AN EVALUATION OF FUNCTIONAL FITNESS IN ASSISTED LIVING AND INDEPENDENT LIVING RESIDENTS

Lauren N. Snyder

A Thesis
Submitted to the Graduate College of Bowling Green State University in partial fulfillment of the requirements for the degree of

MASTER OF EDUCATION

August 2006

Committee:
Amy L. Morgan, Ph.D., Advisor
Lynn A. Darby, Ph.D.
Nancy A. Orel, Ph.D.
ABSTRACT

As our aging population continues to increase, more older adults will be in need of services provided by Continuing Care Retirement Communities. Although subjective activities of daily living (ADL) assessments are common tools used when determining appropriate living arrangements for older adults who are in need of care, there is some controversy over whether these are adequate indicators of physical functioning (Bottomley and Lewis, 2003; Peck, 2005). As a result, the functional ability of these individuals may be over or underestimated, resulting in inappropriate living placement within a retirement community. Therefore, the implementation of an effective means to assess the functional status of these individuals is imperative. The purpose of this study was to evaluate the functional fitness of individuals residing in independent living and assisted living facilities using a series of physical tests to assess strength, balance, flexibility, and aerobic endurance. Participants were women (n= 21) between 70 and 92 years of age, residing in either independent living (n= 12) or assisted living (n= 9) in a Continuing Care Retirement Community. All participants took part in a functional fitness assessment as well as a subjective ADL assessment. Six components of functional fitness were measured: lower body strength, upper body strength, aerobic endurance, lower-body flexibility, upper body flexibility, and balance and agility. Six basic activities of daily living were also assessed: bathing, dressing, toileting, transference, continence, and feeding. Independent t-tests with a Bonferroni adjustment for multiple tests (p = .008) were used to compare the mean results of each functional component for both independent and assisted living participants. A Chi-square test of independence was also calculated to compare the frequency of independent living and assisted living residents in
the categories of the Katz Index of ADL. No significant differences were found in the components of functional fitness and no relationship was found in relation to the frequency of categorization using the Katz Index of ADL. However, findings suggest that residents in both assisted living and independent living are at an increased risk for loss of functional mobility in various components of functional fitness. This identification was not evident in the subjective ADL assessment, which is commonly used when determining the services and needs of residents in Continuing Care Retirement Communities. Therefore, developing specific activity programs targeting functional fitness parameters in CCRC’s may aid in improving limitations in functional fitness, such as upper body flexibility and lower body flexibility.
ACKNOWLEDGEMENTS

I would like to express my gratitude to my advisor, Dr. Amy L. Morgan for her undivided guidance and support throughout this investigation. I would also like to thank my committee members, Dr. Lynn A. Darby and Dr. Nancy A. Orel for their support and encouragement as well. My appreciation is also extended to Dr. David Tobar for his knowledge and assistance with the statistical analysis section of this research. Additionally, thank you to the participants of this study. Your time and effort were greatly appreciated. Lastly, to my family and friends: your unconditional support and encouragement were the foundation for this accomplishment. Thank you.
<table>
<thead>
<tr>
<th>Chapter and Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAPTER I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Purpose</td>
<td>3</td>
</tr>
<tr>
<td>Significance</td>
<td>3</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>3</td>
</tr>
<tr>
<td>Definitions</td>
<td>5</td>
</tr>
<tr>
<td>CHAPTER II. REVIEW OF THE LITERATURE</td>
<td>6</td>
</tr>
<tr>
<td>Quality of Life</td>
<td>6</td>
</tr>
<tr>
<td>Activities of Daily Living</td>
<td>7</td>
</tr>
<tr>
<td>Types of Assessments</td>
<td>8</td>
</tr>
<tr>
<td>Continuing Care Retirement Communities</td>
<td>13</td>
</tr>
<tr>
<td>Independent Living</td>
<td>14</td>
</tr>
<tr>
<td>Assisted Living</td>
<td>14</td>
</tr>
<tr>
<td>Components of Functional Fitness in Older Adults</td>
<td>16</td>
</tr>
<tr>
<td>Muscular Strength</td>
<td>16</td>
</tr>
<tr>
<td>Balance</td>
<td>17</td>
</tr>
<tr>
<td>Flexibility</td>
<td>17</td>
</tr>
<tr>
<td>Aerobic Endurance</td>
<td>18</td>
</tr>
<tr>
<td>Functional Fitness in Research</td>
<td>18</td>
</tr>
<tr>
<td>Exercise Programs and Function in Older Adults</td>
<td>21</td>
</tr>
<tr>
<td>CHAPTER III. METHODS</td>
<td>29</td>
</tr>
<tr>
<td>Participants</td>
<td>29</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Participant Characteristics</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>Performance Scores and Percentage Differences in Functional Fitness</td>
<td>39</td>
</tr>
<tr>
<td>3</td>
<td>Functional Fitness Scores in Relation to National Performance Charts</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>Categorization of Participants by the Katz Index of ADL</td>
<td>41</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

As our aging population continues to increase, long-term care and retirement facilities are becoming a more popular choice of housing for older adults. The continuum of care is a common term used to describe the range of care options available to residents who choose to live in a facility such as a Continuing Care Retirement Community (CCRC) (Ekerdt, 2002). Living options in a CCRC vary from independent living to extended care and hospice services. A popular evaluation of determining whether an individual is placed in independent living or assisted living is through an assessment of his/her capability to complete six common Activities of Daily Living (ADLs): bathing, dressing, toileting, transference, continence, and feeding (Katz et al., 1970). These six ADLs, which are used for assessment, are commonly referred to as the Katz Index of Activities of Daily Living. Although several variations of this index have been adapted, future residents of CCRCs are generally assessed through a self-report or other form of observation while conducting these tasks, and are then scored according to their ability to complete each task (Katz et al., 1970; Wallace, 1998). Scoring is generally based on a numerical or categorical rubric, ranging from independent, some assistance needed, or dependent (Wallace, 1998).

Although the index of ADL is a common tool used when determining appropriate living arrangements for older adults who are in need of care, there is some controversy as to whether ADL’s and instrumental activities of daily living are an adequate indicator of physical functioning (Bottomley and Lewis, 2003; Peck, 2005). As a result, the functional ability of these individuals may be over or underestimated, resulting in an
inappropriate living placement within a CCRC. As the number of individuals in need of care continues to rise, the implementation of an effective means to assess the functional status of these individuals is imperative. To date, various research studies focusing on exercise interventions have been conducted to examine components of functional fitness in older adults (Brandon et al. 2000; Fiatarone et al. 1990; Topp et al. 2005). These exercise interventions have suggested effectiveness in improving or maintaining one or more components of functional fitness in older adults for a wide range of abilities, ranging from extremely frail to healthy, community dwelling participants. However, several of these studies only focus on one primary component of fitness, rather than examining multiple components of function. Additionally, little to no research has focused on comparing and assessing the functional fitness of older adults residing in a CCRC in order to identify factors that may help improve or maintain their functional ability.

Functional fitness tests include measures of strength, flexibility, balance and agility, and aerobic endurance. Flexibility, cardiovascular endurance, and muscular strength are considered to be critical factors of physical fitness (Spirduso, 2005). In order to help improve independence and effectively develop programs for adults with functional limitations in facilities like CCRCs, specific and individual physical limitations must be identified. In turn, utilizing a multi-component functional fitness test to assess performance in these tasks is necessary. As a result, more appropriate physical activity programs to help maintain and improve functional fitness can be developed to increase the likelihood of older adults executing more activities of daily living on their own.
Purpose

This study was designed to compare the functional fitness of individuals residing in independent living and assisted living facilities using a series of fitness tests to assess strength, balance and agility, flexibility, and aerobic endurance.

Significance

Comparing the functional fitness of individuals living in either independent or assisted living will aid in the differentiation in physical functioning between these groups and may support the rationale for implementing a more effective physical assessment in these facilities. Functional fitness assessments will also aid in determining more appropriate living placement for CCRC residents. Upon evaluating the functional status of these individuals through a series of physical fitness tests, recommendations for effective exercises to improve or maintain physical functioning can be implemented.

Hypotheses

The following null hypothesis will be tested:

H1: There will be no difference between groups in lower body strength, as assessed by the chair stand test.

H2: There will be no difference between groups in upper body strength, as assessed by the arm curl test.

H3: There will be no difference between groups in lower body flexibility, as assessed by the chair sit-and-reach test.

H4: There will be no difference between groups in upper body flexibility, as assessed by the back scratch test.
H5: There will be no difference between groups in agility and balance, as assessed by the eight foot-up and go test.

H6: There will be no difference between groups in aerobic endurance, as assessed by the six minute walk test.

H7: There will be no relationship among ADL ratings of assisted living and independent living residents when the frequency of AL and IL residents in the categories of the Katz Index of ADL are compared.
Definitions

Activities of Daily Living- a measurement of the extent of disability for a person who requires long-term medical care (Bettelheim, 2001).

Assisted Living- a combination of housing, personalized supportive services, and health care, designed to meet the needs of individuals who require help with activities of daily living, but who do not require the skilled medical care provided in a nursing home (Allen, 2004).

Functional Fitness- having the physical capacity to perform normal everyday activities safely and independently without undue fatigue (Rikli & Jones, 2001).

Functional Independence- individuals can complete activities of daily living without difficulty, and implies that these individuals are operating on the basis of at least the minimal levels of physical, cognitive, and mental health (Spirduso, Francis, & MacRae, 2005).

Functional Performance- observable ability to perform tasks of daily living; or the ability to perform field tests that emulate tasks of daily living (Spirduso et al., 2005).

Frailty- a condition in which older people have multiple, usually interacting, medical and social problems (Ekerdt, 2002).

Muscle Strength- the amount of force that a muscle or group of muscles can produce with a single maximum contraction (Spirduso et al., 2005).

Balance- process by which the body’s center of mass is controlled (Spirduso et al., 2005).

Flexibility- refers to the range of motion around a single joint or multiple joints (Spirduso, 2005).
CHAPTER II
REVIEW OF THE LITERATURE

**Quality of Life**

Quality of life refers to the goodness, excellence, or fineness of life (Spirduso, Francis, & MacRae, 2005). There are three primary dimensions relating to quality of life (Chang, Kim, Shigematsu, Nho, Nishijima, & Tanaka, 2001; Spirduso et al., 2005):

- Cognitive and emotional function
- Social and recreational function
- Physical function

Cognitive and emotional function refer to an individual’s aim to continue to be productive, independent, and active within the environment. For instance, life satisfaction and feelings of well-being are characteristics of emotional and mental health (Spirduso et al., 2005). The dimensions of social and recreational function are suggested to enable individuals to enrich their lives (Spirduso et al., 2005), and include aspects such as participation in recreational sports and social gatherings.

The final dimension relating to quality of life is the physical function dimension of life. Health status, physical function, energy and vitality are considered significant features when referring to the physical dimension of quality of life (QOL). This is primarily because they are the foundation for any individual to perform physical tasks, including aspects from both the cognitive and recreational dimensions (Spirduso et al., 2005). For instance, physical functioning is the base for performing activities of daily living such as walking, dressing, and bathing (Spirduso et al., 2005). Additionally, the
ability to reach and lift items during everyday routines also relate to an individual’s physical capability.

The remaining elements of the physical dimension of QOL (i.e. health status, energy and vitality) are all correlated with physical functioning (Spirduso et al., 2005). Health status is known as the level in which certain physical conditions, like illness or disease impact an individual’s ability to complete everyday activities of daily living (Spirduso et al., 2005). Health status and physical functioning may both contribute to energy and vitality, however these terms are not identical. For instance, an individual who is free from chronic health conditions can be categorized as being in good health, which as mentioned is an important component of physical function and fitness. However, the individual may not be capable of functioning physically in terms of flexibility, aerobic capacity, strength and endurance (Spirduso et al., 2005). Therefore, it is important to consider health status and physical functional fitness when assessing health related quality of life.

**Activities of Daily Living**

Determining whether older adults are in need of additional assistance is often based on their ability to conduct various daily living tasks. In general, activities of daily living are defined as a variety of common activities whose performance is required for personal self-maintenance and independent community residence (Maddox, 1987). Activities of Daily Living (ADL) are categorized into Basic Activities of Daily Living (BADLs) and Instrumental Activities of Daily Living (IADLs). BADL’s include self-care activities such as grooming, bathing, and dressing (Bettelheim, 2001). IADLs consist of higher order activities and are categorized into two subgroups: Cognitive
IADLs and Physical IADLs (Bettelheim, 2001). Cognitive IADL’s involve tasks like handling money and using the telephone, while physical IADL’s include tasks such as housework and shopping. Although BADLs and IADLs are a popular means of assessing an individual’s ability to function, it is still unclear whether BADLs and IADLs are an adequate indicator of physical functioning. For instance, characteristics of physical functioning such as the ability to climb stairs, flexibility, or a functional walking test, have been suggested as being more closely associated with an individual’s physiological capabilities than BADLs and IADLs (Bottomley & Lewis, 2003).

ADL assessments are often used to aid in the determination of whether an individual resides in independent living or assisted living, however many of these tests are subjective. Additionally, the assessments that have been established vary in the ADL activities that are included. For instance, some assessments only consider basic ADL activities, while others focus on IADL activities (Kane & Kane, 1981). Therefore, administering an ADL assessment to measure the overall function of older adults can be somewhat difficult and may take a considerable amount of time since more than one assessment may be needed.

Types of Assessments

Many ADL and IADL assessments evaluate the functional ability of individuals, but are often administered as self reports from potential residents, relatives, or caregivers rather than observation of the actual physical performance (Maddox, 1987). Some of these assessments may only focus on the number and type of physical conditions individuals have instead of physical functioning (Spirduso et al., 2005). In cases such as this, individuals typically complete single item health assessments or self-ratings in
which they rate their own health on a scale of 1-9, with a score of 1 representing a serious condition or disease, and a score of 9 representing that the individual believes he/she is in optimal health (Spirduso, 2005). This style of assessment has been found to be strongly related to feelings of well-being and life satisfaction, but have low reliability and validity (Spirduso et al., 2005).

The Rapid Disability Rating Scale (RDRS) is an example of an instrument which has been used to assess activities of daily living, but is based on report rather than performance (Kane & Kane, 1981). Sixteen items including eating, walking, bathing, and dressing are assessed by a medical staff member and rated on a three point scale. The rating scale is a point system, which rates the individual as follows: no impairment or special help (1 point), some assistance needed (2 points), and complete impairment or assistance needed (3 points) (Kane & Kane, 1981). The assessment is typically conducted by a nurse, who has immediate knowledge of the individual and is typically completed within a few minutes. The RDRS has been used to describe improvements or declines in the functional status of nursing home patients six months after being placed in the facility (Kane & Kane, 1981). However, limitations to using the RDRS include the fact that staff members rate based on their knowledge of each patient, and each item on the scale is assumed equal weight. For instance, being able to walk and bathe independently are equally compared to items like speaking or eating without assistance (Kane & Kane, 1981).

The Older American Resources and Services instrument (OARS) is another type of ADL assessment that is administered in an interview fashion by a staff member at a particular facility (Kane & Kane, 1981). The OARS is a tool which assesses components
of physical health via questionnaires and interviews. Within this tool, there is a physical ADL section that evaluates activities such as eating, dressing, grooming, transference, bathing, and walking (Kane & Kane, 1981). This scale is either scored by individual section or as an overall, global rating using all sections of the assessment tool. The ADL section is scored using a three point rating similar to the RDRS, ranging from independent to some assistance required to completely dependent. The second form of scoring, the global rating, considers all portions of the OARS and rates the performance from excellent (1) to completely impaired (6). The OARS is well-known in gerontology research, and is therefore noted as one of the most widely used ADL tools used within the general population (Kane & Kane, 1981). However, this tool has limitations which include the interview format of the tool, no direct observation performing the activity, and self-rated scores. Additionally, the OARS primarily examines basic ADLs and there has been no established standard to combine this ADL tool with an IADL tool for an overall functional assessment.

There have been ADL assessments established which require the individual to perform specific tasks and are rated by a staff member of the facility who directly witnesses the task being assessed. Scores for these scales are based most often on immediate observation of the task, however the total amount of time required to complete the specific task has also been observed (Kane & Kane, 1981). One of the most well known of these ADL tools is the Katz Index of ADL (Kane & Kane, 1981).

The Katz Index rates six ADL functions: bathing, dressing, toileting, transference, continence, and feeding (Kane & Kane, 1981; Katz, 1970; Wallace, 1998). Individuals are rated on their performance on these six ADL tasks. The Katz index scoring has been
modified in various ways; however, the overall evaluations are similar. For example, the Katz Index was first scored as either independent or dependent in performing each task and progressed to a three point rating of independent, some assistance, or dependent (Katz, 1970; Wallace, 1998). More specific scales have also been established to rate individuals on a more advanced numerical scale. For example, rather than rating individuals as independent or dependent on each task, scoring has been modified to illustrate more defined classifications: independent (0 points), uses an assistive device (1 point), human assistance (2 points), and completely dependent (3 points) (Kane & Kane, 1981).

Although the Katz Index is a recognized ADL assessment tool, there are limitations when using this tool. Although ADL assessments such as the Katz index are often used as a guide to help define the lines for placement in assisted living over independent living, there is debate over whether ADL assessments are too exclusive and restrain residents too quickly (Peck, 2005). For instance, rating an individual strictly as independent or dependent in completing a task places firm boundaries on the status of the individual. Using an alternative tool, such as a functional fitness test, would evaluate specific components of function and provide a comparative score that can be used to assess individuals in relation to others of the same age and gender (Rikli & Jones, 2001). In other words, specific strengths and weaknesses can be targeted using functional fitness tests and specific programs can be designed to target the specific needs of individuals whereas ADL assessments may place or categorize an individual as dependent without examining the true functional capability of the individual.
As mentioned, ADL assessments differ in a variety of ways, including the level of specificity of performing the particular activity and categorization used to assess performance (Maddox, 1987). Therefore, utilizing functional fitness tests which measure exact components of function such as upper body strength, balance, and flexibility may offer a more specific guideline to assessing the function of older adults, rather than simply rating individuals as independent or dependent. Functional fitness tests are also considered more appropriate to measure the progress of individuals, since specific programs and exercises can be implemented to target functional areas in need of improvement (Rikli & Jones, 2001). Defining the line of whether an individual should be placed in independent living or an assisted living facility can be a difficult process for all involved, including the individual in need of assistance, family, physicians, and administrators of the facility (Lieto & Schmidt, 2005). Therefore, the implementation of a functional fitness tool that specifically defines the strengths and weaknesses of individuals may be helpful and useful to aid in the decision making process.

Lieto and Schmidt (2005) emphasized that very little research has focused on factors associated with assisted living placement. Researchers examined the ability of independent living and assisted living residents to self-administer medication to determine if it was an indicator of living placement. Using a medication administration questionnaire, along with examining ADLs, cognitive status, depressive symptoms, and recording the number of falls that had occurred within the previous six months, individuals 68-98 years of age residing in a Continuing Care Retirement Community (independent or assisted living) were evaluated. Results from the study suggest that the ability to accurately self-manage medication is more indicative of living placement than
cognition, function, depression, age, or number of falls. However, there were limitations in this study that warrant the need for additional research, including a more effective means of assessing medication management skills (Lieto & Schmidt 2005). One distinct limitation of this study was a geriatric nurse who was selected to aid in assessment was instructed to change participants’ responses to the questionnaire when their self responses conflicted with notes in their medical charts. Furthermore, other than assessing six ADLs (bathing, dressing, toileting, transfer, continence, and feeding), no additional functional assessments were included.

**Continuing Care Retirement Communities**

Continuing Care Retirement Communities (CCRCs) are living facilities which emphasize a continuum of care approach for older adults. CCRCs are known as continuum care sites because of the progressive care that is offered and facilitated. CCRCs have been described as planned communities that incorporate desirable housing, amenities, social activities, and health related services to its residents (Sherwood, Ruchlin, Sherwood, & Morris, 1997). Living environments offered through a CCRC typically include independent living and assisted living, in addition to an extended care option such as a nursing home or hospice care. Offering this range of care allows residents to progressively transition from one living arrangement to another when their health and functional needs change (Lieto & Schmidt, 2005). The majority of individuals living in a CCRC are women, approximately 79 years of age, which is attributed to the security, assurance, and quality of care provided in these facilities (Ekerdt, 2002).
Independent Living

Independent living is a general term that reflects the array of services for older adults who are in need of some type of minimal assistance. Independent living encompasses services such as meals on wheels and other nutrition services that deliver nutritious meals to the homes of older adults. In addition, housing arrangements like congregate housing are also categorized as an independent living service (Bettelheim, 2001). Congregate housing is a means of living for individuals who are typically able to live independently, but may require some assistance with daily activities such as housekeeping and transportation (Bettelheim, 2001). Congregate housing arrangements include stand-alone homes and apartments (Bettelheim, 2001). Within a CCRC, there are independent living options that are similar to what congregate housing provides. Residents entering a CCRC for independent living services generally enter in fairly good health, and may only need assistance with tasks such as taking medication, cooking, or cleaning. However, these individuals generally move into a CCRC anticipating the long term care they may need in the future (Bettelheim, 2001).

Assisted Living

Assisted living is a term used to describe the services and care provided to older adults who are in need of assistance related BADLs as well as IADLs. The range of services provided by assisted living facilities include meal preparation and cleaning, as well as assistance dressing, bathing, and grooming. According to the Ohio Assisted Living Association, there are currently 20,000-30,000 assisted living facilities nationwide. Currently in the United States, there are only approximately 17,000 nursing homes located throughout the country (Leitner & Leitner, 2004). There are various
factors contributing to the growing need for assisted living facilities including the size of
the aging population, the potential lifespan of these individuals, and improved quality of
life (Allen, 2004).

At the beginning of the twentieth century, life expectancy was only 47 years of
age (Allen, 2004). Today, the average life expectancy in the United States is 73 years of
age for males and 79 years of age for females (Spirduso et al., 2005). Due to improved
health care and personal willingness to change physical activity patterns and overall
health status, older adults are now living longer and enjoying an increased level of
physical and social health (Allen, 2004). As a result, fewer older adults are in need of
constant 24 hour care provided in a nursing home. Nevertheless, although our aging
population is healthier and more vibrant, as these individuals approach their sixties and
seventies, they become more reliant on assistance with activities of daily living (Allen,
2004).

In addition, as our population continues to age and the post-World War II baby
boom population reaches retirement, there is a growing concern in relation to the long-
term living options available for these older adults who are in need of care (Allen, 2004).
In 2004, Leitner and Leitner reported that approximately 1 million older adults reside in
assisted living facilities; further, 20-50% of the older population is expected to live in an
assisted living facility at some point before death. Additionally, by the year 2020, it is
projected that 14 million older adults will be in need of assisted living services (Allen,
2004). The typical resident in assisted living is a widowed female, 83 years of age and
older (Ekerdt, 2002). With this in mind, it is imperative that health professionals focus
on improving the functional fitness of older adults, particularly women, both in and out of
long-term care facilities like assisted living in order to maintain or increase the likelihood of residents executing ADLs safely and independently.

**Components of Functional Fitness in Older Adults**

Functional fitness is defined as the physical ability to perform normal everyday activities such as dressing and bathing safely and independently without undue fatigue (Rikli & Jones, 2001). Functional fitness consists of components including upper and lower body muscle strength, upper and lower body flexibility, balance, agility, and aerobic endurance.

*Muscular Strength*

Strength is necessary for older adults to carry out many daily activities, from climbing stairs, getting up from a chair or out of a vehicle, to maintaining the ability to participate in activities such as gardening, shopping, dancing, and crafts (Spirduso et al., 2005; Toraman, Erman, & Agyar, 2004). As individual’s age, strength steadily decreases making activities like carrying groceries or rising from a chair more difficult (Spirduso et al., 2005; Wilmore & Costill, 2004). In fact, the ability to stand from a seated position in a chair begins to be compromised at age 50; and by age 80 this task becomes unachievable for some (Wilmore & Costill, 2004). Decreases in strength as individuals’ age can be attributed to the natural aging process, however loss of muscle mass due to physical inactivity is suggested to be the primary factor in the decline in strength and function as individuals age (Wilmore & Costill, 2004). Therefore, when assessing the functional fitness of older adults, it is necessary to focus on upper and lower body strength in order to appropriately assign exercises to help increase or maintain the strength needed to sufficiently conduct daily activities.
**Balance**

Mobility is defined as the ability to move independently and safely from one area to another (Spirduso et al., 2005). Dynamic balance, which is important to maintain mobility, refers to the capability to maintain postural stability while moving (Rikli & Jones, 2001). Mobility and balance are necessary for daily activities including rising from a chair, climbing stairs, walking, dancing, and gardening (Rikli & Jones, 2001; Spirduso, et al., 2005). The body’s ability to maintain balance relies on various factors, including the central nervous system, proprioception, muscle strength, and joint flexibility (Tideiksaar, 2002). Combined, these factors help control postural sway, control stability and allow individuals to maintain balance. As individuals age, proprioception declines, increasing postural sway and increasing the likelihood of falling or losing balance.

For instance, when older adults perform activities like walking or transferring, their center of gravity tends to extend past their support base, affecting their stability. Thus, the individual becomes imbalanced and the risk of falling increases (Tideiksaar, 2002). Functional fitness tests, which include a balance and agility component, can define the limitations of balance in individuals. In turn, proper exercises which focus on improving components related to balance, such as leg strengthening activities, flexibility movements, and transferring exercises may be suggested in an effort to improve functional limitations (Tideiksaar, 2002).

**Flexibility**

Flexibility is maintained by consistently using joints and participating in physical activity (Spirduso, 2005). Loss of flexibility increases the likelihood of injuries such as
muscle strains, damaged tendons and ligaments (Spirduso, 2005). Flexibility is important to consider when assessing functional fitness. As individual’s age, declines in flexibility limit the ability to perform many daily activities. For instance, upper body flexibility is important for ADL’s like reaching, grooming, and grasping (Rikli & Jones, 2001; Spirduso, 2005). Maintaining lower-body flexibility is also important since balance and risk of falling are impacted by an individual’s flexibility (Rikli & Jones, 2001; Tideiksaar, 2002). Although upper and lower body flexibility decline with age, exercises which focus on flexibility can improve or maintain this function (Rikli & Jones, 2001).

Aerobic Endurance

Aerobic endurance is important for individuals who take part in activities like walking, shopping, or recreational activities. In fact, maintaining a sufficient aerobic capacity has a direct impact on an individual’s functional ability (Rikli & Jones 2001). Oxygen consumption is a common method used to measure an individual’s aerobic fitness level. As individuals age, oxygen consumption declines at a rate of 5-15% per decade after the age of thirty (Rikli & Jones, 2001). However, maintaining aerobic function will aid in maintaining an adequate aerobic capacity to conduct daily living activities. Therefore, when assessing functional fitness, an aerobic endurance test such as a walking test can immediately assess the aerobic function of older adults, and help identify changes in aerobic endurance.

Functional Fitness in Research

Several investigations have examined the components of functional fitness in older adults. More specifically, these investigations have evaluated functional fitness in relation to life satisfaction as well as the effects of training programs on functional fitness
and performing activities of daily living. However, the majority of this research has focused on independent community dwelling older adults. Older adults residing in a retirement home have been examined, but inclusion criteria was extremely selective and only included residents who performed ADL’s without the use of an assistive device (Toraman, Erman, & Agyar, 2004). As the aging population continues to increase and more individuals are in need of services offered by CCRCs, it is important to evaluate the functional abilities of current and future residents in these facilities. In turn, improved program development may assist in maintaining or improving components of functional fitness, thus allowing residents to execute more activities of daily living on their own.

In 2001, Chang et al. examined the relationship between functional status and life satisfaction in older adults. One hundred twenty-three older adults (74 ± 5.4 years) completed a life satisfaction questionnaire and participated in functional fitness tests which assessed muscular strength, agility, balance, coordination, and flexibility. Upon analysis, results indicated that there was no significant relationship between total life satisfaction score and the total functional fitness score. Nonetheless, although there was no significant relationship between overall scores, there were significant relationships between the overall functional fitness score and individual life satisfaction components. Specifically, the life satisfaction dimension of negative thinking toward getting old was significantly related to the overall functional fitness score. Functional fitness scores were higher in those who rated higher on components related to life satisfaction. This suggests that functional fitness levels of older adults may be related to having a positive attitude toward life (Chang et al., 2001). When additional components of life satisfaction were examined including economic satisfaction and social activity, there was also a significant
correlation with the agility component of the functional fitness score. Although functional fitness and life satisfaction as a whole do not appear to be related, the results of this study do support the notion that older adults who maintain their functional fitness may benefit in factors of life satisfaction, including a positive attitude toward life and increased social activity (Chang et al., 2001).

Cavani et al. (2002) evaluated the effects of 6-weeks of stretching and moderate-intensity resistance training on the performance of functional fitness tests in older adults. Twenty-two community dwelling older adults (69 ± 1 year) were recruited to participate. Participants were recruited to be in an exercise group or control group. Participants in the exercise group took part in a 6-week intervention consisting of 20 minutes of stretching and 45 minutes of upper and lower body strength training three times per week. Functional fitness tests including an arm curl, chair stand test, back scratch test, chair sit and reach test, an 8 foot up and go test, and a 6-minute walk test were assessed prior to training and after 6-weeks. Results from this study indicated a significant increase in arm curl, chair stand, chair sit and reach, and the 8-foot up and go test after training. The results of this intervention indicate that 6-weeks of combined stretching and moderate-intensity strength training exhibit improved performance on functional fitness tests. One limitation to this study was that participants were not randomly assigned to the two groups. Nonetheless, this research demonstrates that functional fitness tests assessing muscular strength, flexibility, agility and balance, and aerobic endurance are effective means for assessing functional fitness prior to and upon the completion of an exercise program.
In 2004, Toraman et al. examined the effects of a 9-week multi-component exercise intervention on the functional fitness of independent older adults. Forty-two older adults 60-86 years of age were randomly distributed to either an exercise or control group. Functional fitness was assessed prior to and upon the completion of the 9-week intervention via the Senior Fitness Test (Rikli & Jones, 2001); it included upper and lower body strength, upper and lower body flexibility, balance and agility, and aerobic endurance. The 9-week exercise intervention consisted of aerobic training as well as strength training of the upper and lower body. After the 9-week intervention, significant time and group interactions for upper body strength, lower body strength, and balance and agility were found from training. Significant differences between groups were also found in aerobic endurance. There was no significant effect from training on upper body flexibility or lower body flexibility. This finding was attributed to the short duration of the intervention which may not have provided adequate improvements on the flexibility assessments. However, results from this investigation further support improved performance in components of functional fitness with the implementation of a training intervention. Therefore, functional fitness tests such as the Senior Fitness Test have gained support as an assessment tool to evaluate functional ability in older adults.

**Exercise Programs and Function in Older Adults**

An individual’s capability to carry out ADL’s reaches a peak during their early thirties, and then progressively declines with increasing age (Hunter, McCarthy, & Bamman, 2004). The decline in an aging individual’s ability to perform such tasks is attributed to factors such as muscle weakness and increased fat mass. Various studies have been conducted to examine the effectiveness of different exercise programs on
functional status in older adults. These studies include various measures of functional fitness related to exercise in both high functioning and frail older adults. However, very little focus has been directed towards determining whether there is a similarity in the scores of these functional fitness measures in relation to recognized ADL self assessments, which are commonly used in retirement communities today.

In 1990, Fiatarone et al. examined the practicability and physiological effects of high-resistance strength training in frail, older adults. Ten frail subjects (mean age 90 ± 1 year) recruited from a long-term care facility in Boston, MA participated in eight weeks of high intensity resistance training. Two functional measures, a chair stand and a six meter walk were observed to assess the functional mobility of participants. During the first week of training, subjects exercised at 50% of their one repetition maximum. At the end of the second week (or as tolerated), the load was increased to 80% of the individual’s one repetition maximum. Each subject’s one repetition maximum was then reassessed every two weeks, and the training regimen was modified accordingly (to maintain the intensity at 80%). Baseline measures included knee-extensor (quadriceps) strength, chair stand examination, and gait speed.

Findings from the study reported that gains observed in muscle strength were highly significant, but no significant changes were noted in total body composition or functional status in reference to quadricep strength and the chair stand test. When the six meter walking test was analyzed, gait assessment did yield a decrease in overall walking time but was not significant. The fact that no significant change occurred in functional status was attributed to the limitation that the training program only targeted one muscle group, thus inhibiting significant changes in activities of daily living or overall body
composition. However, strength gains were progressive throughout the procedure and did not plateau at eight weeks, indicating that more improvement may be likely if training was continued. Additionally, researchers reported that after the study, two of the ten subjects no longer used assistive devices (canes) to walk, and one of three subjects who initially could not rise from a chair without the use of the arms was able to do so independently.

The overall finding of this study suggests that a high intensity weight training program is capable of increasing muscle strength in frail men and women in a long-term care facility, up to the age of 96 years. Therefore, it is acceptable to implement lower extremity interventions in a diverse population of older adults. However, though lower extremity strength is necessary to carry out daily tasks like rising from a chair and walking, upper extremity strength as well as balance, flexibility, and aerobic endurance are equally important measures to consider when assessing the functional ability of older adults. Balance, flexibility, and aerobic endurance are necessary to execute tasks like walking, carrying groceries, lifting, and dressing. Therefore, a functional fitness assessment which includes an array of measures targeting multiple components of function is necessary when assessing physical function.

Binder et al. (2002) studied the effects of an exercise training program on measures of physical frailty in community dwelling older adults. Sedentary men and women (n=115, mean age 83 ± 4 years) were randomly assigned into either a nine month home exercise program performing flexibility exercises, or an exercise training program that progressively incorporated flexibility, resistance, and balance exercises over the nine month period. Baseline assessment included self-reported information on performing
ADLs and IADLs, a functional status questionnaire, and a modified physical performance test. The ADL assessment measures were collected using the OARS ADL tool. The physical performance test included tasks such as a 50-foot floor walk, putting on and removing a jacket, climbing a flight of stairs, a chair stand test, and picking a penny up from the floor. In addition, a graded treadmill walking test was administered.

Participants were randomized into either an exercise training group or control group. Participants in the control group participated in a home-based program performing nine exercises emphasizing flexibility for the entire duration of the study, while the exercise training group started the first three months (phase 1) of the program with basic flexibility, balance and coordination exercises. The following three months (phase 2), participants continued a modified version of the flexibility and balance exercises, in addition to resistance training; the final three months (phase 3) of the training program incorporated aerobic exercise into the program. Aerobic exercise time was increased progressively to 20 minutes after which interval training was introduced requiring participants to work at 85-90% of their VO₂ peak for a total 30 minutes during this phase.

Findings indicated that participants taking part in a multi-focused exercise training program, incorporating various forms of exercise have significantly higher improvements in VO₂ peak and in functional status questionnaire scores when compared to a home based program. Participants in the exercise group did indicate greater improvements in the Modified Physical Performance Test, with significant improvement at the end of the first phase of the program while the chair stand test showed the only group-by-time effect. The ADL questionnaires used in this study during baseline and
post intervention study did not change significantly. This study indicates that an exercise
training program implemented in sedentary older adults improves physical functioning
more than low-intensity exercises implemented through a home based program.
However, researchers have indicated that future studies should focus on additional
categories of older adults, particularly those who are extremely frail. Also, though an
ADL self-assessment was used during the study, researchers reported that no significant
changes occurred after the exercise intervention and did not indicate any similarity in
relation to performance on the Modified Physical Performance Test and ADL self-
reports. Therefore, performance on functional tests such as this may aid more adequately
in determining functional ability in residents of a retirement community than simply
using a self report or medical history assessment.

Brandon et al. (2000) examined the effects of a four-month lower extremity
strength training program on functional mobility in older adults. Eighty-five healthy
community-dwelling older adults (mean age 72 ± 5.4 years) who were not taking part in
any type of structured physical activity were recruited to participate. The training
program consisted of training lower extremity muscle groups for one hour, three days a
week. To ensure participants were working at an adequate percentage of their one
repetition maximum, resistance was re-evaluated after weeks three, five, seven, and
twelve. Baseline and post-test measures were assessed by the following functional
measures: a 50 ft. walk, chair rise, floor rise, climbing stairs, and descending stairs.
Results from this study indicated that chair rise and floor rise measures improved
significantly. Researchers suggest that these results indicate that strength is an important
component of mobility, however, increasing strength only presents minimal improvement
in an older adult’s mobility (Brandon, Boyett, Gaasch, & Lloyd, 2000). Therefore, though lower body strength is an important aspect of functional mobility, there are other aspects of overall function that impact an individual’s ability to perform daily living activities, such as flexibility and balance.

As mentioned, Brandon et al. (2000) examined the functional mobility of older adults, more specifically targeting aspects of lower body strength. In order to effectively develop programs for adults with functional limitations in retirement communities, long-term care facilities, and within the community, it is important to determine the specific individual limitations of each person, rather than focusing solely on lower body strength. Thus, functional fitness tests for older adults which evaluate performance on multiple components of function are necessary to determine appropriate physical activity programs to maintain and improve functional fitness.

Topp et al. (2005) compared the effectiveness of various types of exercise on the performance of functional tasks. Older adults, 65 years of age and older with limited functional ability were recruited to participate. Participants (n=131) were randomly distributed into one of four groups: resistance training, aerobic walking, combined resistance training/aerobic walking, or a non-exercise control group. At baseline, eight weeks, and sixteen weeks, participants were assessed using functional ability variables including arm curls, a sit to stand test, down and up off of the floor movements, and climbing up and down a flight of stairs. The resistance training portion of the study included exercises which targeted various muscle groups and also included a diverse range of motions. Throughout the duration of the study, resistance and repetitions completed were increased. The aerobic walking design composed of continuous walking
at an intensity relating to a Rate of Perceived Exertion (RPE) between 11 (Fairly light) and 16 (hard-heavy) on the RPE scale (Borg, 1998). Walking times also increased progressively throughout the duration of the study. The combined resistance training and aerobic walking group participated in a combination of at least twenty minutes of aerobic walking and twenty minutes of resistance exercise.

Analysis of the results indicated that significant changes in functional ability occurred in all three of the exercise groups. Yet, the resistance training group showed the most significant improvement in functional ability. Researchers suggested that older adults who are functionally limited can improve functional ability through various types of exercise, but resistance training should be stressed more specifically for older adults who would like to improve their functional ability. However, it is important to note that though the resistance training group showed the most improvement in the functional ability measures that were evaluated, researchers attribute this to the fact that the functional ability measures emphasized muscular strength more than aerobic capacity. Therefore, it is possible that the aerobic walking group gained muscular strength due to the intervention, but not as drastically as the resistance training group. Additionally, it was suggested that the combined resistance and aerobic training group may not have been trained adequately enough in either strength and aerobic endurance to yield more sufficient gains than the resistance group. Nevertheless, this study positively supports the notion that a variety of exercise interventions can improve aspects of function in older adults.

Past and current research investigations continue to indicate that a variety of exercise interventions are effective at maintaining or improving components of functional
fitness in older adults. Nonetheless, in order to design the most effective programming for older adults, precise physical limitations must be identified for specific populations of older adults. As a result, when functional fitness measures such as balance, flexibility, aerobic endurance, and strength are assessed, exercise interventions targeting the specific needs of various groups of older adults can be developed to improve and maintain physical function. Additionally, as the physical limitations of older adults change, functional fitness measures examined during a functional fitness assessment can be reassessed and programming can be modified to adapt to future needs.
CHAPTER III

METHODS

The purpose of this study was to compare the functional fitness of older adult women who reside in either assisted living or independent living in a Continuing Care Retirement Community. In this chapter, the methods are explained using the following headings: 1) participants, 2) research design, 3) assessment tool, 4) procedures, 5) statistical analyses, and 6) sample size determination.

Participants

Women 60 years of age and older, were recruited from a Continuing Care Retirement Community (CCRC) in Northwest, Ohio. Nine women comprised the assisted living (AL) group, and 12 women comprised the independent living (IL) group. Demographic characteristics of all participants are displayed in Table 1. No significant differences were found in age, height, weight, or BMI between groups. All participants completed each of the functional fitness tests with the exception of the 6-minute walk. One participant in the IL group did not attempt the walk due to safety concerns. Eligible individuals using assistive devices were permitted to participate. Participants were asked to complete a Medical History Questionnaire and an informed consent prior to participating. Any individual who was unable to independently complete and answer the required forms was excluded from this study. Participants who were less than 60 years of age, or had any untreated or uncontrolled medical conditions such as diabetes, high cholesterol, hypertension, or other cardiovascular conditions which may have limited them from completing any of the functional fitness tests were excluded. Participants who had only resided in the retirement community for less than one month were also excluded.
in order to account for any personal transition time that may have been needed to adjust to the new living arrangements. Furthermore, individuals who were currently taking part in a rehabilitation service like physical or occupational therapy were excluded. Prior to conducting the study, approval from the Human Subjects Review Board at Bowling Green State University and the CCRC facility board was obtained.

Table 1. Participant Characteristics (Mean ± SD)

<table>
<thead>
<tr>
<th></th>
<th>Assisted Living (AL) (n=9)</th>
<th>Independent Living (IL) (n=12)</th>
<th>Total (N=21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs.)</td>
<td>80.9 ± 6.64</td>
<td>83.7 ± 6.15</td>
<td>82.5 ± 6.36</td>
</tr>
<tr>
<td>Height (in.)</td>
<td>60.4 ± 2.09</td>
<td>62.1 ± 2.50</td>
<td>61.3 ± 2.42</td>
</tr>
<tr>
<td>Weight (lb.)</td>
<td>134.1 ± 20.93</td>
<td>146.0 ± 20.07</td>
<td>141.0 ± 20.76</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>25.8 ± 3.24</td>
<td>26.5 ± 2.82</td>
<td>26.1 ± 2.70</td>
</tr>
</tbody>
</table>

**Research Design**

Two categories of residence were examined: participants residing in independent living (IL) and participants residing in assisted living (AL) at the CCRC. Six dependent functional fitness variables were measured: lower body strength (chair stand test), upper body strength (arm curl test), aerobic endurance (6-minute walk test), lower-body flexibility (chair sit-and-reach test), upper body flexibility (back scratch test), and agility and balance (the 8-foot up-and go test) (Rikli & Jones, 2001).
**Assessment Tool**

The Senior Fitness Test (SFT) was used to measure physical functioning of participants. The SFT is a series of functional fitness tests which evaluate the ability of older adults to carry out everyday tasks (Rikli & Jones, 2001). The SFT is considered a functional fitness test because its overall intention is to assess physical functioning needed for practical mobility in later years (Rikli, 2001). The test is designed to evaluate older adults 60-90+ years of age with fitness levels ranging from frail to highly fit.

**Rationale for using the Senior Fitness Test**

The SFT measures a variety of fitness aspects which relate to independent functioning in older adults and requires minimal equipment to administer components of the test (Rikli, 2001). All of the tests can be administered in any setting, including a CCRC. The SFT tasks have shown satisfactory validity and test-retest reliability \( r \geq 0.80 \) (Rikli, 2001). SFT scores are versatile and can be obtained for frail individuals or highly fit older adults. The SFT is also sensitive enough to distinguish changes from exercise training, which provides the opportunity for future research to implement an exercise program to maintain or increase functional fitness and independence for residents of a CCRC.

The SFT also supplies performance charts based on national data of community dwelling, men and women 60-94 years of age who required no assistive devices for ambulation. The performance charts provide a break down of reference points based on various scores of each component of the SFT. The reference points indicate scores related to both high-function and low-function, and serve as indicators for identifying
loss of functional mobility (Rikli & Jones, 2001). Table 3 displays the results based on the SFT performance charts.

**Procedures**

The SFT was designed to administer all functional tests to older adults 60-90+ years of age during one testing period. As designed, all functional tests were administered in one testing period. Up to the day of testing, participants followed their normal daily routines and activity patterns. Immediately prior to participating, volunteers completed a medical history questionnaire and signed the informed consent document. Upon completion of the functional tests, data for the Katz Index of ADL was collected either from a nurse or coordinator of the facility who directly observed and interacted with the participants on a daily basis. The Katz Index of ADL was distributed to the nurse or coordinator of the facility immediately following the SFT and collected upon completion. Prior to completion, the nurse or coordinator was provided information describing the three levels of categorization (independent, some assistance, dependent) and a review of the six ADL tasks measured by the Katz Index of ADL. SFT data were collected by an individual trained in the functional fitness measurement and procedures being utilized. Height and weight were measured prior to administering the SFT using a physician’s scale. Participants performed the SFT in the following order: 8-foot up and go, arm curls, chair stand, chair sit-and-reach, back scratch, and the 6-minute walk. Prior to each test, instruction was provided on how to complete each test, as well as time to answer any concerns before beginning the test. A Polar HR monitor (Woodbury, NY) was used to measure pre and post exercise heart rates during the 6-minute walk test. Participants residing in AL and IL facilities were tested on different days. Testing took
place in the wellness or exercise room of the CCRC to ensure adequate space and safety of the residents.

*Height and Weight-*

Height (in.) and weight (lb.) were recorded using a standard physician’s scale.

*8-foot up-and go test-*

Participants were instructed to sit in the middle of a standard folding chair with back straight, feet flat on the floor, and arms resting on the thighs. On the signal of the experimenter, the participant rose from the chair, walked as briskly as possible around either side of a cone placed eight feet in front of the chair and returned to a seated position. Two test trials were conducted and recorded in seconds with the fastest time being used for analysis (Rikli, 2001).

*Arm Curl Test*

As described by Rikli and Jones (2001), participants were instructed to sit in a standard folding chair with back straight, feet flat on the floor, and the dominant side of the body close to the edge of the chair. A 5 lb. dumbbell was used and was held down at the side in the participant’s dominant hand. The participant was instructed to curl the weight up from the down position with the palm rotating to face up. The weight was then returned to the extended down position. During the test, the upper arm remained still. The test was demonstrated slowly to display proper form. Participants were permitted to practice 1-2 repetitions without the weight to confirm understanding of the task. On the go signal, participants were instructed to perform as many arm curls as possible. One trial was administered and the number of curls completed over 30 seconds were recorded.
At the end of 30 seconds, if the participant’s arm was more than halfway up, it was counted as a completed curl (Rikli and Jones, 2001).

Chair Stand Test

Participants were instructed, as illustrated by the SFT, to sit in the middle of a standard folding chair with back straight, feet flat on the floor, with arms crossed and held against the chest. Upon the experimenter’s signal, the participant was instructed to rise to a full stand, then return to a fully seated position as many times as possible over 30 seconds. Before the participant began the test, a demonstration was provided to ensure understanding and proper form (Rikli & Jones, 2001). One test trial was conducted and the total number of stands completed in 30 seconds was recorded. If a participant was more than halfway up at the end of 30 seconds, the final stand was counted (Rikli & Jones, 2001).

Chair Sit-and-Reach Test

Participants were instructed, as indicated by the SFT, to sit on the edge of a standard folding chair. One leg was bent, with one foot flat on the floor. The other leg was extended as straight as possible, with the heel on the floor and foot flexed at approximately 90°. With arms stretched and hands overlapping, the participant was instructed to bend forward as far as possible reaching toward their toes. Participants were instructed to practice using both legs to determine which leg yielded the best distance (in.). Once the participant had at least one practice trial using the pre-determined leg, two test trials were administered and recorded (in.). The best score was used for analysis. For the purpose of this test, the tip of the shoe represented the zero point. Any distance
short of zero was expressed as a negative, while any distance beyond zero was expressed as a positive score. (Rikli & Jones, 2001)

*Back Scratch Test*

As described by the SFT, participants were instructed to stand and put their preferred hand over the same shoulder, palm down and fingers extended reaching down the middle of the back as far as possible. The participant was permitted to practice using both hands to determine which hand position yielded the best distance to the nearest half inch. Participants were instructed to attempt to touch or overlap the middle fingers of both hands, however grabbing the middle fingers and pulling them together was unacceptable. After two practice trials, two test trials were administered. The distance of overlap or the distance remaining between the tips of the middle finger was recorded. As a guideline, if the middle fingers did not touch, scores were recorded as a negative; if the middle fingers barely touched, a zero was recorded; and if the middle fingers overlapped, scores were expressed as a positive. Scores were recorded to the nearest half-inch and the best of the two trials was used for analysis (Rikli, 2001).

*Six-Minute Walk Test*

A 50-yard rectangular area was recommended to be marked off with cones as described by Rikli and Jones (2001). Due to space constraints, a 20-yard area for AL participants and an 18-yard area for IL residents were used. To ensure the safety and care of the participants, chairs were placed along the inside perimeter of the marked path for participants to rest if necessary. Participants were informed that the goal of this task was to safely walk as far as possible over the six-minute time period. Pre-exercise heart rate was recorded after a 5-minute seated rest period. On the experimenter’s signal, the test
began and each lap completed was tallied. During the test, the experimenter announced the remaining time to the participant at 3 minutes, 2 minutes, and 1 minute. Once time had expired, the participant was instructed to stop so the experimenter could record the distance of the last lap completed to the nearest yard. Immediately following the test, post-exercise heart rate was recorded. To encourage participants to perform at their optimal ability, positive feedback and reinforcement was recommended and was used during the test (Rikli & Jones, 2001).

**Statistical Analysis**

Independent t-tests were used to compare the mean results of each component of the SFT for both independent and assisted living participants. A Chi-square test of independence was also calculated to compare the frequency of independent living and assisted living residents in the categories of the Katz Index of ADL. Bonferroni adjustment for multiple tests was used to set the level of significance at .008 (0.05 divided by 6) (Vincent, 2005).

**Sample Size Determination**

G-Power analysis was used to determine a target sample size. Based on a desired power of 0.80 and an effect size of 0.69, the target sample size for this study was 54 participants (n=27 assisted living; n=27 independent living) (Erdfelder & Buchner, 1996).
CHAPTER IV
RESULTS

The purpose of this study was to compare the functional fitness of individuals residing in independent living and assisted living facilities using a series of functional fitness tests to assess strength, balance, flexibility, and aerobic endurance. This chapter is a description of the results.

**Functional Fitness**

Independent-samples t-tests were calculated comparing the mean scores of participants residing in assisted living and residents residing in independent living for each of the functional fitness components. After Bonferroni adjustment for multiple tests, the level of significance was set to .008. No significant difference was found in the chair stand test \( t(19) = 0.043, p = 0.967 \), arm curl test \( t(19) = -0.195, p = 0.848 \), the 8-foot up and go test \( t(19) = 0.561, p = 0.582 \), the chair sit and reach test \( t(19) = -1.08, p = 0.292 \), the back scratch test \( t(19) = -1.375, p = 0.185 \), or the 6 minute walk \( t(18) = 0.217, p = 0.831 \). The percentage differences in each of the six functional fitness components examined are displayed in Table 2. The formula used to determine percentage differences for the six functional fitness variables was: AL score - IL score / AL score * 100.

While not statistically significant, the IL group had slightly greater scores in the arm curl (3.74%), 8-foot up and go test (11.13%), chair sit and reach test (119.80%), and back scratch test (44.0%) than the AL group. In addition, to determine whether the changes in these measures were practically meaningful, effect size was calculated. Cohen’s \( d \) for effect sizes for each measure are listed in Table 2. An effect size of 0.2-0.49 represent small differences; 0.5-0.79 moderate differences; and 0.8 and above
represent large differences (Vincent, 2005). Table 3 displays the mean performance of each group in relation to national performance charts (Rikli & Jones, 2001).
Table 2. Performance scores and percentage differences in functional fitness measures for each group.

<table>
<thead>
<tr>
<th>Functional Test</th>
<th>Mean ± SD</th>
<th>$d$</th>
<th>$p$</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chair Stand Test</strong> (# completed in 30 sec.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assisted Living</td>
<td>5.70 ± 4.15</td>
<td>0.017</td>
<td>0.967</td>
<td>1.75</td>
</tr>
<tr>
<td>Independent Living</td>
<td>5.60 ± 4.64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Arm Curl Test</strong> (# completed in 30 sec.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assisted Living</td>
<td>13.11 ± 4.97</td>
<td>0.085</td>
<td>0.848</td>
<td>-3.74</td>
</tr>
<tr>
<td>Independent Living</td>
<td>13.60 ± 5.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8-foot Up and Go Test</strong> (sec.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assisted Living</td>
<td>14.91 ± 7.01</td>
<td>0.247</td>
<td>0.582</td>
<td>11.1</td>
</tr>
<tr>
<td>Independent Living</td>
<td>13.25 ± 6.44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chair Sit and Reach Test</strong> (in.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assisted Living</td>
<td>-1.05 ± 2.56</td>
<td>0.480</td>
<td>0.292</td>
<td>119.8</td>
</tr>
<tr>
<td>Independent Living</td>
<td>0.208 ± 2.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Back Scratch Test</strong> (in.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assisted Living</td>
<td>-9.90 ± 6.11</td>
<td>0.606*</td>
<td>0.185</td>
<td>44.0</td>
</tr>
<tr>
<td>Independent Living</td>
<td>-5.54 ± 7.86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6-Minute Walk</strong> (yd.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assisted Living</td>
<td>234.89 ± 68.91</td>
<td>0.097</td>
<td>0.831</td>
<td>3.5</td>
</tr>
<tr>
<td>Independent Living</td>
<td>226.64 ± 95.53</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* = Indicates a moderate effect; $d$ = Cohen’s $d$

% difference equation = AL score-IL Score/AL Score * 100
Table 3. Mean functional fitness scores of each group in relation to national performance charts.

<table>
<thead>
<tr>
<th>Functional Test</th>
<th>Performance Chart Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lower body strength</strong></td>
<td></td>
</tr>
<tr>
<td>AL</td>
<td>At risk</td>
</tr>
<tr>
<td>IL</td>
<td>At risk</td>
</tr>
<tr>
<td><strong>Upper body strength</strong></td>
<td></td>
</tr>
<tr>
<td>AL</td>
<td>Normal</td>
</tr>
<tr>
<td>IL</td>
<td>Normal</td>
</tr>
<tr>
<td><strong>Balance and agility</strong></td>
<td></td>
</tr>
<tr>
<td>AL</td>
<td>At risk</td>
</tr>
<tr>
<td>IL</td>
<td>At risk</td>
</tr>
<tr>
<td><strong>Lower body flexibility</strong></td>
<td></td>
</tr>
<tr>
<td>AL</td>
<td>Borderline normal/below average</td>
</tr>
<tr>
<td>IL</td>
<td>Normal</td>
</tr>
<tr>
<td><strong>Upper body flexibility</strong></td>
<td></td>
</tr>
<tr>
<td>AL</td>
<td>At risk</td>
</tr>
<tr>
<td>IL</td>
<td>At risk</td>
</tr>
<tr>
<td><strong>Aerobic Endurance</strong></td>
<td></td>
</tr>
<tr>
<td>AL</td>
<td>At risk</td>
</tr>
<tr>
<td>IL</td>
<td>At risk</td>
</tr>
</tbody>
</table>
Activities of Daily Living

A Chi-square test of independence was also calculated comparing the frequency in independent living and assisted living residents in the categories of the Katz Index of ADL. No significant relationship was found ($\chi^2 (2) = 4.67, p = .097$) in relation to the frequency of categorization using the Katz Index of ADL. Table 4 displays the participants’ categorization in relation to the Katz Index of ADL.

Table 4 Categorization of residents by the Katz Index of ADL

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>IL</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>1</td>
<td>2</td>
<td>21</td>
</tr>
</tbody>
</table>

*Katz Index of ADL categorization: A= Independent in all six ADL’s; B= Independent in all but one ADL; C=Independent in all but bathing and one additional ADL (Katz, 1970)*.
CHAPTER V
DISCUSSION

The purpose of this study was to evaluate the functional fitness of residents residing in assisted living and independent living at a Continuing Care Retirement Community. A discussion and conclusion from the results of this study are included in this chapter.

**Functional Fitness**

This investigation examined components of functional fitness in two groups of residents residing in a CCRC. The null hypotheses for all functional fitness measures were supported by the results of this study. In other words, there was no difference in upper and lower body strength, upper and lower body flexibility, agility and balance, or aerobic endurance between the two groups of participants. The IL group demonstrated better performance in upper body strength, balance and agility, and upper and lower body flexibility than the AL group. To further quantify the difference in functional fitness in the two groups, Cohen’s $d$ for effect size was calculated for all components of functional fitness. Small effects were revealed for balance and agility (0.25), and lower body flexibility (0.48). A moderate effect size was found for upper body flexibility (0.61). In other words, though not statistically significant, Cohen’s $d$ for both upper and lower body flexibility further support the suggestion that there is a practical difference in the calculated percentage differences for these variables.

Therefore, in the functional fitness components examined in AL and IL residents utilizing this battery of tests, this investigation demonstrates that practical functional differences exist in at least two components of functional fitness in CCRC residents. It is
expected that with a larger sample size, significant differences between these groups of residents would become evident. Nonetheless, upper body flexibility and lower body flexibility appear to be the most distinctive functional characteristics differentiating the two groups. According to the SFT performance charts established by Rikli and Jones (2001), regardless of living status, both groups of participants were categorized as at risk for loss of functional mobility in four of the six functional fitness tests.

Participants in the AL group were also categorized as at risk for loss for functional mobility in balance and agility and upper body flexibility (Rikli & Jones, 2001). When assessing lower body flexibility, participants’ average performance in the IL group was within the normal range, while the lower body flexibility performance of AL participants was on the border of normal to below average based on established performance charts for their age (Rikli & Jones, 2001). Furthermore, participants in both groups were also characterized as at risk for decreased functional mobility in relation to lower body strength and aerobic endurance. However, both groups performed within the normal range for upper body strength. These notable functional limitations suggest that both AL and IL residents are at an increased risk for functional decline.

Therefore, this research has helped identify probable limitations in functional fitness among CCRC residents. Balance and agility, upper body flexibility, lower body strength, and aerobic endurance appear to be the most distinct risk factors for loss of functional ability in both assisted living and independent living residents. Further research with a larger sample size is needed to support this rationale. To date, previous research has not identified specific limitations in the functional fitness of various populations of older adults. The majority of research conducted has focused on the
effects of several training programs on functional fitness. In fact, a diverse range of exercise interventions have proven effective in improving components of functional fitness.

Cavani et al. (2002) and Toraman et al. (2004) suggest that multi-component programs consisting of either stretching or an aerobic component in addition to resistance training significantly improve performance on functional fitness tasks in community dwelling independent older adults. More specifically, components of functional fitness including upper and lower body strength, balance and agility, and lower body flexibility significantly improved upon the completion of a multi-component exercise program. Additional investigations have also examined the effects of exercise programs in populations of older adults with limited functional ability and extremely frail individuals. Highly significant gains in lower extremity muscular strength (Fiatarone et al., 1990), VO₂ (Binder et al., 2002), and greater improvements in physical performance tests have been found (Brandon et al., 2000; Fiatarone et al., 1990). Others (Topp et al., 2005) have also suggested that various types of exercise including aerobic training, resistance training, and a combined aerobic and resistance program exhibit significant improvements in functional ability. However, changes in function appear most evident after resistance training. This suggests that resistance training is a more appropriate means to improve functional performance in older adults (Topp et al., 2005).
Activities of Daily Living

An additional goal of this study was to determine the frequency of AL and IL residents in the categories of the Katz Index of ADL. The null hypothesis for the categories of the Katz Index of ADL was supported by the results of this study. Specifically, there was no significant relationship between the frequency of AL residents rated by an AL aid and IL residents rated by the IL coordinator in the categories of the Katz Index of ADL. All 12 participants in the IL group were rated as completely independent in the six ADL’s assessed by the Katz Index of ADL. Generally, residents residing in an IL facility of a CCRC are required to independently perform BADLs such as those addressed in the Katz Index of ADL (Bettelheim, 2001). Though not significant, the results of this study do support that independent living residents perform BADLs as assessed by the Katz Index of ADL on their own. However, as indicated by measures of functional fitness, IL participants in this investigation are at an increased risk for loss of functional mobility in relation to upper body flexibility, lower body strength, aerobic endurance, and balance and agility. In turn, though not identified by the Katz Index of ADL, these functional limitations may progress to more difficulty performing ADLs. Thus, as past literature supports (Maddox, 1987; Peck, 2005; Spirduso et al., 2005) utilizing subjective ADL assessments like the Katz Index of ADL may not be an adequate and reliable indicator of ADL performance in relation to components of functional fitness. Therefore, using a functional fitness test which examines specific components required to execute daily living tasks appears more appropriate when assessing the functional performance of residents residing in a CCRC.
Residents in AL are typically those who need assistance with IADLs such as cooking and managing medications in addition to assistance with BADLs such as bathing and dressing. During this investigation, 6 participants in the AL group were categorized as completely independent in performing the six ADL’s assessed by the Katz Index of ADL. One participant was rated as independent in all but one ADL; this participant was categorized as needing some assistance bathing one part of the body such as the back or leg. The remaining two participants were rated as independent in all ADLs with the exception of bathing and one additional ADL (Katz, 1970). Specifically, in addition to bathing, these two participants were rated as also needing some assistance dressing or some assistance transferring. Activities of daily living like dressing, transferring, and bathing require considerable amounts of balance, flexibility, and muscular strength to be executed independently. Though the majority of AL participants in this investigation appear to be independent in the ADLs assessed by the Katz Index, further research is needed to clarify this assumption. As indicated by the functional fitness measures evaluated in this investigation, AL participants exhibit functional limitations in upper body flexibility, lower body strength, aerobic endurance, and balance and agility. Additionally, AL participants were borderline below average when lower body flexibility was assessed.

It is important to mention that there may be additional factors including cognitive limitations which have also contributed to these individuals being placed in assisted living. Additional research is needed to evaluate this suggestion. Another factor to consider is placement of individuals into AL or IL. For instance, on occasion a spouse of an assisted living resident who is independent both functionally and cognitively will live
in assisted living to remain close to their loved one. In other words, living placement may not be determined strictly from functional or cognitive limitations.

Nonetheless, this investigation supports the suggestion that subjective ADL assessments do not adequately assess the functional abilities of individuals. Functional fitness assessments, such as the Senior Fitness Test, are suggested to be more appropriate indicators of functional performance. Therefore, participants in the current investigation may benefit from a resistance training program or multi-component training program such as those utilized in past research in an effort to improve components of functional fitness and maintain current residential status (Binder et al., 2002; Brandon et al., 2000; Fiatarone et al., 1990; Topp et al., 2005).

**Limitations**

There were several limitations in this investigation. First, the small sample of participants in this investigation did not provide adequate power to appropriately determine if significant differences in functional fitness or frequency of ADL categorization exist between groups. Also, conclusions regarding functional fitness and ADL categorization in relation to CCRC residents from this investigation are only applicable to females, 60 years of age and older. Additionally, due to space constraints, the perimeter of the 6-minute walk was altered. This modification may have limited the performance of participants due to the small area available. It is also important to mention that this study is based on the current living placement of both groups of participants during the time of this study, and was assumed to accurately represent ability to live independently. Finally, this investigation did not examine any cognitive measures. Though not measured, some cognitive limitations including disorientation and memory
lapses were observed and most evident in AL residents. Further investigation into the
cognitive status of residents in a CCRC may provide more insight on determining living
placement for CCRC’s.

**Recommendations**

Several opportunities exist to expand on the findings of this investigation. Further
research, including a larger sample of participants, is needed to clearly define the
functional fitness parameters which place older adults residing in CCRCs at risk for loss
of mobility and independence. Though various exercise interventions for older adults
have proven effective in improving components of functional fitness, the majority have
focused on community dwelling older adults. Examining the effects of an exercise
training program in relation to CCRC residents and the levels of care provided by CCRCs
may also be of future interest. Furthermore, assessing cognitive status of residents
combined with components of functional fitness should also be considered when
determining living placement for residents. Though not analyzed in the current study,
observable cognitive differences in relation to memory and following instructions across
AL and IL residents were evident. This recognizable difference may play a role in living
placement.

**Conclusion**

Although there were no significant differences found in functional fitness or
frequency of ADL categorization, this investigation demonstrates that evaluating
functional performance via a functional fitness test rather than a subjective ADL
assessment identifies more specific functional limitations than subjective ADL
assessments. Though not statistically significant, IL residents exhibited better
performance in balance and agility, upper body strength, and upper and lower body flexibility. However, these residents are still at an increased risk for loss of mobility. As our aging population continues to grow and more older adults are in need of services provided by CCRC’s, it is vital to aid in improving or maintaining the functional fitness of this population. Development of specific activity programs targeting functional fitness parameters in CCRC’s based on the findings of this investigation may aid in this effort, thus increasing the likelihood of individuals executing more daily living activities safely and independently.
References


APPENDIX A:

MEDICAL HISTORY QUESTIONNAIRE
MEDICAL HISTORY QUESTIONNAIRE

All information given is personal and confidential. It will enable us to better understand you and your health and fitness habits. In addition, we will use this information to classify your health status according to the American College of Sport Medicine in ACSM's Guidelines for Exercise Testing and Prescription (2006). Please let us know if and when you have changed your medication (dose & type), diet, exercise or sleeping habits within the past 24 or 48 hours. It is very important for you to provide us with this information.

NAME______________________________________________ AGE___________________ DATE___________________
OCCUPATION________________________________________________________________________________________

1. FAMILY HISTORY

Check each as it applies to a blood relative:

* Heart Attack       yes______ no_____ unsure______
   If yes, age at onset __________ years

* Sudden Death       yes______ no_____ unsure______
   If yes, relation to you __________________________
   Age of relative at onset __________ years.

Father’s Age ______ Deceased ______ Age at death ______

2. PERSONAL HISTORY

Check each as it applies to you:

* Current Cigarette Smoking       yes______ no_____ unsure______

* High Blood Pressure       yes______ no_____ unsure______
   Systolic Blood Pressure ≥140mmHg or diastolic ≥90mmHg
   If yes, give value if known: __________/________ mmHg.

* High Blood Cholesterol       yes______ no_____ unsure______
   Total Serum Cholesterol >200 mg·dl⁻¹
   If yes, give value if known: __________ mg·dl⁻¹

* Diabetes Mellitus       yes______ no_____ unsure______
   If yes, age of onset: ___________ years

* Obesity – BMI >30 kg·m⁻²       yes______ no_____ unsure______
   If yes, give value if known: ___________ kg·m⁻²

* Sedentary Lifestyle       yes______ no_____ unsure______
   Persons not participating in a regular exercise program or not meeting the minimal physical activity recommendations from the U.S. Surgeon General’s Report.


For Office Use Only:

_____ Number of coronary heart disease risk factors* (according to Table 2-4 ACSM (2006)}
NOTE: All risk factors are explained verbally to each person completing the questionnaire.
Classification according to ACSM (2006) (check one): _____ Low risk; _____Moderate risk; _____High risk

3. MEDICAL HISTORY

Name of your physician__________________________________________________________

Date of your most recent physical examination_____________________________________

What did the physical examination include?__________________________________________

Have you ever had an exercise EKG? Yes_______ No________

Are you presently taking any medications? Yes_______ No________
(Including over-the-counter medications and/or herbs) List name and dosage

Have you ever taken:

Digitalis yes______ no______ unsure______
Nitroglycerin yes______ no______ unsure______
High Blood Pressure medication yes______ no______ unsure______
Sedatives yes______ no______ unsure______
Inderal yes______ no______ unsure______
Insulin yes______ no______ unsure______
Pronestyl yes______ no______ unsure______
Vasodilators yes______ no______ unsure______
Other yes______ no______ unsure______

If yes, list medications:__________________________________________________________

4. EXERCISE HISTORY

Do you exercise? Yes______ No______ What activity_____________________________________

How long have you been exercising?______________________________________________

How many days do you exercise?___________ How many minutes per day?_____________

What kinds of shoes do you work out in?__________________________________________

Where do you usually exercise?__________________________________________________

Do you monitor your pulse during your workout?____________________________________
5. HEALTH HISTORY

<table>
<thead>
<tr>
<th>Height</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

At Age 20 | At Age 30 | At Age 40 | One Year Ago | Most Weighed | Least Weighed | After Age 20 |
|----------|-----------|-----------|--------------|--------------|---------------|--------------|

Do you use Health Foods? Yes____ No____ List___________________________________________________

Do you take Vitamin pills? Yes____ No____ List___________________________________________________

Approximate your daily intake: Coffee_____ tea_____ coke_____ beer_____ wine_____ liquor_____

Do you smoke or use tobacco products? Yes____ No____

If yes, approximate your daily usage: Cigarettes_____ Cigars_____ Pipes_____ Chewing Tobacco_____

Did you ever smoke? Yes____ No____ How many years? ____________ Age when you quit ____________

Approximate the number of hours you work per week? _______________ Vacations weeks per year _______________

Home Status: Very happy__________ Pleasant__________ Difficult__________ Problem__________

Work Status: Very happy__________ Pleasant__________ Difficult__________ Problem__________

Do you feel you are stressed? Yes_____ No_____ Unsure_____

Are you worried about your health? Yes____ No_____ Unsure_____

6. APPROXIMATE A TYPICAL 24 HOUR DAY FOR YOU

Number of hours:

Work
TV
Relaxation/Leisure activities
Driving/Riding
Eating
Exercise
Sleep
TOTAL

Additional information from client interview to further assess health/coronary risk status:

_____________________________________________________________________________________________________
_____________________________________________________________________________________________________
_____________________________________________________________________________________________________
_____________________________________________________________________________________________________
_____________________________________________________________________________________________________
_____________________________________________________________________________________________________
_____________________________________________________________________________________________________
APPENDIX B:

INFORMED CONSENT FORM
Informed Consent

Investigator: Lauren N. Snyder                         Phone: (419) 372-0212

Project Title: An Evaluation of functional fitness in assisted living and independent living residents

Purpose: You are invited to participate in a research study on how certain fitness components like flexibility and balance affect your performance of everyday activities. As part of my work on a Master of Education degree in the Department of Kinesiology, I am conducting a study of women 60 years of age and older.

The entire study will last approximately 2 hours. If you would like to stop participating in the study at any time, you may do so. You are not required to complete this study.

Procedures: This study will require you to perform 4 fitness tasks: 1) stand from a chair and walk 8-feet, go around a cone and return back to the chair; 2) lift a 5 pound weight with your arm as many times as possible in 30 seconds (while sitting in a chair); 3) determine how many times you can rise from a chair in 30 seconds; 4) determine how far you can walk in 6 minutes. We will also measure your height and weight. We will also look at how flexible you are by asking you to 1) reach behind your back and 2) to sit in a chair and reach toward your toes.

Before you perform these tasks, you will be asked to fill out a paper listing any medication or other health information you feel is important for us to know. We will also ask an employee of your residence who you feel comfortable with, like a nurse or an aid, to complete a form which looks at and rates your ability to complete these everyday life activities: 1) bathing; 2) dressing; 3) grooming; 4) toileting; 5) feeding; 6) continence.

Risks: While participating in this study, the anticipated risks to you are no greater than those normally encountered in daily life. You may be sore from walking or lifting the weight. All precautions will be taken to minimize these risks. In case of injury, appropriate emergency measures will be taken. You will be responsible for paying for any emergency measures that may be required.
Benefits: You will learn about your health and your ability to complete basic physical tasks that relate to everyday living. The information we gather will help to design health programs for other people. If you complete the entire study, we will meet with you to discuss your results and provide you with exercises to help improve or maintain your physical independence.

Confidentiality: Information you provide will remain confidential and your identity will not be revealed. Only members of the research team will have access to the information you provide. Your individual results and information will be combined with other participants' information for a general analysis. Your identity will not be revealed in any published results.

Voluntary Participation: Your participation in this study is completely voluntary, and you can refrain from answering any or all questions without penalty or explanation. If you decide to participate and change your mind during the study, you may withdraw your consent and stop participating at any time without penalty or explanation.

Contact Information: If you have questions or comments about this study, you can contact Lauren Snyder at linsnedy@bgsu.edu or Dr. Amy Morgan, my project advisor, at amorgan01@bgsu.edu. If you have questions or concerns about your rights as a research participant, you may contact the Human Subjects Review Board, Bowling Green State University, (hsrb@bg su.edu).

Authorization: I have read this document and all of my questions have been answered. I volunteer to participate in this study.

Participant’s Signature ___________________________ Date ____________
APPENDIX C:

KATZ INDEX OF ADL
Table 1.—Index of Independence in Activities of Daily Living

The Index of Independence in Activities of Daily Living is based on an evaluation of the functional independence or dependence of patients in bathing, dressing, going to toilet, transferring, continence, and feeding. Specific definitions of functional independence and dependence appear below the index.

| A | Independent in feeding, continence, transferring, going to toilet, dressing, and bathing. |
| B | Independent in all but one of these functions. |
| C | Independent in all but bathing and one additional function. |
| D | Independent in all but bathing, dressing, and one additional function. |
| E | Independent in all but bathing, dressing, going to toilet, and one additional function. |
| F | Independent in all but bathing, dressing, going to toilet, transferring, and one additional function. |
| G | Independent in all six functions. |
| Other | Dependent in at least two functions, but not classifiable as C, D, E, or F. |

Independence means without supervision, direction, or active personal assistance, except as specifically noted below. This is based on actual status and not on ability. A patient who refuses to perform a function is considered as not performing the function, even though he is deemed able.

**Bathing (Sponge, Shower, or Tub)**

- Independent: assistance only in bathing a single part (as back or disabled extremity) or bathes self completely.
- Dependent: assistance in bathing more than one part of body; assistance in getting in or out of tub or does not bathe self.

**Dressing**

- Independent: gets clothes from closets and drawers; puts on clothes, outer garments, braces, mahees, fasteners; act of tying shoes is excluded.
- Dependent: does not dress self or remains partly undressed.

**Going to Toilet**

- Independent: goes to toilet; gets on and off toilet; arranges clothes; cleans organs of excretion; may manage own bedpan used at night only and may or may not be using mechanical supports.
- Dependent: uses bedpan or commode or receives assistance in getting to and using toilet.

**Transfer**

- Independent: moves in and out of bed independently and moves in and out of chair independently (may or may not be using mechanical supports).
- Dependent: assistance in moving in or out of bed and/or chair; does not perform one or more transfers.

**Continence**

- Independent: urination and defecation entirely self-controlled.
- Dependent: partial or total incontinence in urination or defecation; partial or total control by enemas, catheters, or regulated use of urinals and/or bedpans.

**Feeding**

- Independent: gets food from plate or its equivalent into mouth; preparation of food, as buttering bread, are excluded from evaluation.
- Dependent: assistance in act of feeding (see above); does not eat at all or parental feeding.

**Table 2.—Evaluation Form**

Name..........................................................Date of evaluation..................

For each area of functioning listed below, check description that applies. (The word “assistance” means supervision, direction of personal assistance.)

**Bathing**—either sponge bath, tub bath, or shower.

- Receives no assistance (gets in and out of tub by self if tub is usual means of bathing).
- Receives assistance in bathing only one part of the body (such as back or a leg).
- Receives assistance in bathing more than one part of the body (or not bathed).

**Dressing**—gets clothes from closets and drawers—including underclothes, outer garments and using fasteners (including braces if worn).

- Gets clothes and gets completely dressed without assistance.
- Gets clothes and gets dressed without assistance except for assistance in tying shoes.
- Receives assistance in getting clothes or in getting dressed, or stays partly or completely undressed.

**Toileting**—going to the “toilet room” for bowel and urine elimination; cleaning self after elimination, and arranging clothes.

- Goes to “toilet room,” cleans self, and arranges clothes without assistance (may use object for support such as cane, walker, or wheelchair and may manage night bedpan or commode, emptying same in morning).
- Goes to “toilet room” or in cleaning self or in arranging clothes after elimination or in use of night bedpan or commode.
- Doesn’t get to room termed “toilet” for the elimination process.

**Transfer**

- Moves in and out of bed as well as in and out of chair without assistance (may be using object for support such as cane or walker).
- Moves in or out of bed or chair with assistance.
- Doesn’t get out of bed.

**Continence**

- Controls urination and bowel movement completely by self.
- Has occasional “accidents.”
- Supervision helps keep urine or bowel control; catheter is used, or is incontinent.

**Feeding**

- Feeds self without assistance.
- Feeds self except for getting assistance in cutting meat or buttering bread.
- Receives assistance in feeding or is fed partly or completely by using tubes or intravenous fluids.