Memorial University of Newfoundland

The Scale of Happiness is a questionnaire consisting of 24 questions used to measure happiness in terms of "yes", "no", or "don't know" questions. The 3-item Happiness Scale measures self-perception and self-accomplishment. The scale allows for an assessment of internal consistency while not overburdening respondents or threatening its unidimensional structure with numerous items.

## **3.5 Physical Assessments**

Physical characteristic measures, functional fitness, balance and a 1 week daily physical activity assessment was completed prior to implementation of the intervention and after approximately 12 weeks. Assessments were conducted at the Senior Services, Inc of Wichita's Downtown Senior Center. Time required to administer assessments was approximately 90 minutes. Participants were verbally encouraged to do their best, but not to push to the point of over exertion or beyond what they feel is safe for them. In addition, pedometer step counts were measured for 1 week prior to program implementation. A basic questionnaire was administered.

Details of the assessments and questionnaires are as follows:

### Demographics

A demographics questionnaire was administered to each participant to assess variables such as current age, race/ethnicity, marital status, years of education, and household/family income, self-reports of alcohol consumption, smoking status, personal history of disease, and medication use.

## **3.6 Functional Fitness Assessments**

### 30-Second Chair Stand

Lower body strength is measured through this assessment. The test began with the participant seated in the middle of the chair with back straight. Feet were approximately shoulder width apart and flat on the floor. Arms were held against the chest while crossed. At the signal "go" the participant rose to a full stand (body erect and straight). They then returned back to the initial seated position. Within a 30-second time limit, the participant was encouraged to complete as many full stands as possible. Two or three practice repetitions were given to participants. Total number of stands executed correctly within 30 seconds equaled the score. It counted as a full stand if the participant was more than halfway up upon completion of the 30 seconds.

### 30-Second Arm Curl

Upper body strength measured in this assessment. With the dominant side of the body close to the edge, the participant was seated on a chair, back straight and feet flat on the floor. The weight was held with the dominant hand at the side. With the arm in the down position

beside the chair, perpendicular to the floor, the test began. The participant curled the arm through a full range of motion at the signal "go" and then curled the arm through a full range of motion, returning to the fully extended position in a controlled manner. As many times and as quickly as possible the participant repeated this movement as in 30-seconds. The total number of curls made correctly within 30 seconds equaled the score. It counted as a completed curl if the participant's arm was more than halfway up at the end of 30 seconds. A 5-lb dumbbell was used for females and an 8-lb dumbbell was used for males.

### Chair Sit and Reach Test

Lower body (primarily hamstring) flexibility was assessed in this exercise. The participant sat on the front edge position of a chair. With heel on the floor and foot flexed. Keeping one leg bent and foot on the floor, the other leg (the preferred leg\*) was extended straight in front of the hip. The participant slowly bent forward at the hip joint sliding the hands (one on top of the other with the tips of the middle fingers even) down the extended leg in an attempt to touch the toes with the extended leg as straight as possible. Two seconds were how long the reach was held for. A ruler was used to measure the number of inches (nearest ½ inch) a person is short of reaching the toes (minus score) or reaches beyond the toes (plus score). Two practice trials were given to the participant. The best measure of two trials equaled the score. \* The one that results in the better score is the defined as the preferred leg.

### 8' Up and Go

Physical mobility involving speed, agility, and dynamic balance were measured in this assessment. Hands on thighs, and feet flat on the floor with the participant fully seated in the

chair is how the exercise began. In order to aid the participant in getting up from the chair they were allowed to push off the sides or arms of the chair. Each participant was instructed to stand up from the chair as quickly as possible on the signal “go”, walk around a cone placed 8 feet in front of the chair, and return to a seated position in the chair. The participant was told the object was to walk around the cone as fast as possible (without running) to return to a seated position, and that they were being timed. Until the participant returned to a seated position on the chair a timed score was recorded from moment the signal “go” was given. In order to practice the participant was allowed to walk through the test. The best of the two most consistent times measured were recorded as the score.

### Scratch Test

The upper body (shoulder) flexibility was assessed in this exercise. The participant placed the preferred hand\* over the same shoulder and reached as far as possible down the middle of the back, palm down and fingers extended, in a standing position. Reaching up as far as possible in an attempt to touch (or overlap) the extended middle fingers of both hands the hand of other arm was placed behind back, palm up. A measurement of the nearest ½ inch measured the distance of overlap, or distance between the tips of the middle fingers. Plus scores (+) represent the degree of overlap of middle fingers and minus scores (-) were given to represent the distance short of touching middle fingers. Performance was evaluated with the "best" score.

\* The one that results in the better score is defined as the preferred hand.

### 12-Minute Walk

Aerobic endurance was assessed in this exercise. The test involved measuring the maximum distance that can be walked in 12 minutes along a 50-meter course, marked into 5-meter segments. In order to cover as much distance as possible participants continuously walked around a measured lap throughout the 12-minute period. The participants were instructed to walk as fast as possible (not run) the marked distance around the cones as many times as they can within the time limit on the signal "go". The participants could stop and rest, sit on chairs provided, then resume walking if they felt necessary. The total number of yards walked in 12 minutes to the nearest 5 meter indicator equaled the score.

### **3.7 Data Analysis**

Absolute values were used for statistical analysis. However, when discussing differences between groups, relative change is used to normalize differences as each functional fitness and balance measure utilizes a unique scale and results would be difficult to interpret. Data analysis was completed using the statistical software program SPSS for Windows V.16.0 (SPSS Inc., Chicago, IL). To reduce the potential influence of outliers on the statistical analysis, box-and-whiskers plots were used to identify outliers, which were subsequently eliminated prior to analysis. Each variable was examined for normality using the Kolomogorov-Smirnov test. Assumptions of homogeneity of variance and sphericity were evaluated. Baseline group mean comparisons were performed using two-tailed independent t-tests. Change in both the physical and psychological variables were evaluated by paired samples t-test. A probability value of less than 0.05 was considered statistically significant and a Bonferroni adjustment was used to correct for multiple comparisons.

## CHAPTER 4

### RESULTS

#### 4.1 Normality and Assumptions

Kolomogorov-Smirnov tests were used to test for normality. Non-significance indicated all variables, excluding STEPS, were normally distributed. STEPS non-normality was corrected using a Log10 transformation. A second Kolomogorov-Smirnov test on the transformed daily step variable indicated a successful transformation, with STEPS being normally distributed. Histograms and normal Q-Q plots revealed normal distributions. Assumptions of homogeneity of variance and sphericity were evaluated and not violated.

#### 4.2 Adherence to Intervention

Of the 28 participants who started the study, 15 completed both Pre and Post testing, thus the program experienced a large amount of attrition. The average adherence of the WellREP group participants was 92%. A number of participants did not want to complete the mood questionnaires.

#### 4.3 Change in Functional Fitness

Table 4.1 presents the relative change of functional fitness measures after 16 weeks of intervention. All functional measures, excluding flexibility, in the WellREP group exhibited an 8% to 45% significant increases. Paired samples t-tests analysis of the functional measures revealed a significant change for all measures, excluding the upper and lower body flexibility measures. Differences were noted for arm curl ( $t = 4.06, p \leq 0.001$ ), chair stand ( $t = 5.84, p \leq$

0.001), up and go ( $t = -4.80, p \leq 0.001$ ), 12-min walk ( $t = -3.77, p \leq 0.001$ ). Upper body strength, as measured by arm curls, increased 26%. Lower body strength, as measured by chair stand, increased 45%. Time to complete the Up and Go decreased 10%. A 11% improvement in cardio-respiratory fitness, as measured by the 12-min walk, was demonstrated. Daily physical activity also significantly increased over the 16 week period ( $t = 5.96, p \leq 0.001$ ) with participants walking 56% more from pre to post assessment.

TABLE 4.1  
FUNCTIONAL FITNESS MEASURES

	Pre	Post	% Change
30s Arm Curl (reps)	16.33 ± 2.50	20.53 ± 3.96	26% *
30s Chair Stand (reps)	11.00 ± 3.18	16.00 ± 4.04	45% *
Back Scratch (cm)	-7.29 ± 10.66	-5.05 ± 9.77	8%
Sit and Reach (cm)	-0.53 ± 6.77	1.65 ± 8.16	14%
8 ft up-and-go (sec)	6.81 ± 1.41	6.15 ± 1.20	-10% *
12-min Walk (m)	807.67 ± 137.76	896.33 ± 104.23	11% *

Values are Mean ± SD

TABLE 4.2  
DAILY PHYSICAL ACTIVITY

	N	Steps		% Change
		Pre	Post	
Daily Steps	15	3032 ± 890	4733 ± 1741	56% *

Values are Mean ± SD

#### 4.4 Change in Mood Measures

Tables 4.3 – 4.7 present the relative change of the mood measures after 16 weeks of a physical activity intervention. There was a significant improvement on the Scale of Happiness domains, however, no significant change was observed in the other mood measures. Paired samples t-tests analysis of the Scale of Happiness revealed a significant change for all domains (Table 4.5). Differences were noted for positive affect ( $t = 2.09, p \leq 0.05$ ), negative affect ( $t = 2.90, p \leq 0.05$ ), general positive life experience and ( $t = 2.78, p \leq 0.05$ ), negative life experience ( $t = 2.91, p \leq 0.05$ ). Positive affect improved 32%, negative affect improved 42%, general positive life experience improved 36% and negative positive life experience improved 39%.

TABLE 4.3

#### SATISFACTION WITH LIFE

	Pre	Post	% Change
Satisfaction with Life	26.07 ± 4.07	26.75 ± 5.86	3 %

Values are Mean ± SD

TABLE 4.4

#### QUALITY OF LIFE

	Pre	Post	% Change
Quality of Life - General	4.21 ± 0.43	4.29 ± 0.61	2 %
Health	3.93 ± 0.83	3.64 ± 0.84	7 %
Physical Health	47.76 ± 9.20	47.96 ± 7.36	0 %
Psychological Health	49.17 ± 7.67	53.10 ± 9.29	8 %
Social Relationships	50.67 ± 11.84	58.52 ± 17.57	16 %
Environment	62.50 ± 11.77	68.21 ± 10.94	9 %

Values are Mean ± SD

TABLE 4.5  
SCALE OF HAPPINESS

	Pre	Post	% Change
Positive Affect	7.36 ± 2.21	5.00 ± 4.15	32 % *
Negative Affect	5.29 ± 0.99	3.07 ± 2.46	42 % *
Positive Life Experience	11.36 ± 2.34	7.29 ± 5.93	36 % *
Negative Life Experience	7.21 ± 1.31	4.43 ± 3.55	39 % *

Values are Mean ± SD

TABLE 4.6  
SELF-ESTEEM

	Pre	Post	% Change
Self-Esteem	16.21 ± 1.31	16.92 ± 1.44	4 %

Values are Mean ± SD

TABLE 4.7  
GENERAL WELL-BEING

	Pre	Post	% Change
Total	65.64 ± 12.38	70.14 ± 14.17	7 %
Anxiety	18.00 ± 3.51	19.86 ± 3.80	10 %
Depression	15.57 ± 2.34	16.36 ± 2.47	5 %
Positive Well-Being	6.50 ± 1.51	6.69 ± 2.14	3 %
Self-Control	12.07 ± 2.43	12.93 ± 2.53	7 %
Vitality	14.57 ± 2.28	14.79 ± 2.36	1 %
General Health	9.79 ± 3.77	10.43 ± 3.74	7 %

Values are Mean ± SD

## **CHAPTER 5**

### **DISCUSSION**

This study was designed to determine the impact of a regular physical activity program on mood regulation. Mood was measured through five different questionnaires representing five different concepts of mood: quality of life, well-being, satisfaction with life, self esteem, and happiness. Physical activity was measured through exercises such as: 30-second chair stand, 30 second arm curl, chair sit and reach test, 8' up and go, scratch test, and 12-minute walk.

#### **5.1 Functional Fitness**

Participants took part in a 16 week moderate regular physical activity program that focused on strength, balance, flexibility and promoting cardiovascular activity outside of class. There was significant improvement in daily physical activity as is evident in the increase in steps from pre to post assessment. There was also significant improvement for the 30-second chair stand (25%), 30 second arm curl (45%), 12-minute walk (11%, and up and go (-10%). There was no significant improvement in the flexibility measures - chair sit and reach test (14%), 8' up and go (-10%).

#### **5.2 Mood Measures**

The lack of improvement on the majority of the assessments may be attributed to a ceiling effect in which participants were a relatively happy group leaving little room for improvement. The Satisfaction with Life measure did not detect change over the 16-week program and exhibited a 3% change pre to post. Scores between 26 and 30 on the Satisfaction

with Life measure indicated overall life satisfaction. Thus, with a pre-test score of 26 the intervention group entered the study satisfied with their life.

The Quality of Life measure also did not result in significant change with little change observed (quality of life-general (2%), health (7%), physical health (0%), psychological health (8%), social relationships (16%), and environment (9%)). Upon entering the study, participants were relatively healthy and exhibited positivity within their interactions with each other and researchers. These scores may reflect little room for improvement in the older adult's quality of life. One measure of interest, however, is social relationship measure which exhibited a 16% change from pre to post and was also a much larger change compared to the other variables. Perhaps there is a trend for improvement in this measure which may have been brought about by the social interaction participants received during the WellREP intervention.

Lack of change was also noted in the measure of Self-Esteem and General Well-Being. Again, the lack of findings may be due to participants generally high self-worth which may also have served as a basis for participating in the study. The General Well-Being measure exhibited little change over the course of the 16-week program (anxiety (10%), depression (5%), positive well-being (3%), self-control (7%), vitality (1%), and general health (7%)). General well-being is highly relative to the other four concepts of mood, and since little change was observed in those measures it is no surprise that little change was observed in this measure.

One exception of this was observed with the results of the Happiness Scale. Participants did exhibit significant change on this scale. One may presume that either the intervention program induced the change or the mere sense of belonging to the exercise group produced significantly greater levels of happiness. Participants were relatively happy prior to the study, but became happier throughout participating in the physical activity program. Significant change was

detected within positive effect (32%), negative effect (42%), positive life experience (36%), and negative life experience (39%).

More research has to be conducted in order to further define the relationship between physical activity and mood regulation. The participants were already happy and well rounded individuals which could have had an effect on the scores. Perhaps, this same study could be more relevant as well as show more significant scores if participants all had underlined mental problems such as depression prior.

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## **APPENDICIES**

## APPENDIX A

### INFORMED CONSENT DOCUMENT

#### **A Community-Based Multi-Component Physical Activity Program for Older Adults**

You are invited to participate in a study to improve your functional fitness. We hope to determine how a multi-component physical activity program affects functional ability, balance, strength, flexibility and aerobic (heart and lung) fitness in older individuals. We are also interested in determining if participating in a physical activity program will improve mood in older adults. If you decide to participate you will meet for 16 weeks at the Downtown senior center twice per week for 50 minutes for instructor-led exercise. We want to do this because it will help improve your fitness and your ability to complete everyday tasks. Knowledge gained from this project will also assist exercise and medical professionals in prescribing activity and in helping older individuals maintain their independence. We would like you to take part in this study. You were selected as a possible participant in this study because your age is within the range in which we are interested. We will recruit approximately 60 people to participate in this program.

If you decide to participate, you will be asked to perform a series of assessments and then to repeat the same assessments after approximately 8 and/or 16 weeks. These assessments are designed to measure your ability to maintain your balance and to measure your functional ability. The assessments will be done at the Downtown senior center. You will also be asked to complete a number of questionnaires to measure your fear of falling, functional limitations, and mood. The questionnaires regarding mood will ask you about your general mental health, how you feel about your life, loneliness, attitudes about yourself, and symptoms of depression.

During the assessments we will ask you to stand on a balance platform and on a piece of foam while your balance is assessed. You will also perform a timed test where you will be asked to stand from a chair, walk 8 feet, and return to the chair. Your lower body flexibility will be assessed while sitting in a chair and reaching toward your toes and strength will be assessed while rising from a chair and sitting down for 30 seconds. Your walking ability will be assessed by having you walk around a 50-yard perimeter for twelve minutes. Your upper body strength will be assessed while lifting a dumbbell (5 pounds for women, 8 pounds for men) for 30 seconds and flexibility by placing your arms behind your back. To measure your typical daily activity, you will be given a “locked” pedometer. We will explain when and where to wear the pedometer. One week after the assessments, we will meet with you at the senior center to “unlock” your pedometer and record step counts for that week.

You will also participate in a physical activity class to improve your fitness. The instructor-led physical activity class will be conducted twice a week at your local senior center. This class will be taught by an experienced instructor. The program will consist of the following activities: (a) strength training, using 6 inch wide elastic resistance bands; (b) balance training while standing on the floor, foam mats, and other training devices; and (c) flexibility activities. You will also be asked to increase your (d) cardiovascular/aerobic activity outside of class.

### **Potential Risk/Discomfort**

Physical movement rarely causes problems in healthy adults. However, if they suffer from hidden heart disease, an exercise test could cause chest pain, dizziness, or bouts of irregular heart rhythms. Also, there is always a slight risk of a heart attack occurring during the exercise tests in persons with preexisting heart disease. You will be asked about any type of disease that you may have.

Muscle soreness could also occur following any of these physical activities. For this reason, you will perform stretching exercises and a warm-up exercise before each test and each exercise training session to prevent this from occurring. You will receive proper instruction for all activities. The supervisors of the program have extensive experience leading activities like the ones you will perform.

You may feel uncomfortable answering some of the questionnaires because they contain questions regarding attitudes, mood, and mental health. You can skip any of the questions in any of the questionnaires if you are uncomfortable answering them or do not want to provide a response.

### **Potential Benefits**

Many studies have found that poor functional fitness is a major limitation in gaining and maintaining physical independence. This program is being implemented to see if it will improve your functional ability, balance, strength, flexibility and heart and lung fitness and if this improvement will lead to a more independent lifestyle. To determine if this program is performing its purpose, we are asking you to participate in the functional fitness and balance assessments. By participating in this program you will gain valuable insights into your functional fitness and balance.

If you take part, your results will be combined with other participants so it will not be possible to identify your responses in a published report; your name will not be directly associated with any of the results.

You have been informed and you understand that Wichita State University does not provide medical treatment or other forms of reimbursement to persons injured as a result of or in connection with participation in research activities conducted by Wichita State University or its faculty. If you believe that you have been injured as a result of participating in the research covered by this consent form, you should contact the Office of Research Administration, Wichita State University at 316-978-3285.

If you have any questions concerning this study, you may contact Dr. Rogers at work (316-978-6684) or at home (316-686-7749). You may also contact the Office of Research Administration at 316-978-3285.

**YOU ARE MAKING A DECISION WHETHER OR NOT YOU WILL PARTICIPATE IN THIS STUDY. YOU SHOULD NOT SIGN UNTIL YOU UNDERSTAND ALL THE INFORMATION PRESENTED IN THE PREVIOUS PAGES AND UNTIL ALL YOUR QUESTIONS ABOUT THE RESEARCH HAVE BEEN ANSWERED TO YOUR SATISFACTION. YOUR SIGNATURE INDICATES THAT YOU HAVE DECIDED TO PARTICIPATE IN THIS STUDY.**

**You will be offered a copy of this letter to keep.**

I agree to take part in this project. I know what I will have to do and that I can stop at any time.

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name Printed

\_\_\_\_\_  
Nicole L. Rogers, PhD  
Principal Investigator

\_\_\_\_\_  
Date

APPENDIX B

MEDICAL CLEARANCE FORM

A Community-Based Multi-Component Physical Activity Program for Older Adults

**MEDICAL CLEARANCE OF PERSONAL PHYSICIAN**

Your patient, \_\_\_\_\_, has expressed an interest in participating in a Community-Based Physical Activity Program, offered through the School of Community Affairs Gerontology Program at Wichita State University and Senior Services, Inc. Downtown Senior Center. This multi-component physical activity program, under the direction of Nicole Rogers, PhD, has been offered in community settings for the past 6 years.

We would appreciate your medical opinion and recommendations concerning this individual’s participation in exercise. If you feel that this individual might benefit from participation in the program, we would greatly appreciate your endorsement of his/her participation.

**Assessments:** The program participants are asked to complete a series of functional fitness assessments. This are completed to identify weaknesses in physical parameters associated with activities of daily living and to more effectively prescribe appropriate exercise.

<b>Physical Parameters</b>	<b>Assessments</b>	<b>Approval</b>	
Cardiovascular	12 minute walk	yes ___	no ___
Muscular Strength / Endurance	30 second chair stand	yes ___	no ___
	30 second arm curl	yes ___	no ___
Flexibility	Chair sit-and-reach	yes ___	no ___
	Back scratch	yes ___	no ___
Balance & Gait	8 foot up-and-go	yes ___	no ___
	Computerized Postural Sway	yes ___	no ___
	Computerized Limits of Stability	yes ___	no ___

**Exercise Program:** The level of intensity of the this program is based on the individual capabilities of each participant. The program will incorporate the *First Step to Active Health*™ programing which provides a simple 4-step routine to increase physical activity. The well-rounded fitness program includes four components: cardio-respiratory, flexibility, strength, and balance. Flexibility, strength and balance will be addressed during class sessions, while cardio-respiratory will be addressed on an individualized basis outside of class. The multi-component physical activity class will be conducted twice a week for 24 weeks at Senior Services, Inc. Downtown Senior Center. Instructors will progress through the program at a pace deemed appropriate for participants. Program progression will involve the addition of new fitness components and additional exercises during each class session until participants are performing all 3 components during each class session. To enhance cardiovascular fitness, participants will be asked to incorporate more physical activity into their daily lives. A 1-week baseline will be established. Based on these values, program instructors will calculate physical activity goals by increasing baseline values 10% with a subsequent 10% increase every 2 weeks until an overall physical activity goal of at least 10,000 steps is achieved. Physical activity will be monitored by pedometers. Participants will record their daily step counts and other non-translatory activities (biking, swimming, etc.) in an activity log once per week before or after the physical activity class.

APPENDIX B (continued)

**Physical Activity Class Approval:** yes \_\_\_\_ no \_\_\_\_

**Please list any modifications/comments for testing and exercise class:**

---

Please indicate by your signature below that your patient is medically cleared to participate in the specific portions of testing and training as described. Please call Dr. Rogers if you have any question concerning the program at (316) 978-6684.

\_\_\_\_\_  
Signature of Physician

\_\_\_\_\_  
Print Name of Physician

\_\_\_\_\_  
Date

Physician phone #: ( \_\_\_\_ ) \_\_\_\_ - \_\_\_\_

Please return this form by FAX or Postal Mail to:

Nicole L. Rogers, PhD

**Fax: 316.978.3626**

Assistant Professor, Gerontology  
School of Community Affairs  
Wichita State University  
1845 Fairmount - Campus Box 135  
Wichita, Kansas 67260

Phone: 316.978.6684

Email: [nicole.rogers@wichita.edu](mailto:nicole.rogers@wichita.edu)

## APPENDIX C

### Exercise And Screening for You

[www.easyforyou.info](http://www.easyforyou.info)



Nearly all older adults can safely meet the national recommendations of engaging in moderate intensity physical activity (such as brisk walking or gardening) for at least 30 minutes a day, most days of the week. The EASY tool helps you know when to see a health care provider to discuss your exercise plan and how to choose activities for optimal benefit if you have any health problems.

#### **Getting Started**

**It is always a good idea to start at a level that is easy for you and to build up slowly. See the attached safety tips.**

**While it is generally not necessary to see a health care provider before beginning every-day physical activities that are of light or moderate intensity, we encourage you to talk with your health care provider about your health and exercise as part of your regular visits.**

**The EASY tool at [www.easyforyou.info](http://www.easyforyou.info) helps identify ways you can be active safely.**

**For more information on using the EASY tool please contact:  
Phone: 979-458-3507  
Email: [ahpp@srph.tamhsc.edu](mailto:ahpp@srph.tamhsc.edu)**

**[www.easyforyou.info](http://www.easyforyou.info)**

**Revised 11/15/2007**

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## Answering the Six Easy Questions:

### EASY QUESTIONS (Circle Response):

	Yes	No
1) Do you have pains, tightness or pressure in your chest during physical activity (walking, climbing stairs, household chores, similar activities)?	Yes	No
2) Do you currently experience dizziness or lightheadedness?	Yes	No
3) Have you ever been told you have high blood pressure?	Yes	No
4) Do you have pain, stiffness or swelling that limits or prevents you from doing what you want or need to do?	Yes	No
5) Have you fallen in the past year, or do you feel unsteady or use a cane or walker while standing or walking?	Yes	No
6) Is there a health reason not mentioned why you would be concerned about starting an exercise program?	Yes	No