

**THE EFFECTS OF A MOVEMENT COMPETENCE
PROGRAMME ON THE FUNCTIONAL CAPACITY,
SELF-PERCEPTION AND RESILIENCE OF OLDER
ADULT WOMEN**

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Declaration

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and has not previously, in its entirety or partially, been submitted at any University for the purpose of obtaining a degree

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Abstract

Global aging is occurring at an unprecedented rate. South Africa has the highest proportion of older adults in Southern Africa, with nearly 7% of the population over the age of 60 years in 1997. However, although people are living longer, statistics show that they are not necessarily living healthier. The majority of women who outlive men have to deal with more chronic diseases as well as a poorer functional status than the latter. The purpose of the present study was to implement a movement competence programme suited to the needs of South African older adult women; requiring inexpensive apparatus and that can be performed in any environment.

A time-series design was used which included follow up testing 9 months after the cessation of the movement competence programme. The intervention group consisted out of 21 (76.14 ± 5.44 years) older adult women, who were randomly selected from a retirement village. The movement competence programme was broad based in nature and was performed in two one hourly sessions a week for 12 weeks. After pre-tests of functional capacity, self-perception and resilience, the older adult women were tested using the Physical Self-Perception Profile (Fox & Corbin, 1989) and the Resilience Scale (Connor & Davidson, 2003) respectively. Significant improvements ($p < 0.05$) were observed in the Berg Balance Scale, 8-Foot Up-and-Go and the Physical Self-Perception's results of the older adult women. No significant ($p > 0.05$) difference was noted in the Barthel Index and Resilience Scale after the 12-week movement competence programme. Follow up testing indicated a significant improvement in the resilience of the older adult women who continued to exercise, compared to those that chose a sedentary lifestyle after the movement competence programme.

Opsomming

Globale veroudering vind teen 'n ongekende tempo plaas. Suid-Afrika beskik oor die hoogste verhouding ouer volwassenes in Suidelike Afrika met amper 7% van die populasie in 1997 ouer as 60 jaar. Hoewel mense egter langer lewe toon statistiek dat hulle nie noodwendig gesonder lewe nie. Die meerderheid dames wat langer lewe as mans het te kampe met meer chroniese siektes asook 'n swakker funksionele status as dié van laasgenoemde. Die doel van die huidige studie was om 'n bewegingsbevoegdheidsprogram te implementeer wat aan die behoeftes van ouer Suid-Afrikaanse volwasse dames voldoen, waar goedkoop toerusting benodig word en in enige omgewing uitgevoer kan word.

'n "time-series" ontwerp was gebruik wat opvolgtoetse ingesluit het nege maande ná die beëindiging van die bewegingsbevoegdheidsprogram. Die intervensiegroep het bestaan uit 21 (76.14 ± 5.44 jaar) ouer volwasse dames wat lukraak geselekteer is by 'n aftree-oord. Die bewegingsbevoegdheidsprogram was breed in fokus en was uitgevoer in twee eenuurlikse sessies per week vir 12 weke. Ná voortoetse oor funksionele kapasiteit, selfpersepsie en veerkrag, is die ouer volwasse dames getoets deur respektiewelik gebruik te maak van die Fisieke Selfpersepsie Profiel (Fox & Corbin, 1989) en die Veerkrag skaal (Connor & Davidson, 2003). Beduidende verbeterings ($p < 0.05$) van die ouer volwasse dames is waargeneem in die Berg Balansskaal, "8-Foot Up-and-Go" en die resultate op die Fisieke Selfpersepsie. Geen beduidende ($p > 0.05$) verskil is waargeneem in die Barthel Indeks en Veerkrag skaal ná die 12 weke aanbieding van die bewegingsbevoegdheidsprogram nie. Opvolgtoetse het 'n beduidende verbetering aangedui in die veerkrag van die ouer volwasse dames wat aangehou het met oefening in teenstelling met dié wat gekies het om 'n sedentêre leefstyl te volg nadat die bewegingsbevoegdheidsprogram voltooi is.

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Chapter One

Setting the Problem

The world's aged population are growing at an unprecedented rate (Jones & Rose, 2005). One aspect of this dramatic demographic change is due to the increase in people's longevity, and the social, financial and health consequences of this aspect cannot be ignored (Lautenschlager, Almeida, Flicker & Janca, 2004). In the United States, the older population (above the age of 65) totalled 36.3 million in 2004. They represented 12.4% of the American population - about one in every eight people (Administration on Aging, 2005). The "old-old," who are individuals over the age of 85 years, constitute the most rapidly growing segment of society (Chodzko-Zajko, 2006).

Within Africa, the absolute number of older adults is projected to increase dramatically: from 47.4 million in 2005 to 193 million by 2050 (Kalula, 2007). South Africa's population over the age of 60 years constitute 7% of the total population and represent the fastest growing segment of the population (Kolbe-Alexander, Lambert & Charlton, 2006). In addition, 61% of all aged persons within South Africa are female (Commission on Gender Equality, 2003). Racially, more than one fourth of the white population are aged 50 years and older (Kinsella & Ferreira, 1997).

The increase in the older adult population is partly due to the increase in life expectancy globally. The average life expectancy for Americans born in 1990 was 47 years compared to 77 years for those born in 2001. Within South Africa, white women out live black men by 25 years and live to be an average age of 77. This dramatic increase in life expectancy in recent decades, has largely been due to improvements in health care, sanitation and more frequent use of preventative health measures (Kinsella & Ferreira, 1997).

However, statistics also show that although people might be living longer, they are not necessarily living healthier (Rikli, 2005). Women constitute the highest proportion of the elderly population as well as have the highest life expectancy compared to men. They also have higher rates of disability and a poorer functional

status than men of the same age. The reason for this is not that more women have disabilities than men but that women with disabilities live longer than men with functional limitations (Aging well, living well, 2006). Amongst the older adult population of South Africa, 70% (age 65 and over) have a chronic illness or health condition that results in functional limitations (Kinsella & Ferreira, 1997; Kolbe-Alexander, et al., 2006).

Aging is associated with physical decline that brings with it an increase in dependency on others. According to the American College of Sports Medicine (2003), physical decline associated with aging can be due to a number of complex interactions, including normal aging, disease, and disuse. Research concludes that with normal aging there is a loss of physical function that can eventually threaten independent living and the capacity to perform activities of daily living (ADL). The rate of physical decline is approximately 0.75% to 1% each year, commencing at the age of 25 years (Govindasamy & Paterson, 1994). Little evidence suggests differences in aging among women and men (Pearl, 1993). In addition, the rate at which aging occurs is not uniform across the population (American College of Sports Medicine, 2000).

Together with physical decline associated with aging are various psychological changes. Depression, anxiety and cognitive decline are a few of the mental disorders most frequently experienced by older adults. Depression, which is the most common of these disorders, is closely associated with dependency and disability amongst the older adult population (Wynchank, 2004). Depressive symptoms have also been linked to increases in physical inactivity with aging (Chodzko-Zajko, 2006).

Fortunately, leading chronic illnesses such as heart disease and diabetes amongst the older adult population, as well as psychological decline accompanying physical deterioration of aging, often can be delayed, treated, and prevented (Chodzko-Zajko, 2006). Brody (1998) concluded that living a healthier lifestyle not only allows an individual to live longer, but also better. He found that those who follow a healthy lifestyle experience only half as many serious health problems, compared to those that lead an unhealthy lifestyle.

Physical activity has been shown to help individuals either postpone or avoid a number of chronic diseases and physical decline. In so doing, an active lifestyle maintains the functional attributes necessary for performing the tasks of daily living easier. It also reduces the risks of falls and makes participation in many recreational activities possible (Gretebeck, Black, Blue, Glickman, Huston & Gretebeck, 2007; Jones & Rose, 2005; Kolbe-Alexander et al., 2006; Mazzeo, Cavanagh, Evans, Fiatarone, Hagberg, McAuley & Startzell, 1998). An enhanced functional capacity is viewed as possibly being the most important benefit of remaining active (Shepherd, 2004).

Physical activity has been shown to have many psychological benefits for the aging female (Pearl, 1993). Examples of some of these benefits are, preserved cognitive function, alleviation of depression, and improved concept of personal control and self-efficacy (Lucidi, Lauriola & Leone, 2004; Mazzeo et al., 1998). The World Health Organisation (2003) stated that physical activity is particularly important for women in preventing and treating depression. Double the amount of women compared to men experience depression in developing as well as developed countries. Furthermore, physical activity participation is associated with various important and valuable social implications. A social support network is formed by the exercise group, forming new meaningful relationships, which is exceptionally important in maintaining good mental health (Centers for Disease Control and Prevention, 2004).

Physical activity has specifically been shown to significantly improve individual's physical self-perceptions. Many research studies have produced evidence that regular physical activity can improve physical self-perceptions in various age groups and contexts (Fox, cited in Edwards, Ngcobo, Edwards & Palavar, 2005). Whaley (2004) reported that the relationship between self-perceptions and participation in physical activity has been extensively studied in adult populations, and there is considerable evidence that self-perceptions directly and indirectly affect successful aging.

The physiological and psychological benefits of exercise have been well documented. However, there are still an alarming number of people who remain inactive (Jones & Rose, 2005; Rikli, 2005). In the United States, only 31% of

people aged 65-74 participate in 20 minutes of moderate physical activity three or more times a week (De Vreede, Samson, Van Meeteren, Duursma, & Verhaar, 2005). A sedentary lifestyle is considered to be one of the most important factors contributing to loss of independent performance of daily tasks among older adults (De Vreede, et al., 2005; Puggard, 2003).

In South Africa, inactivity levels are also high, varying according to race, gender, educational levels and socio-economic status (Kolbe-Alexander et al., 2006). South African women, who have low education levels and come from poor socio-economic backgrounds, are more inactive than other South African women. This has been attributed to their lack of education concerning the implications of exercising as well as poor accessibility to exercise facilities (Erasmus, Wilders & Meyer, 2005).

There are many possible reasons for these high levels of inactivity globally. According to Chodzko-Zajko (2005), there is a persistent aging fallacy in which individuals within society view the aging process as only negative, and that exercising only worsens their condition. In addition, older adults perceive exercise as unsafe and avoid taking part in any physical activity due to the fear of falling or aggravating past injuries. Fear of falling results in a self-imposed reduction in physical activity, which is associated with further increases in frailty and independence). In addition to these reasons, the majority of the exercise interventions in South Africa are focused on children, and the South African older adult population are often neglected in programme delivery (Kalula, 2007). Kinsella and Ferreira (1997) stated that a further concern for older South Africans is that the majority of the health programmes focus their attention on childcare and not on the ever-increasing geriatric population and the consequences that accompany this neglect.

Drastic measures are needed to reverse these trends and the perceptions that are contributing towards the global inactivity epidemic. There is a need to persuade older people that it is safe and beneficial to become more active and change the aging stereotypes of society (Jones & Rose, 2005). The benefits of exercise for the older adult population are too important for slowing down the rate at which aging occurs and preserving their independence, to be ignored. With the

dramatic increase within this population group, various measures need to be implemented in order to extend their quality of life and independence (Rikli, 2005).

For the older adult population, maintenance of mobility and functional capacity should be important exercise outcomes. Impaired balance and gait are the two most significant risk factors for limited mobility and falls in the elderly (Daley & Spinks, 2000). Several studies have shown impaired balance to be a factor associated with falls among older adults (Jansson & Söderlund, 2004). Exercise interventions aimed at reducing falls in the elderly are based on the assumption that falling in the elderly is related to poor control of balance and that balance can be improved by practice and exercise (Shupert & Horak, 1999). Balance is viewed as a prerequisite to functional capabilities because it is a requirement for the successful performance of ADL (Gertenbach, 2002).

Their level of functional ability determines the extent to which they can cope independently in the community, participate in events, visit other people, make use of the services and facilities provided by society, and generally enrich their own lives and those of the people closest to them. (World Health Organization, 1998, p.2)

Statement of the Problem

The dramatic growth in the older adult population throughout most of the world as well as locally within South Africa, has important implications for researchers, health care providers, policy makers and others interested in addressing the challenges that accompany aging. Unfortunately, statistics show that although people are living longer they are also living with an increased prevalence of chronic disease (Rikli, 2005). Within South Africa, 70% of the adults in the age group of 65 years and older have chronic illnesses (Kinsella & Ferreira, 1997). One of the greatest challenges facing this population is being able to carry out ADL (Rikli, 2005).

Functional dependence on others to perform ADL is one of the most serious health problems encountered by elderly people today (Daley & Spinks, 2000).

With the continuing growth of elderly populations in modern societies, it has become a matter of increasing urgency to look for ways to maintain and improve the functional abilities of ageing people, to help them cope independently in the community and ultimately, to raise the quality of their lives. (World Health Organization, 1998, p. 1)

The combination of physiologic function coupled with cognitive and environmental factors can lead to an increase in disability and decreased functional capacity to perform ADL. This decrease in ability to carry out ADL independently tends to be cyclic in nature. In other words, there is a cycle in which decline in ADL performance may be followed by a temporary recovery or improvement in the ability to carry out these activities independently again (Trader, Newton & Cromwell, 2003). According to Trader et al., (2003) in a given year, approximately 10% of community dwelling older adults show a decline in performance of ADL and 20-25% of community dwelling older adults may demonstrate improvements (recovery) in ADL activities.

Associated with this decline in performance of ADL is an increased risk of falling. The decreased ability to perform basic tasks such as bed transfers and walking up stairs have been identified as risk factors for falls (Trader et al., 2003). Falls are a large concern amongst the elderly. In the United States, falls and related injuries are currently the sixth leading cause of death among persons over the age of 65 years and the leading cause of death among adults over the age of 85 years (Trader et al., 2003). Up to 30% of community-dwelling older American adults above the age of 65 years have fallen at least once (Lajoie, et al., 2002).

Research on falls and related injuries in Africa is sparse (Kalula, 2007). Fear of falling is an important factor that affects the willingness of older adults to take part in physical activity (Boulgarides, McGinty, Willet & Barnes, 2003). The result is a sedentary lifestyle, whether it is due to the fear of falling or to a decrease in mobility and balance, which accelerates the decline of muscle force production as well as decreases quality of life in general (Chodzko-Zajko, 2005).

Loss of functional capacity, independence as well as an increased fall risk are all associated with a decrease in the individual's self-efficacy, which in turn

effects their quality of life and ability to cope (Boulgarides et al., 2003; Trader et al., 2003). The physical, psychological and social consequences of a decline in an individual's quality of life often results in an increase in frailty and the chances for future falls (Trader et al., 2003). Resourcefulness in the performance of ADL as well as an increase in physical activity by older adults is associated with a lower risk of mortality (Ginzburg, Shmotkin, Blumstein & Shorek, 2005). Consequently there is a desperate need for interventions that improve older adults ability in performing everyday activities and in turn improve their individual quality of life.

Despite evidence that physical activity is an important factor in preserving functional mobility and a form of treatment in reducing certain chronic diseases within the older adult population, there remains an increase in inactivity among older adults. This sedentary lifestyle is seen increasingly among women, people from low-income groups and among those with low-education levels (Kolbe-Alexander, et al., 2006). In addition, inactivity is considered to be one of the most important factors contributing to loss of independent performance of daily tasks, which has been associated with increased dependency on others and a negative impact on self-efficacy (De Vreede, et al., 2005).

Significance of the Study

“The combination of an increasing population of older adults and escalating health care cost contribute to a major health care problem. In the United States alone, older adults account for more than one third of health care spending” (Gertenbach, 2002, p.6).

Although older individuals are living longer they are not necessarily living healthier with the highest prevalence of chronic diseases being in this age group. Rising health costs associated with the increase in disability, disease and dependency on others, place a heavy burden on the increasing older adult population (Rikli, 2005). In 1990, at least 92% of previously disadvantaged older South Africans had no medical insurance, yet 90% had annual medical expenses. This highlights the financial burden of disease amongst the older adult population in communities within South African (Kolbe-Alexander et al., 2006).

Worldwide fall related injuries are a serious public health issue, especially among older adults (Kalula, 2007). Falling and the associated health conditions place further strain on both the older adult individual as well as members within society. "The cost of falling is high both to the individual in terms of physical and psychological trauma, loss of independence, or even death, and to health and allied services in terms of resources and bed occupancy." (Close, Ellis, Hooper, Gluckman, Jackson & Swift, 1999, p.98)

In the United States, falls are not only the leading cause of death but also result in the greatest total lifetime costs among adult's ages 65 and older. In 2000, these costs were more than 19 billion dollars with women accounted for 51% of the cost of all lifetime injuries (Finkelstein, 2006). The literature concerning the cost of falls within Africa is scarce. With inadequate information on falls and poor mobility among the elderly in Africa, economic costs for related morbidity and mortality can only be estimated (Kalula, 2007). Kalula (2007) stated that the fear of falling amongst the elderly is a long lasting condition and should be addressed in intervention studies. "Important benefits for both the individuals as well as the society, therefore relate to ensuring independence among elderly people as long as possible" (Puggard, 2003, p. 70).

In South Africa, the older adult population are growing dramatically, which results in serious implications on the financial resources of the country. More and more older adults are living with chronic disabilities associated with aging (Erasmus et al., 2005). The majority of older adults who live the longest are women, and some of these women are widowed and have to care for their grandchildren. To complicate the situation, most South African women report a sedentary lifestyle, which contributes further to a reduction in quality of life (Erasmus et al., 2005).

"As more individuals live longer, it is imperative to determine the extent and mechanisms by which exercise and physical activity can improve health, functional capacity, quality of life, and independence in this population." (Mazzeo et al., 1999, p.115)

Preserving independence is possible through the treatment of chronic diseases and through modifications in lifestyle, such as an increase in regular physical activity. Even among older adults, regular physical activity has been associated with an overall reduction in morbidity and mortality (Kolbe-Alexander et al., 2006). In addition, benefits of exercise include improved functional ability, health and quality of life, with an associated decrease in costs of health care, both for the individual and for society (World Health Organization, 1998). Nicholson (1999) stated that if exercise has the capability to enhance only a person's perception of his/her quality of life - even if it does not lead to visible functional changes - that subjective change better than no change at all.

Although the benefits of exercise interventions in older adults have been well documented in developed countries, there is little data available on the effectiveness of exercise programmes in developing countries (Kolbe-Alexander et al., 2006). Kalula (2007) found that there is an absence of literature in Africa regarding the assessment of the effectiveness of interventions to prevent falls and indirectly the functional capacity of older adults.

The purpose of the present study was to implement a movement competence programme for older adult women, requiring no expensive apparatus and that can be carried out in any environment. The aim of the programme was to provide exercise activities that could contribute to each individual's ability to carry out ADL and in turn contribute to the reduction in the risk of falls as well as psychological benefits, such as increases in self-perception and resilience. To achieve this objective, the programme consisted of activities focusing on the development of balance, strength, flexibility, aerobic fitness as well as the inclusion of functional activities such as sitting and getting up from a chair. This was also a group-based exercise programme, and it was hypothesised that it would not only promote gains in functional capacity, but also create a positive social environment for the participants that would foster improvements in the subject's psychological well-being

Research Questions

The purpose of this study was to determine the effect of a movement competence programme on the functional capacity, self-perception and resilience of elderly women. Four research questions guided this study:

1. Can a movement competence programme improve the functional capacity of older adult women?
2. Can a movement competence programme improve the self-perception of older adult women?
3. Can a movement competence programme improve the resilience of the older adult women?
4. Can a movement competence programme have lasting effects on the self-perception and resilience of older adult women?

Methodology

This study followed a time-series evaluation design, which is categorised as a quasi-experimental approach (Johnson & Nelson, 2001).

“The purpose of a quasi-experimental design is to fit the design to settings more like the real world settings...the use of these designs in kinesiology has increased considerable in recent years.” (Johnson & Nelson, 2001, p. 323)

A time-series design involves only one group. The purpose of the design is to determine if the changes that occur when a treatment is administered, are present when the treatment is removed (Johnson & Nelson, 2001). McKenzie and Jurs (1993) recommended using a time series evaluation design when examining differences in programme effects over time. This approach involved taking several measurements both before and after the programme is implemented. They described it as an especially appropriate design for measuring the delayed effects of the programme. The motivation for the selection of this design is presented in Chapter Three.

Both the self-perception, resilience and functional capacity of the subjects were assessed by questionnaires and the functional capacity measured by two functional tests. Pre-testing took place prior to the commencement of the intervention programme, which included individualised health screening to identify any contra-indications to exercise as well as anthropometric measurements such as, weight, height and body mass index of the subjects. The intervention consisted of a 12-week movement competence programme, which included aerobic, balance, strength and flexibility components. The programme was presented in one-hour sessions held twice a week. The subjects' primary source of physical activity was from the movement competence programme. All 21 subjects completed follow-up questionnaires 9 months after the cessation of the intervention programme. These measured the change in the self-perception and resilience variables since the cessation of the intervention programme, between those women who chose to continue with exercise and those who did not.

Limitations

The following limitations must be taken into account when drawing conclusions from the results of this study:

- The subjects were from a closed retirement community which made it impossible to identify either a control group or a comparison group within the local region.
- There were a limited number of subjects which would have influenced the amount of change required to achieve statistical significance in any changes reported.
- Resilience is a new topic in sport and exercise psychology literature and its measurement is still in the process of refinement.

Terminology

For the purpose of this study the following definitions were used for the terms below:

Older Adults

Defining “older adults” is difficult as there is no specific age at which a person can be considered an “older adult” (Levant & Barbanel, 2002). However, for the purpose for the present study older adults refers to individuals between the ages of 60 and 86 years of age.

Movement Competence

This is a functional rather than a skill perspective that tells whether a person is effective in a situation. Competence implies that an individual can adapt and adjust to get the job done (Keogh & Sugden, 1985).

Movement Competence Programme

It is a movement programme that is designed in order to enable the individual to be more competent in achieving the goal of a skill or movement.

Functional Capacity

Functional capacity refers to the capability of performing tasks and activities that people find necessary or desirable in their lives (Kane, 2007).

Self-Perception

Self-perception can be defined as individuals’ beliefs, perceptions, attitudes, thoughts and feelings about themselves in general or about their abilities, skills, competencies, characteristics and behaviours (Horn, 2004).

Resilience

Resilience embodies the personal qualities that enable one to thrive in the face of adversity (Connor & Davidson, 2003).

Chapter 2

Review of Literature

“The demographic tidal wave is coming” (Centers for Disease Control and Prevention, 2004, p. i).

Global Aging is occurring at an unprecedented rate (Jones & Rose, 2005). According to the Center for Chronic Disease Prevention and Health Promotion, (2007) the United States is on the brink of a longevity revolution. Since 1900, the American population has tripled but the number of older adults has increased 11-fold, from 3.1 million in 1900 to 35 million in 2000. The older population above the age of 65, totalled 36.3 million in 2004. They represented 12.4% of the American population, about one in every eight people (Administration on Aging, 2005). By the year 2030, the older Americans are expected to account for 20% of the total population. The “old-old” which are individuals over the age of 85 years, constitute the most rapidly growing segment of society. In 2004, there were 21.1 million older women and 15.2 million older men, or a gender ratio of 139 women for every 100 men (Shephard, cited in Chodzko-Zajko, 2006).

Locally, South Africa has the highest proportion of older persons in the Southern African region with 7% of the population over the age of 60 years in 1997 (Kolbe-Alexander et al., 2006). Overlooked in the wake of the HIV/AIDS pandemic is the fact that most African populations are aging rapidly (Kinsella & Ferreira, 1997). The White South African population already show an age structure similar to some of the world’s more developed countries. More than one-fourth of all Whites now are aged 50 or above with nearly 14 percent in the 60-and-over category (Kinsella & Ferreira, 1997). In addition, 61 % of all aged persons within South Africa are females (Commission on Gender Equality, 2003).

In the United States of America, persons reaching age 65 have an average life expectancy of an additional 18.5 years (19.8 years for females and 16.8 years for males) (Administration on Aging, 2005). Life expectancy increased dramatically during the past century, from 47 years for Americans born in 1900 to 77 years for those born in 2001 (Centers for Disease Control and Prevention, 2004).

Summarily, life expectancies for White South African women exceeds that of women in some European nations and is 25 years higher than for Black South African men. This is an average of 77 years of age for white women compared to an average life expectancy of a black man being 52 years of age.

“The dramatic gain in life expectancy in the 20th century was, in large measure, due to improved sanitation, better medical care and increased use of preventive health services” (Kinsella & Ferreira, 1997).

Data has also shown that Americans might be living longer but not necessarily healthier lives. Unfortunately, statistics also show that although people are living longer, they are also living with a substantial amount of chronic diseases (Rikli, 2005). The increase in older adult population has important implications for most people worldwide, especially, researchers, health care providers, policy makers and others interested. Regarding the older adult population of South Africa, 70% (age 65 and over) have a chronic illness or health condition. A further concern within South Africa is that the majority of the health programmes focus most of their attention on childcare and not on the ever-increasing numbers in the geriatric population (Kinsella & Ferreira, 1997).

Rikli (2005) states that because of the importance of good health to quality of life in later years, and because of the need to control the increase in health care costs associated with the growing population of older adults, it is extremely important to carefully examine the factors that are influencing the health and functional ability of the older adult population.

Defining Aging

Defining the term old age or aging sounds simple, but it is actually very complex (Jones & Rose, 2005). The aging process is almost always defined by the passage of calendar time, however there is still confusion as to what the most accurate definition of aging should be (Cotton, Ekeroth & Yancy, 1998). In addition, Mazzeo et al., (1998) define aging as a complex process involving many variables (e.g. genetics, lifestyle factors, chronic diseases) that interact with one another, all influencing the manner in which we age.

Amongst the confusion of defining old age, gerontologists have identified three different categories: the *young-old*, those who have retained a sufficient level of fitness to continue a normal living pattern; the *middle-old*, those who are independent for activities of daily living but require assistance with certain activities; and the *old-old*, those who are disabled and require nursing care. These groups correspond presently to chronological ages of 60 to 75 years, 75 to 85 years and greater than 85 years (Pearl, 1993).

There are four main terms used to describe the process of aging or old age. Firstly, Jones and Rose (2005) define chronological age, as the passage of time from birth in years. Secondly, biological age which characterizes senescence (our later years of life) in terms of biological, rather than chronological processes (Cotton et al., 1998). Most studies suggest that, on average, people who exercise regularly have lower biological age than people of the same chronological age who do not exercise (Jones & Rose, 2005). Thirdly, Jones and Rose (2005) define functional age, as referring to an individual's functional fitness in comparison with others of the same age and gender. Lastly, psychological age refers to an individual's capabilities of certain dimensions of mental or cognitive functioning, including self-esteem and self-efficacy, as well as learning, memory and perception (Birren, cited in Cotton et al., 1998). Schroots and Birren (cited in Cotton et al., 1998) showed that in the same way that people of the same chronological age can differ biologically it also is possible for people to have different psychological ages.

According to American College of Sports Medicine (2000) it is not appropriate to define the "elderly" by any specific chronological age or any set of ages, as physiologic aging does not occur uniformly throughout the population. In recent years, researchers have focused a considerable amount of attention on increasing our understanding of the factors responsible for the individual differences in the rate and extent at which we age (Mazzeo et al., 1998). It has been well documented that hereditary factors play an important role in determining the pattern of changes observed in an individuals later years of life. However, in addition to the genetic factors known to influence human aging are lifestyle factors,

for example, smoking cessation and regular physical activity (Chodzko-Zajko, 2006).

Normal Physiological Changes Associated With Aging

Physical decline associated with aging can be due to a number of complex interactions, including normal aging, disease, and disuse (ACSM, 2003). On average the rate of decline of most physiological functions is approximately 0.75 to 1 % each year, commencing at about age 25 years (Govindasamy & Paterson, 1994). Fortunately, although functional decline is an inevitable consequence of aging, as mentioned before aging does not occur uniformly across the population (Chodzko-Zajko, 2006). At present, it is difficult to distinguish reasons for decline in physiological functions. The reasons can be from advancing age, deconditioning from physical inactivity, disease, or any combination of these (Lim, 2006).

Research evidence emphasizes that with normal aging there is a loss of physical function that can ultimately threaten independent living and the capacity to perform activities of daily living (Govindasamy & Paterson, 1994). Table 1 indicates the different changes within the functions of the various bodily systems that occur as a result of aging.

Table 1.

Physiological Changes Associated With Aging (ACSM, 2003, p.157).

System	Function	Change
Cardiovascular	Resting Heart Rate	No change
	Maximal Heart Rate	Decrease
	Resting Cardiac Output	Decrease
	Maximal Cardiac Output	Decrease
	Resting Stroke Volume	Decrease
	Maximal Stroke Volume	Decrease
	Resting Blood Pressure	Increase
	Exercise Blood Pressure	Increase
	VO ₂ peak	Decrease
Respiratory	Residual Volume	Increase
	Vital Capacity	Decrease
	Total Lung Capacity	No change
	Respiratory Frequency	Increase
Nervous	Reaction Time	Decrease
	Nerve Conduction Time	Increase
	Sensory deficits	Increase
Musculoskeletal	Muscular Strength	Decrease
	Muscle Mass	Decrease
	Flexibility	Decrease
	Balance	Decrease
	Bone Density	Decrease
Renal	Kidney Function	Decrease
	Acid-base control	Decrease
	Glucose Tolerance	Decrease
	Drug Clearance	Decrease
	Cellular water	Decrease
Metabolic	Basal Metabolic rate	Decrease
	Lean Body mass	Decrease
	Body fat	Increase

Globally, 88% of Americans over the age of 65 years have at least one chronic health condition and 21% of people 65 and older have chronic disabilities

(Robert Wood Johnson Foundation, 2001). The prevalence of disability increase with age resulting in a prevalence amongst older adults (people older than 65 years) of 50%, compared to 17% for people ages 18-64 (Hughes, Thomas, Rimmer & Heller, 2005). Within South Africa, four out of ten persons over the age of 65 years, have some chronic disorder that may result in functional limitation (Kolbe-Alexander et al., 2006).

Among the most frequently occurring conditions amongst the older adult population between the years 2002-2003 were: hypertension (51%), diagnosed arthritis (48%), all types of heart disease (31%), any cancer (21%), diabetes (16%) and sinusitis (14%) (Administration on Aging, 2005). According to the American Psychological Association (1998), the top five causes of death among older adults are heart disease, cancer, cerebrovascular disease, pneumonia and flu, and chronic obstructive pulmonary disease. Chronic diseases of older adults place a large burden on the health and economic sectors of countries due to associated long-term illness, diminished quality of life and greatly increases health care costs (Center for Chronic Disease Prevention and Health Promotion, 2007). Both of these leading killers are often preventable (Centers for Disease Control and Prevention, 2004). A study published during April in *New England Journal of Medicine*, clearly showed that people with healthier lifestyles not only live longer, they live better, experiencing only half as many chronic disabilities than those who follow unhealthy lifestyles (Brody, 1998).

Normal Psychological Changes Associated With Aging

Physical changes associated with age also carry along particularly significant psychological changes because the self is tied inseparably to the body (De Vries, 2003). According to De Vries (2003, p.710)

The loss of attractiveness, health and fitness strikes people as an assault on the self, and that assault could reactivate feelings of inferiority and compensatory strivings that are remnants of difficult childhood experiences. A welter of emotional reactions, such as fear, anxiety, grief, depression and anger accompanies the physical affects of aging.

A substantial proportion of the population aged 55 years and older experience specific mental disorders including depression, anxiety disorders, and dementia (Center for Chronic Disease Prevention and Health Promotion, 2007). Areas of psychological function that seem to be more susceptible to decline with age and have generated a substantial body of literature are namely, cognitive function, depression, and perceptions of control or self-efficacy (Mazzeo et al., 1998).

Cognitive Decline

On average, older adults begin to experience declines in cognitive function in their 60's, although the rate at which the decline occurs varies considerably across the older population (Barnes, Cauley, Lui, Fink, McCulloch, Stone & Yaffe, 2007). Cognitive function refers to maintaining and improving mental skills such as learning, memory, decision-making and planning (Mazzeo et al., 1998). Normal changes that occur with aging are, a slower pace when learning and the need for new information to be repeated (Center for Chronic Disease Prevention and Health Promotion, 2007). This decline associated with age is due to the decline of the central nervous system, which results in changes that are irreversible (Mazzeo et al., 1998). However, some older adult individuals may experience major cognitive decline with aging resulting in dementia (Barnes et al., 2007). Among Americans 65 years and older, approximately 6-10% have dementia and two-thirds of the population with dementia have Alzheimer's disease. Although research has not found a way to prevent dementia or Alzheimer's disease, cognitive decline may be preventable. Recent research suggests that being physically active, controlling your hypertension, and engaging in social activities may help you maintain and improve your cognitive health (Center for Chronic Disease Prevention and Health Promotion, 2007).

Depression

Depression is one of the most frequently reported mental health disorders in the older adult population (Mazzeo et al., 1998). This condition is closely associated with dependency and disability (Wynchank, 2004). In America, 8% to 20% of older adults in the community and up to 37% in primary care settings suffer from depressive symptoms (Center for Chronic Disease Prevention and Health

Promotion, 2007). Depression is the single most significant risk factor for suicide in the older adult population. In the group aged 80-84 years, the suicide rates are more than twice those of the general population (Wynchank, 2004). Comprising only 13% of the American population, individuals aged 65 and over accounted for 18% of all suicide deaths in 2000 (Psychology Today, 2005).

According to Wynchank (2004), several factors increase the risk of depression amongst older adults, which include: female gender, single status, recent stressful life events and lack of social supportive network. In addition depression often occurs with other serious illnesses such as heart disease, diabetes, or cancer (Center for Chronic Disease Prevention and Health Promotion, 2007). Data that suggests that depression increases with age may be partially, due to the tendency for physical activity levels to decline with age and not simply due to the increase in time (Chodzko-Zajko, 2006). As people age they need to face more and more life stressors. These could include loss of status, loss of recognition, loss of income, physical aging, decrease in mobility, chronic diseases and perceived loss of control (De Vries, 2003; Mazzeo et al., 1998; Wynchank, 2004). These stressors result in the aged feeling depressed, frustrated and hopeless. De Vries (2003) describes the collective term of all these stressors as the retirement syndrome.

Aging Women

For the purpose of this section, an older adult women is defined as a women above the age of 60 years. Women almost always have a higher life expectancy than men. Currently the worldwide life expectancy for all people is 64.3 years but for males its 62.7 years and females life expectancy is 66 years, a difference of more than three years. The reasons for the difference between male and female life expectancy are not fully understood (Rosenberg, 2003). In addition, most frail older adults are women (partly because they live longer), and women older than 80 years old often receive care from an adult child (Torpy, Lynn & Glass, 2006).

Older women still have higher rates of disability than men of the same age, not because more women develop disabilities than men, but rather women with disabilities survive longer than men (Rikli, 2005). Most studies reveal that women

report greater emotional distress, trauma, and mental health problems than men (Seplaki, Goldman, Weinstein & Lin, 2006). The three key health conditions that most effect for older women include (Aging well, living well, 2006):

- Cardiovascular disease (such as hearth disease and stroke)
- Cancer
- Mental health disorders

An estimated 61% of all aged persons within South Africa are females. Black women are often widows, who are left to care for their grandchildren without any support (Commission on Gender Equality, 2003). Makiwane (2004) conducted a study on the elderly in Mpumalanga and found that about 72 % of older people in this province are the main breadwinners in multigenerational households. South African women outlive men with a life expectancy of 58 years compared to 54 years. These figures differ amongst different population groups with the life expectancy of White South African women exceeding that of Black South African women (Kinsella & Ferriera, 1997).

There is little evidence to suggest a difference in the aging process between men and women (Pearl, 1993). In both men and women as the body ages there is a loss of bone mass, tissues become more inflexible, muscles atrophy and aerobic fitness levels decline. An approach to conditioning the aging female has produced diverse opinions. Inconsistencies in variables such as initial fitness level, bone demineralisation, conditioning methods employed have made it difficult to draw conclusions from research (Pearl, 1993).

Implications of Physical Activity for Older Adults

Physiological Benefits of Exercise for Older Adults

The physical and psychological benefits of regular physical activity (see Table 2) for older adults are well established (Conn, Minor, & Burks, 2003; Jerome et al., 2006; McAuley, Jerome, Elavsky, Marquez, Ramswy, 2003). However, few factors contribute as much to successful aging as having a physically active lifestyle (Centers for Disease Control and Prevention, 2004). Regular physical activity has been found to increase longevity (ACSM, 2004). It has also been shown that a certain level of fitness not only protects the individual from a number of chronic diseases and physical decline, but also makes performing the tasks of daily life easier, reduces the risks of falls, and makes participation in any recreational activities possible (Gretebeck et al., 2007; Jones & Rose, 2005; Kolbe-Alexander et al., 2006; Mazzeo et al., 1998).

Table 2.

A Summary of the Physiological Benefits of Physical Activity for Older Adults
(World Health Organization, cited in Chodzko-Zajko, 2006, p. 3).

Immediate Benefits

Glucose levels: Physical activity helps regulate blood glucose levels

Catecholamine activity: both adrenalin and noradrenaline levels are stimulated by physical activity

Improved sleep: Physical activity has been shown to enhance sleep quality and quantity in individuals of all ages

Long Term Effects:

Aerobic/Cardiovascular Endurance: Substantial improvements in almost all aspects of cardiovascular functioning have been observed following appropriate physical training

Resistive training/muscle strengthening: Individuals of all ages can benefit from muscle strengthening exercises especially in the maintenance of independence of the elderly

Flexibility: Exercise which stimulates movement throughout the range of motion assists in the preservation and restoration of flexibility

Balance/Coordination: Regular activity helps prevent and/or postpone the age associated declines in balance and coordination that are a major risk factor for falls

Velocity of movement: Behavioural slowing is a characteristic of advancing age. Individuals who are regularly active can often postpone these age-related declines

Table 3 is a summarised version of the physiological benefits of exercise formulated by the American College of Sports Medicine (2000). It is also a more detailed description of the physiological benefits of exercise on the systematic level as well as with reference to the reduction in coronary artery disease and morbidity and mortality.

Enhancement of functional capacity is perhaps the most important reason why the older adult should increase regular physical activity (Shephard, 2004). It has been shown that numerous factors namely, low level of physical activity is highly associated with increased risk in decline of functional status and dependence (Puggard, 2003). Remaining physically active throughout ones life and even more importantly in ones later years is critically important in retaining ones independence. This is evident in a study done by Paterson et al., (cited in Shephard, 2004), which showed that for those who were physically active at age 50, were much less likely to become dependent on institutionalised care as they grew older.

Table 3.

Benefits of Regular Physical Activity and/or Exercise (Summarised from ACSM, 2000).

Improvements in Cardiovascular and Respiratory Function

- Increased maximal oxygen uptake due to both central and peripheral adaptations
- Lower minute ventilation at a given submaximal intensity
- Lower myocardial oxygen cost for a given absolute submaximal intensity
- Lower heart rate and blood pressure at a given submaximal intensity
- Increased capillary density in skeletal muscle
- Increased exercise threshold for the accumulation of lactate in the blood
- Increased exercise threshold for the onset of disease signs and symptoms

Reductions in Coronary Artery Disease Risk Factors

- Reduced resting systolic and diastolic pressures
- Increased serum high-density lipoprotein cholesterol and decreased serum triglycerides
- Reduced total body fat, reduced intra-abdominal fat
- Reduced insulin needs, improved glucose tolerance

Decreased Mortality and Morbidity

Primary prevention

1. Higher activity and/or fitness levels are associated with lower death rates from coronary artery disease.
2. Higher activity and/or fitness levels are associated with lower incidence rates for combined cardiovascular diseases, coronary artery disease, cancer of the colon and type 2 diabetes

Secondary prevention

1. Mortality is reduced in post-myocardial infarction patients who participate in cardiac rehabilitation exercise training.

An age-related decrease in muscle strength is often an important factor in loss of independence to perform activities of daily living (Shephard, 2004). Strength training has been shown to correct many of these problems, enhancing the speed of rising from a chair and walking speed (Mazzeo et al., 1998). Strength training has important implications for older adults. Recovery from illness is quicker when a person has adequate levels of muscle strength and regular physical activity has a positive impact on gait (Rimmer, 1994).

A decrease in flexibility of major joints may accompany aging, which increases the difficulty of performing activities of daily living (Rimmer, 1994; Shephard, 2004). Training programmes can enhance flexibility by 10%, making it easier to carry out daily activities such as reaching or bending down (Mazzeo et al., 1998).

Regular physical activity is helpful in enhancing balance, which in turn can help prevent falls amongst the older adult population (Rimmer, 1994). Lord and Castell (cited in Chodzko-Zajko, 2006) have reported improvements in balance and body sway following participation in a general exercise programme emphasizing walking, flexibility and strength exercises as well as due to specialized balance training (Chodzko-Zajko, 2006). In addition, Shephard (2004) states that the stability of blood pressure is increased through exercise, reducing the risk of hypotensive falls.

Older adults have the highest rates of obesity within America (Foundation for Physical Therapy, n.d.). Obesity can be corrected through a decrease in food intake and/or by performing physical activity. However, an increase of physical activity is considered to be a critical component of a weight control plan for the following reasons (Shephard, 2004):

1. "Moderate physical activity is pleasant and enhances the mood-state, in contrast by depression induced by dieting" (p. 556).
2. "Moderate physical activity helps to conserve lean tissue mass, whereas with dieting alone, loss of lean tissue may be as great as loss of body fat" (p.556).

According to a study done at the University of Pittsburgh, older adult women should worry more about exercise than weight. The reason for this is that weight loss may be detrimental to the health of an older person, a focus on increasing physical activity rather than focusing solely on weight is advised (Foundation for Physical Therapy, n.d.).

Women are more at risk of developing osteoporosis than men (World Health Organisation, 2003). Inactivity results in loss of bone mass and thus further increases risk of osteoporosis. Moderate exercise can significantly slow down the progression of this disease and it has also been shown that persons who are more active have fewer fractures than those who are sedentary (Rimmer, 1994).

Psychological Benefits of Exercise for Older Adults

Any movement programme has a tremendous amount of psychological benefits for the aging female (Pearl, 1993). Table 4 illustrates a summary of various psychological benefits of physical activity for the aged population.

Table 4.

*A Summary of the Psychological Benefits of Physical Activity for Older Adults
(World Health Organization, cited in Cotton et al., 1998, p.12)*

Immediate Benefits

Relaxation: Appropriate physical activity enhances relaxation

Reduces stress and anxiety: There is evidence that regular physical activity can reduce stress and anxiety

Enhance mood state: Numerous people report elevations in mood state following appropriate physical activity

Long-term effects

General Well-being: Improvements in almost all aspects of psychological functioning have been observed

Improved mental health: Regular exercise can make an important contribution in the treatment of several mental illnesses, including depression and anxiety neuroses.

Cognitive improvements: Regular physical activity may help postpone age-related declines in central nervous system processing speed and improve reaction time.

Motor Control and Performance: Regular activity helps prevent and/or postpone the age associated declines in both fine and gross motor performance.

Skill Acquisition: New skills can be learned and existing skills refined by all individuals regardless of age.

Regular exercise has been shown to provide a number of psychological benefits related to preserved cognitive function, alleviation of depression, and improved concept of personal control and self-efficacy (Lucidi, Lauriola, Leone & Grana, 2004; Mazzeo *et al.*, 1998). The World Health Organisation (2003) state that physical activity is particular important for women in the prevention and

treatment of depression, as the prevalence of depression is almost double among women than for men in both developed and developing countries. In addition, Paluska and Schwenk (2000) conclude that both aerobic and strength training has been shown to reduce depressive symptoms significantly.

Psychological health consists of both positive and negative components. Previous literature has focused on the effects of physical activity on negative components of psychological health such as depression and anxiety (Cotton et al., 1998). McAuley and Rudolph (1995) focus on physical activity and more positive elements of psychological functioning such as self-esteem and self-efficacy. Self-efficacy is defined as the individual's sense of control over his or her environment and ability to function effectively (Chodzko-Zajko, 2005). McAuley and Rudolph (1995) found that the vast majority of studies report a positive association between physical activity and self-efficacy.

Social Implications of Regular Physical Activity for Older Adults

The majority of research studies examining the benefits of exercise on aging focus primarily on the physical and psychological benefits of activity. However, there are a substantial amount of benefits of exercise affecting the social component of older adults lives (Cotton et al., 1998). Table 5 demonstrates a summary of the social benefits of physical activity for older persons as proposed by the World Health Organization (cited in Cotton et al., 1998). Social support is a key component of good mental health (Centers for Disease Control and Prevention, 2004).

Table 5.

A Summary of the Social Benefits of Physical Activity for Older Persons (World Health Organization, cited in Cotton et al., 1998, p. 15)

Immediate Benefits

Empowering Older Individuals: A large proportion of the older adult population voluntarily adopts a sedentary lifestyle, which eventually threatens to reduce independence and self-sufficiency. Participation in appropriate physical activity can help empower older individuals and assist them in playing a more active role in society

Enhanced Social and Cultural Integration: Physical activity programmes, particularly when carried out in small groups and/or in social environments, enhance social and intercultural interactions for many older adults.

Long-term effects:

Enhanced Integration: Regularly active individuals are less likely to withdraw from society and more likely to actively contribute to the social milieu.

Formations of new friendships: Participation in physical activity, particularly in small groups and other social environments, stimulates new friendships and acquaintances.

Widened Social and Cultural Networks: Physical activity frequently provides individuals with an opportunity to widen available social networks.

Role Maintenance and New Role Acquisition: A physically active lifestyle helps foster the stimulating environments necessary for maintaining an active role in society, as well as for acquiring positive new roles.

Enhanced Intergenerational Activity. In many societies, physical activity is a shared activity that provides opportunities for intergenerational contact, thereby diminishing stereotypical perceptions about aging and the elderly.

Aging is associated with a need to adjust to changing roles within society (Cotton et al., 1998). Death of family or friends, financial hardship, ill health and

isolation often force many older people to lose their identity and self-worth within society. As previously discussed these are all contributing factors towards the retirement syndrome (De Vries, 2003), which inevitably results in some form of depression. Physical activity can help older people to adjust to these changing roles by providing them with new friendships, forming new social networks and it also allows them to obtain positive meaningful roles within society by becoming more functional and capable.

A Global Inactivity Epidemic

Despite this large body of research evidence, statistics in America indicate that few older adults engage in physical activity on a regular basis (Jones & Rose, 2005; Rikli, 2005). A sedentary lifestyle is considered to be one of the most important factors contributing to loss of independent performance of daily tasks (Trader et al., 2003; De Vreede et al., 2005). An inactive lifestyle along with a decreased participation in activities of daily living often result in a decline in health status, frailty and falls (Trader et al., 2003).

Within the United States, 250 000 deaths each year are due to physical inactivity (Larsen, 2001). Only 31% of people aged 65-74 participate in 20 minutes of moderate physical activity three or more times a week. Moreover, adults aged 75 and older are even less physically active with only 23 % of this population report that they engage in regular physical activity three or more times per week (De Vreede et al., 2005). Evidence suggests that physiological decline, especially that associated with physical inactivity, is modifiable through proper activity intervention (Rikli & Jones, 1997).

Prevalence of inactivity among older adults also varies by race and gender. Inactivity among White American women is 47.4 % and 61% in older black females (Hughes, Prohaska, Rimmer & Heller, 2005; Robert Wood Johnson Foundation, 2001). Unfortunately, physical inactivity accounts for the most deaths within the older adult population and can contribute to a loss of independence (ACSM, 2000).

Within South Africa, there is a decline in activity levels is more pronounced in women, low-income groups and in persons with low education levels (Kolbe-Alexander et al., 2006). South African women from low socio-economic backgrounds are more prone to engage in low levels of physical activity. Possible reasons for this are access to public exercise facilities, inability to afford access to these facilities and feel unsafe or insecurity to exercise extramurally. Women that come from a poor socio-economic with high inactivity levels background are at higher risk of developing chronic diseases within their life times (Erasmus et al., 2005).

“There are many possible reasons for these alarming inactivity levels. One reason could be the persistent fallacy about aging is the widespread perception that aging is associated with nothing but losses and decline doom and gloom” (Chodzko-Zajko, 2005, p. 25).

This tendency to perceive aging as a negative condition or a social problem is inconsistent with current experimental evidence on the functional capacities of older individuals. This tendency is referred to as ageism, which is the practice of discriminating against an individual or group of individuals on the basis of their chronological age (Chodzko-Zajko, 2005).

Another reason is that for many years, older adults believe that it is unsafe to exercise and that exercising could actually worsen their individual condition. The irony is that contrary to traditional understanding, exercise helps, not hurts older adults. Unless this current trend is reversed, the costs of physical inactivity among the older adult population will place increasing demands on medical and social services and as well as the public health system. Interventions are needed to address this current epidemic of inactivity (Rikli, 2005).

Traditionally most intervention approaches have involved applying various cognitive and behavioural change strategies, to increase exercise participation, with more attention given to improving self-efficacy and readiness to change (McAuley et al., 2003). Unfortunately, according to Rikli (2005) these strategies have not yet led to a noticeable improvement in population-based participation rates or an increase in exercise adherence in most research studies.

More recently, the focus on increasing physical activity participation has shifted from individual strategies to ecological approaches, which are based on the principle of behaviour is influenced by wide range of factors, including biological, psychological, social, cultural and environmental. It is also suggested that successful interventions should combine as many of these above factors as possible (Rikli, 2005). Psychological outcomes associated with exercise participation such as enjoyment or positive feedback might influence exercise behaviour, although very few studies have examined this relationship (McAuley et al., 2003). However, the ecological strategy approach seems to be the most effective in improving physical activity participation (Robert Wood Johnson Foundation, 2001).

In addition, there is a need to persuade older people that it is safe and beneficial to become more active and change the aging stereotypes of society (Jones & Rose, 2005). A possible way to accomplish this is through education of the benefits and facts of what participating in exercise entails. According to Madermott and Mernitz (2006) older adults tend to have less access than other demographic groups to physical activity information and are much less educated on the benefits of exercise.

Movement Programme Considerations

The first consideration when planning a movement programme for older adults is to focus on their individual safety (ACSM, 2000; Lim, 2006). Concern for safety should be a priority throughout the exercise programme to minimise the risk of possible injury as well as reduce high the dropout rate associated with this particular age group (ACSM, 2000). The physiological changes that accompany aging should be considered in the design of an effective and safe exercise programmes.

Secondly, Polman (2004) stated that exercise programme should focus on competence and should be conducted in a comfortable environment in order to aid in creating positive physical self-perceptions. For example, in a private setting where privacy is respected and outsiders are prohibited to enter and view

participants exercising. According to Hughes et al. (2005) an exercise programme for older adults should follow these guidelines:

- “Design interventions that individuals can replicate on their own at home or elsewhere once formal training ends” (p. 55).
- “Tailor the intervention to individuals perceived performance needs and goals and health and cognitive conditions” (p. 55).
- “Provide systematic reinforcement regarding individual’ ability to improve their exercise performance over time” (p.55).

Traditional approaches to exercise programmes for adults have generally focused on improving specific physiological parameters such as cardiorespiratory endurance or muscular strength (Jones & Rose, 2005). Although this approach may be appropriate towards some older adult’s each individual’s physical status can vary later on in life (ACSM, 2000). For instance, some may be healthy throughout life whereas others may experience a decline in health, fitness and functioning. It is for this reason that careful planning should be done according to the individual’s needs and physical functioning with specific emphasis placed on safety and functional exercise prescription (Polman, 2004).

Thirdly, according to the American College of Sports Medicine (2000) and Gill and Stewart (2005) a broad-based programme is recommended for older adults, which includes balance and strength training, walking, and weigh transfers as part of a fall prevention programme. They also advise the inclusion of cardiorespiratory, and resistance training as well as aerobic dance and stretching for overall improvement in joint range of motion. The American College of Sports Medicine (2000) advise that when possible an accumulation of at least 30 minutes of moderate intensity exercise on most, and preferably all days of the week should be performed. The guidelines also recommend that resistance training at least twice a week be beneficial in improving muscles strength and endurance. However, functional-tasks are said to be more effective than resistance exercises at improving functional task performance in healthy elderly women and may have an important role in helping them maintain an independent lifestyle (De Vreede et al., 2005).

The guidelines in Table 6 were specifically identified to apply to programmes for older adults. They were used to guide planning the movement competence programme implemented within the present study. However, balance training, which is not included in Table 6, was added. The reason for this being that a broad based training programme was chosen and the balance training would be critical in reducing the risk of falling amongst older adult women.

Lastly, warm up and cool down are essential for older adults to prevent injury and aid in the most efficient function possible. The physiological benefits of a warm up and cool down are of great importance (see Table 7). Norman (2005) defines warm up as increasing the temperature of muscles and blood for the body's transition from rest to activity. The purpose of cooling down is to slowly decrease body temperature, heart rate and respiration to levels prior to exercising (Norman, 2005).

Table 6.

Guidelines for exercise prescription for the elderly (summarised from ACSM, 2000, p. 226).

<p>Cardiovascular fitness</p> <p><i>Mode:</i></p> <ol style="list-style-type: none"> 1. Walking is an excellent mode of exercise for many elderly 2. The activity should be accessible, convenient and enjoyable to participate in, following all factors directly related to exercise adherence 3. A group setting may provide important reinforcement to adherence. 4. The exercise modality should be one that does not impose excessive orthopaedic stress.
<p><i>Intensity:</i></p> <ol style="list-style-type: none"> 1. To minimize medical problems and promote long-term compliance, exercise intensity for inactive elderly people should start low and individually progress according to tolerance and preference. 2. Conservative approach is recommended as many older persons suffer from a variety of medical conditions 3. Exercise need not to be vigorous and continuous to be beneficial.
<p><i>Duration:</i></p> <ol style="list-style-type: none"> 1. Exercise duration need not be continuous to produce benefits; thus, those who have difficulty sustaining exercise for 30 minutes can exercise for 10-minute periods at different times during the day. 2. To avoid injury and ensure safety, older individuals should always increase duration not intensity.
<p><i>Frequency</i></p> <ol style="list-style-type: none"> 1. Moderate intensity exercise on most days of the week.
<p>Resistance Training</p> <p><i>Intensity:</i></p> <ol style="list-style-type: none"> 1. Perform at least 1 set of 8 to 10 exercises that use all the major muscle groups 2. Each set should involve 10-15 repetitions
<p><i>Frequency:</i></p> <ol style="list-style-type: none"> 1. Should be performed at least twice a week with 48 hours of rest in between
<p><i>Duration:</i></p> <ol style="list-style-type: none"> 1. Exercise session lasting longer than 60 minutes have a detrimental affect on exercise adherence
<p>Flexibility Training</p> <p><i>Intensity:</i></p> <ol style="list-style-type: none"> 1. Exercises should incorporate slow movement 2. At least four repetitions per muscle group 3. The degree of stretch achieved should not cause pain
<p><i>Frequency</i></p> <ol style="list-style-type: none"> 1. Stretching should be performed two to three times per day and should be included in the warm up and cool down
<p><i>Duration</i></p> <ol style="list-style-type: none"> 1. The stretching phase of an exercise session should last long enough to exercise the major muscle/tendon groups

Table 7.

The Physiological Benefits of a Warm Up (Norman, cited in Jones & Rose, 2005, p. 154).

Physiological change	Specific benefits
Increased release of oxygen from haemoglobin and myoglobin	Delivery of more oxygen to the working muscles and more efficient use of oxygen
Decreased muscle viscosity	Improved mechanical efficiency and power
Increased blood saturation of muscles, tendons and ligaments	Increased elasticity Decreased susceptibility to injury Increased delivery of necessary fuel
Increased speed of nervous impulses and sensitivity of nerve receptors	Improved coordination and reaction time
Reduced pulmonary resistance	Increased lung circulation More efficient aerobic metabolism
Improved cardiac blood flow	Decreased risk of myocardial ischemia
Increased metabolic rates	Improved efficiency

The physiological benefits of cool down are as follows (Norman, 2005):

- “Decreased body temperature” (p.153)
- “Decreased heart rate and respiration” (p.153)
- “Decreased blood pooling in extremities” (p.153)
- “Decreased catecholamine levels in blood” (p.153)

- “Decreased muscle soreness and recovery” (p.153)

Motor Learning Principles for the Physical Activity Instructor

When planning the movement programme it is equally important for the instructor to consider the specific teaching skills that will allow not only for the exercises to be performed effectively and safely but also allow for proper communication channels between instructor and subject. This would in turn influence their adherence towards regular physical activity. As mentioned before women have the highest drop out rate of any other population group and that is why it is of great importance that appropriate measures be taken by the instructor to create a efficient, safe, and enjoyable exercise environment for the group (ACSM, 2000).

The most common used strategy for communicating how to perform a new skill is demonstrating the skill. Research indicates that in certain situations a demonstration is likely to be more effective than other forms of conveying a skill (Magill & Grodesky, 2005). In addition, research has shown that beginners can benefit from observing other beginners practice a skill, especially when they can hear the instructors correct evaluation of the observed person’s performance (McCullagh & Weiss, cited in Magill & Grodesky, 2005). This strategy can be especially useful in larger groups, for instance within the present study, where it is difficult for the instructor to provide comments on each participant’s performance.

According to Norman (2005) guidelines of demonstration that the instructor should keep in mind are as follows:

- “Make sure that the demonstrations are observed from a location where everyone can see the critical aspects of the skill”(p.154)
- “Demonstrate the correct way to perform the skill several times” (p.154)
- “Demonstrate at a slow speed” (p.154)
- “Do not provide a lot of verbal commentary during demonstration” (p.154)

Aging and Functional Capacity

The capability to perform important ADL is based, partly on an individual's perceived judgement that one can do so (Feltz & Payment, 2005). As age increases, so too does the dependency on others when performing ADL (Leveille, 2002). It is estimated that 32% of women aged 70 or older in America have difficulty or inability in performing daily self-care activities (Leveille, 2002). A progressive decrease in flexibility of the major joints increasingly restricts the possible range of ADL for most seniors (Mazzeo et al., 1998). Pedretti (cited in Burton, 1998, p. 257) defines ADL as "tasks of self-care, communication, home management, mobility, and management of environmental hardware and devices that enable an individual to achieve personal independence in his or her environment"

Balance is viewed as the prerequisite to functional capabilities because it sets a baseline requirement necessary to carry out ADL (Gertenbach, 2002). Changes in the ability to balance can occur as a result of disease or aging. Age-related declines in postural stability and dynamic balance are risk factors for falls and fall-related injuries in older adult populations (Chodzko-Zajko, 2006). Balance is the ability of keeping the body's centre of gravity within limits of the supporting surface and in the bodily state of equilibrium (Gertenbach, 2002). This equilibrium is affected and disturbed by external factors, by the body's voluntary movements, and by the fact that the body due to gravity, is constantly about to fall in some direction. When the three-receptor organs namely proprioception, vestibular and eyesight deteriorates with age, the postural stability and functional balance ability become impaired (Woollacott & Shumway-Cook, 1990). Several studies have shown impaired balance to be a factor associated with falls in this age group (Jansson & Söderlund, 2004). Postural sway is related to risk of falling and therefore is significant in the performance of many functional skills (Chodzko-Zajko, 2006). Functional balance is all the balance skills a person needs to live independently (Gertenbach, 2002). Poor postural stability is associated with frequent falling. Therefore an improvement in an individual's posture can be useful in preventing falls (Chodzko-Zajko, 2006; Mazzeo et al., 1998).

Falls are a large concern amongst the older adult population. Approximately 30 % of community-dwelling persons aged 65 or older, fall one or more times each year and 8-17 % sustain multiple falls (Lajoie et al., 2002). In addition, the psychological sequelae (“post-fall syndrome”) can be severe and can lead to a loss of self-confidence in one’s ability to perform ADL as well as social withdrawal, depression or confusion (Nevitt et al., cited in Lajoie et al., 2002). In turn, this can lead to self-imposed restrictions in physical activity, decreased mobility, increased dependency and fear of falling (Lajoie et al., 2002). Bandura defines a “fear of falling” based on his self-efficacy theory, as having a low self-confidence when it comes to avoiding the possibility of falling when doing necessary safe everyday activities. The degree of self-efficacy when performing a certain activity has been shown to have a strong relation to what activities one chooses to perform (Jansson & Söderlund, 2004).

In addition, 35 to 50% of women ages 70 to 80 years have difficulty with general mobility tasks like walking down the street or climbing a flight of stairs (Robert Wood Johnson Foundation, 2001). The development of movement disabilities among older adults are most commonly assessed by examining limitations in ADL such as transferring from a bed to a chair, using a toilet, dressing, bathing, and walking (Rikli, 2005). While movement disability is mostly the result of a progressive decline in musculoskeletal and neuromuscular function, it can be accelerated by a stroke or heart attack (Martin & Grabiner cited in Gertenbach, 2002). Although little is known about the shift from functional independence to physical frailty, it is known that physical impairments, such as balance or gait deviations, may increase the risk of the older adult to progress more rapidly towards dependency. The reaction of the older adult to their own perceived decrease in function and capabilities often makes it difficult for them to participate in functional mobility activities or exercise programmes (Nicholson, 1999). Therefore, older persons with poor functional capabilities have the most to gain from interventions that help to maintain or improve functional capacity (Eyigor, Karapola & Durmaz, 2007).

The Effects of Training on the Functional Capacity of Older Adults

“The benefits of regular exercise and physical activity contribute to a healthier, independent lifestyle for seniors, greatly improving their functional capacity and quality of life” (Rikli & Jones, 2001, p. 3).

Being moderately vigorous physical activity is associated with lower rates of death in the middle aged and elderly, and decreases the incidence of falling and fall related injuries (Nicholson, 1999). Exercise training programmes enhance the functional independence of older adults through increased mobility (Daley & Spinks, 2000). Several factors such as strength, balance, flexibility, and endurance included in an exercise programme have been shown to improve functional capacity (Eyigor et al., 2007). Improving the balance, strength and flexibility of the older adult all contribute in a more independent and mobile life for older adults. This is accomplished in the present study by including balance, strength and flexibility training elements in the movement competence programme.

Balance Training

According to Brach, Simonsick, Kritchevsky, Yaffe and Newman (2004) any physical activity is better than no activity for protection against functional limitations, with exercise resulting in substantial gains in physical capacity. Daley & Spinks (2000), recommend a wide variety of balance and mobility activities should be considered as an essential component of any well-rounded physical activity programme. There are numerous studies that indicate specific risk factors in older adults, such as weakness and instability, which can be reversed or improved following exercise or balance training (Daley & Spinks, 2000).

According to Rose (2002), in recent years many research investigations have been conducted in an effort to determine whether declining balance and mobility among older adults can be reversed or slowed. Unfortunately, the results of these studies have not indicated positive results. This is partly due to the programmes failing to include a multidimensional design that targets the sources of the balance or mobility-related impairments (Rose, 2002).

At least 10 – 15 minutes during each class or personal training session should be allocated to balance and mobility activities. Balance activities can be either static or dynamic, be varied to suit the client's needs and can be included into the warm up or cool down section of the exercise programme (Rose, 2005).

Several intervention studies have been made in order to try to improve balance ability of older adult people (Jansson & Söderlund, 2004). Common to the majority of the studies is a significant improvement in the balance of the participants. A couple of the studies have linked the improved balance ability to fall frequency, and show that the fall frequency decreases in the groups that have taken part in exercise training (Jansson & Söderlund, 2004). Madureira, Takayama, Gallinaro, Caparbo, Costa and Pereira (2006) studied the balance amongst elderly women with osteoporosis. They all completed a balance training intervention programme once a week for 12 months. The results showed that the balance training was effective in improving functional and static balance, mobility and falling frequency in elderly women with osteoporosis.

Flexibility Training

Flexibility is a general term, which encompasses the range of motion of single, or multiple joints and the ability to perform specific tasks (Mazzeo et al., 1998). Aging reduces the function of the mechanisms within joints such as connective tissue structure, muscle strength and bone density, which results in a decreased range of motion and thus, the effecting the ability to carry out ADL for older adults (Chodzko-Zajko, 2006). A flexibility training programme is defined as a planned, deliberate, and regular programme of exercises intended to progressively increase the usual range of motion of a joint or set of joints (Mazzeo et al., 1998). Improvements in flexibility due to flexibility training have been shown to improve the ability to carry out ADL, such as level and inclined walking, stair negotiation and rising from a chair (Mazzeo et al., 1998). Stretching exercises that emphasize range of motion and flexibility have been shown to increase ankle, knee joint and lower back flexibility (Chodzko-Zajko, 2006). There are two types of stretching exercises, namely static and dynamic stretches. Static stretches focus on one muscle group and moves the joint in a single movement plane, whereas a dynamic

stretch moves a joint through a given range of motion and does not hold a joint at a end position for any period of time (Rose, 2005).

According to Mazzeo et al., (1998), training interventions designed to improve flexibility have often lacked large numbers of subjects, randomisation and control. There has been surprisingly little recent research in the area of interventions to increase flexibility in the older adult despite known deterioration in joint range of motion (Mazzeo et al., 1998). However, Rose (2005) state that it does not seem to matter what the mode of exercise is, what matters most is the stressing the end range of joint motion, using an activity that is fun and safe and feels good.

Strength Training

Research clearly shows that it is never too late to improve one's physical fitness and functional ability (Rikli, 2005). One common characteristic of the aging process is the loss of muscle mass, which in turn leads to a loss of muscle strength that results in reduced physical activity (Rikli, 2005). The increased risk of falls and chronic disorders found in the frail older adult may be as a result of lower overall strength. Strength or resistance training is an exercise intervention that can reverse much of the loss of muscle function and deterioration of muscle structure associated with aging and can improve physical health (Jones & Rose, 2005; Lavie & Milani, 2007). Strength training may be the most important type of exercise for older people since it can stop or reverse the damaging losses in muscle mass (Lavie & Milani, 2007; Rikli, 2005). Strength conditioning is generally defined as training in which the resistance against which a muscle generates force is progressively increased over time (Mazzeo et al., 1998).

Many studies have shown the positive effects that strength training has on the overall functional capacity of the older adult population. Stronger individuals tend to react and move faster and generally have more control over their movements than frail individuals (Meyer et al., cited in Gertenbach, 2002). In a study done by Galvao and Taaffe (2005) resistance training consisting of only a single-set exercise is sufficient to significantly enhance muscle function and physical performance in everyday tasks in older adults. A significant correlation

between muscle strength and preferred walking speed has been reported for both sexes (Mazzeo et al., 1998).

Self Perception

“How we see or think about ourselves as persons- who are we, who we want to be, what we believe we are capable of doing or not doing-is intimately tied to what we actually do” (Whaley, 2004, p.101).

Self-perception the most general term for these thoughts and feelings, are guided by our past and present experiences, as well as our hopes and dreams for what we would like to happen (Whaley, 2004). Self-perception can be defined as individuals' beliefs, perceptions, attitudes, thoughts and feelings about themselves in general or about their abilities, skills, competencies, characteristics and behaviours (Horn, 2004). According to Fox (1997) self-perception is an umbrella term that includes all types of self-referent statements about the self, from those that are global to those that are specific in content. The problem that has plagued this area of study on the self is the terminology (Fox, 1997). However, in recent years, consensus has been reached in the majority of literature on the definitions of the self. Prior to proceeding with this section, it is important to fully understand the different terms of self that are found within psychological literature (see Table 8) in order to provide clarity regarding the correct meaning of self-perception.

Table 8.

Glossary of Relevant Terms (Summarised from Whaley, 2004, p. 291).

Term	Brief definition
Self-Perception	General term for all statements about the self; interrelated knowledge about the self.
Self-Concept	Individual as known to the individual; totality of the self
Self-Esteem	Evaluative component of the self; can be global or domain specific
Perceived Competence	Assessment of abilities; can be made at domain or domain specific
Identity	Integration of values, beliefs, and behaviours into a coherent sense of self
Self-efficacy	Belief in one's ability to accomplish a task successfully

In the past the self was viewed as unidimensional concept, which was apparent in instrument design such as true false items referring to self in a variety of life situations. This approach has since been widely criticised and has not been effective in furthering our understanding of the self (Fox, 2002). In 1973, Epstein (Fox, 2002) was one of the first theorists to introduce the idea that the self was multidimensional including perceived competence, moral self-approval, power and love-worthiness. The multidimensional view of the self allows researchers to focus on particular components of the self. For the purpose of this study, the self will be examined in relation to physical activity, in other words, the physical self which is discussed in the section that follows. The competence domain has also received a lot of attention, and a self-perception profiles approach, has been used which has clearly established that self-ratings are subdivided according to the domain of life being addressed (Fox, 2002).

In 1976, Shavelson, Hubner and Stanton (cited in Fox, 1997) introduced the now well-known multidimensional model of self-concept. This contains a hierarchical system with specific self-perceptions of ability at the base and global

self at the apex. This view was based on the premise that daily experiences would produce specific self-perceptions of ability that might eventually with repetition, generalize to higher levels of perceived competence in the hierarchy (Fox, 2002). Thus, self-perceptions which are measured at different levels in different domains (see Fig 2.1) are thought to contribute to an overall and more global sense of self-esteem (Hayes, Crocker & Kowalski, 1999). Specific self-perceptions are hypothesized to be more changeable, whereas global self-esteem is seen to be more stable and enduring (Fox, 2002).

The Physical Self

Regardless of the extent to which we aspire to be spiritual, there is no way around the fact that we are physical entities. Our health and emotions are expressed through out bodies. Our desires and behaviours are enacted through our bodies (Fox, 1997, p. vii)

Of particular relevance to sport participation and performance is the physical. Physical self-esteem, which refers to the evaluative element of self-concept, is sub-set of global self-esteem, psychological well-being, health and life (Fox, 2002). Fox (2002) found that high levels of physical self-perceptions have repeatedly been found to be associated with higher levels of global self-esteem. Figure 2.1 depicts how self-perceptions (of the physical self) at varying levels of specificity are linked to self-esteem on a global level (Lindwall, 2004).

Physical self-perceptions are generally formed in the context of cultural determinants of what is perceived as being beautiful and desirable body shape. There are clear gender differences in these perceptions, and women appear to be more affected by such values than men (Lindwall, 2004; Polman, 2004). Culturally, white populations show a higher rate of body dissatisfaction when compared to black populations. In addition, attractive adults possess more favourable self-perceptions and perceive themselves to be more competent than unattractive adults (Lindwall, 2004).

Physical Activity and Self-Perception

The self interacts with many life domains daily and the self is presented primarily through the body and is closely involved with the physical environment (Fox, 2002). Many research studies have produced sound evidence that regular physical activity can improve physical self-perceptions in various age groups and contexts, although the association with global self-esteem is weak and inconsistent (Fox, 1997). Physical activity is consistently related to increases in perceptions of the self and global measures of satisfaction such as quality of life (Weiss, 2004). The relationship between self-perceptions and physical activity performance has been extensively studied in adult populations (Whaley, 2004). Studies have examined how self-related constructs such as perceived physical competence (Fox, 2002), self-efficacy (McAuley et al., 2003) and self-schemata (Whaley, 2004) increase participation in physical activity behaviour. Physical activities researched in relation to physical self-perception have included various team and individual endurance and resistance activities. According to Fox (2002), these might eventually, through sufficient repetition, produce generalized perceptions of competence or ability. Perceived ability to successfully carry out a particular movement might produce high levels of perceived movement competence. General physical competence might contribute to physical self-worth (Fox, 2002).

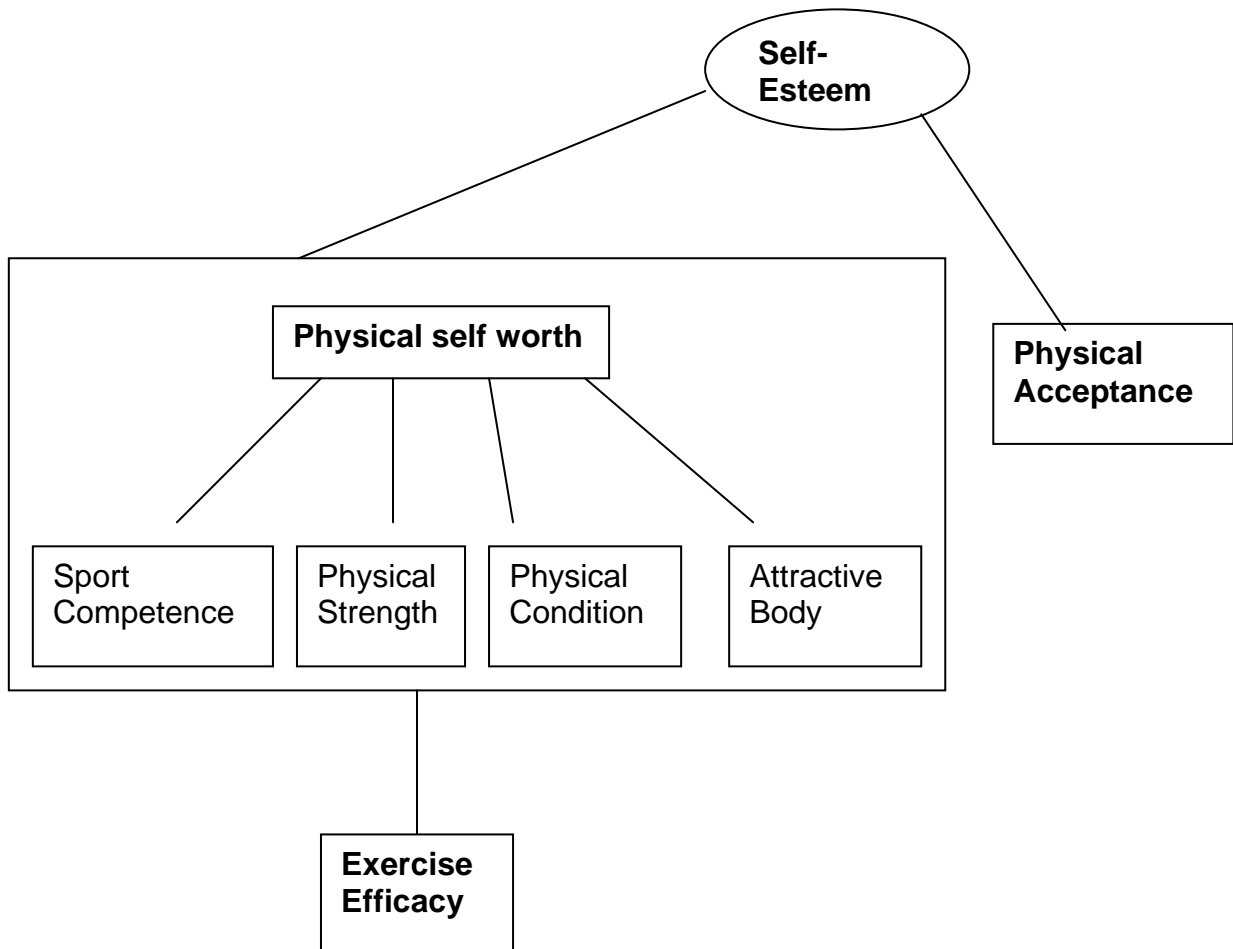


Figure 1. Adaptation of the exercise and Self-Esteem Model (EXSEM) to include the Physical Self-Perception Profile (Fox, 2002).

Sonstroem, Harlow and Josephs (cited in Lindwall, 2004; Fox, 1997), expanded the Exercise and Self-Esteem Model through the implementation of the four subdomains from Fox's Self-Perception Profile (Fox & Corbin, 1989) namely, sport competence, physical strength, physical condition and attractive body, and named it EXSEM (see figure 1).

Several potential mechanisms for the positive effects of exercise on self-esteem and physical self-perceptions have been suggested (Sonstroem cited in Lindwall, 2002):

- a) "an unidentified psychophysiological factor that increases mood and self-regard" (p. 53)

- b) “enhanced body image, body satisfaction, and body acceptance in relation to weight loss or increased fitness” (p. 53)
- c) “enhanced physical competence through skills, abilities and fitness” (p. 53)
- d) “increased sense of effectiveness, self-determination and control over body functioning and increased sense of autonomy” (p. 54)
- e) “enhanced self-acceptance” (p. 54)
- f) “improved feelings of belonging to a group and having relationships within the exercise group” (p. 54)

In addition, there is also considerable evidence that self-perceptions directly and indirectly affect successful aging (Whaley, 2004). Given the ambiguity of the term "success", there is no single well-accepted definition or model of successful aging (Bearon, 1996). However, Gibson (1995) anticipates defining successful aging as reaching one's potential and arriving at a level of physical, social, and psychological well-being in old age that is pleasing to both self and others. The processes that are involved in reaching ones potential, can be directly linked to a view of oneself in the past, present and future (Whaley, 2004).

Recent evidence has suggested that women might have an excessive fear of becoming fat, might develop obsessive and distorted physical self-perceptions (Anderson, Murphy, Mutagh, Nevill, 2006; Polman, 2004). In a study done by Polman (2004), found relationships between physical self-perceptions and body composition were particularly apparent in females and the higher the body mass index score was negatively associated with most of the sub-domains of Fox's Physical Self-Perception Profile (Fox & Corbin, 1989). Anderson et al. (2006) found that exercise-induced changes in body size and body mass, influence the facilitation of exercise-induced changes in some self-perception constructs. In addition, according to a study done by Netz, Wu, Becker and Tenenbaum (2005) examining the effect of exercise on the psychological well-being of older adults, physical activity had the strongest effects on self-efficacy and improvements in

cardiovascular status, strength and functional ability were linked to well-being improvements overall.

Resilience

Resilience has been defined in many ways, and this has been recognized as a source of confusion in literature (Humphreys, 2003; Neil & Dias, 2001). Resilience embodies the personal qualities that enable one to thrive in the face of adversity (Connor & Davidson, 2003). Ryff and colleagues (cited in Esche & Tanner, 2005) define resilience as the maintenance, recovery or improvement in mental or physical health following a challenge. “For older people resilience is described as flexibility and as a type of adaptive capacity that may be activated and contribute to maintenance of independent functioning and well-being” (Nygren et al., 2005, p. 355). Lastly, Jacelon, (1997) states that the Oxford English Dictionary provides a possible solution to the confusion by defining resilience as the ability to “spring back” or “rebound.”

The study of resilience dates back to 1800's when the concept of resilience was viewed in the field of psychology as primarily a psychological coping mechanism. However, more recently, the term resilience has expanded to include how individuals cope with physiological stress too (Esche & Tanner, 2005). It is a concept that is increasingly being used in education and psychology, particularly with regard to being a goal of primary prevention mental health programmes (Neill & Dias, 2001).

Resilience has also been identified as a constellation of traits (Jacelon, 1997). Levant and Barbanel (2002) confirm this by stating that resilience is an interactive product of beliefs, attitudes, approaches, behaviours and perhaps physiology that help people fare better during adversity and recover more quickly following it.

Characteristics of a Resilient Individual or Older Adult

Wagnild and Young (cited in Nygren et al., 2005), identified five interrelated components that constitutes resilience:

1. "Equanimity (a balanced perspective of one's life and experience)" (p. 355)
2. "Perseverance (a willingness to continue to reconstruct one's life and to remain involved)" (p. 355)
3. "Self-reliance (a belief in oneself and one's capabilities)" (p. 355)
4. "Meaningfulness (an understanding that life has a purpose)" (p. 355)
5. "Existential aloneness (a realization that each person's life path is unique)" (p. 355)

Esche and Tanner (2005) illustrate mechanisms that enhance and inhibit resilience following stressful events (Table 9).

Table 9.

Mechanisms that Enhance and Inhibit Resilience following Stressful Events.

Protective Mechanisms	Risk Factors
Social support	Increased age
Few depressive symptoms	Living alone
Living with others	Low social support
Intact cognitive functioning	Depressive symptoms
High level of mobility	Diminished vision

Hardy, Concato, and Gill (2004) studied resilience among community-dwelling older adults, focusing on the interrelationship of resilience as a

personality trait, psychosocial factors and function. Factors correlating with high resilience included, sex (male), living with others, independence in activities of daily living, fewer depressive symptoms, and a high self-rating of health. Other factors such as age less than 75 years, education (postsecondary) and a high level of physical activity, did not correlate as highly with a high level of resilience as the others mentioned above (Esche & Tanner, 2004).

Neill (2006) identifies a simple formula that could aid in individual resilience. Figure 2 demonstrates that any level of challenge can be overcome if the individual receives sufficient support.

$$\text{Growth} = \text{challenge} + \text{support}.$$

Figure 2. Neill's (2006) illustrates a simple formula to aid in a person's resilience.

As illustrated in Table 2.9 it is important for an older adults to preserve their cognitive functioning for example, avoid negative thinking, keep brain active by reading etc. This is confirmed by the Australian Psychological Association (2007), who state that cognitive function makes an individual more resilient because the individual maintains the ability to problem solve, to invoke coping strategies and allows the older adult to value social interaction.

Resilience and Aging

Age is a risk factor (Table 2.9) that contributes to diminished resilience. As age increases above 75 years, resilience has been shown to decrease. In addition, individuals who show low self-ratings of health are also associated with lower levels of resilience (Esche & Tanner, 2004; Levant & Barbanel, 2002).

Psychological stressors or risk factors are often considered as experiences of acute or chronic stress. Each population group faces unique stressors of their own. Examples of stressors that the older adult experiences, are not only losses in physical capacity and cognitive resources but also social status, friends and family

members (Nygren et al., 2005). If a stressor is considered to be a danger, coping responses are triggered. Coping strategies are generally either be outwardly focused on the problem (problem-solving), inwardly focused on emotions (emotion-focused) or socially focused, such as emotional support from others (Neill, 2006). However, Levant and Barbanel (2002) state that there is no right way to cope. Older adults generally control negative emotions, but also need to actively address problems posed by the stressor.

Some elderly seem to have more strengths and better ability than others to deal with various losses, bodily decline and other functional health limitations. The reason for this is unclear but Flach (cited in Jacelon, 1997) states that resilience is a system, which can be learned at any point in life and is a dynamic quality (Neill, 2006) whereby resilience is self-renewed by the individual.

Walter-Ginzburg, Shmotkin, Blumstein and Shorek (2005) studied the association between gender differences in resilience and mortality of the old-old in Israel. The study showed that individuals who were more physically activity and showed higher resilience in ADL were associated with lower risk of mortality for both genders. Both men and women were resilient yet there were differences. However, a study done by Sepaki et al. (2006) concluded that after a traumatic event or disaster the near-elderly (between the ages of 54 and 70) were less resilient than the elderly.

Surprisingly, there has been a lack of investigation into whether resilience can be enhanced and how this might be best achieved (Neill & Dias, 2001). There is also a shortage of literature examining the relationship between exercise and resilience of any age group. Nygren et al. (2005), concludes that research on the relationship between the physical and mental health among the oldest old is scare. In a survey done by St Luke's Health Initiative (2005) who examined the resilience of people in America, and whether they perceived being part of an exercise programme would help them become more resilient. The results indicated that 67 % percent anticipated joining an exercise group in order to help them cope individually, of which only 57% found it very helpful.

Another area requiring further research is the process of resilience in different populations (Jacelon, 1997). In addition, "Future research examining whether psychological constructs related to adaptation to chronic stress, including hardiness, resilience and coherence may be incorporated in quantitative studies for successful aging" (Reichstadt, Depp, Palinkas, Folsom & Jeste, 2007, p. 199). Levant and Barbanel (2002) conclude that older adults are especially likely to benefit from intervention efforts at the individual and community levels, for example in their communities and senior centres.

The need for social support in promoting resilience amongst not only the elderly but amongst other age groups is stated to aid an individual to be more resilient and coping with stressors easier (Esche & Tanner, 2004). For many older adults, family and life-long friends provide the most meaningful social ties and play important roles in helping older adults maintain positive emotions and recover from stressful experiences (Levant & Barbanel, 2002).

Participating in an exercise group results in the formation of meaningful relationships and contributes greatly to provide an extra source of a social support system for the individual, over and above their other relationships outside of the exercise group. The hypothesis within the present study is that for the older adults to form part of an exercise group, they would receive an adequate amount of social support, which could possibly result in an improvement in their individual resilience.

Summary

The dramatic increase in the number of older adults worldwide, poses a cascade of challenges. Within South Africa, together with the rest of the world, women have a higher life expectancy than men, resulting in the need for measures to be employed to aid in the quality of life of these women. Despite the increase in well-documented benefits of exercise for people of all ages, especially for the aged who could possibly gain more from physical activity than other age groups, there are still a large percentage of older adults who remain inactive. This results in the susceptibility towards more debilitating chronic diseases such as obesity, diabetes type 2 as so on, which in turn not only has devastating effects for the individual,

but for the rest of society as well. Together with the rise in inactivity is possible weight gain as well as an increase in dependency amongst the older adult population. A negative relationship exists between both dependency and obesity and an individual's self-perceptions. In addition to the physical limitations faced with aging, are a number of stressors that the older adult has to cope with such as loss of family, friends, income and status. These challenges often result in depression and anxiety and characterize the inability to cope, helplessness and a lack of resilience. Participation in physical activity provides older adults with meaningful relationships and social support, which could enable the individual to deal with the specific stressors associated with aging more easily. When designing an appropriate exercise programme specific considerations need to be into account such as placing great importance on the safety of the older individuals, the fitness components of the programme and motor learning principles the instructor needs to implement when working with older adults.

Chapter Three

Methodology

The approach used in this study was empirical in nature, exploring new information by means of different types of measurement (Gratton & Jones, 2004). This chapter entails a detailed description of the tests and procedures followed in the present study.

Research Design

The most powerful research design is usually considered to be the experimental design. However, when neither a satisfactory control group nor a satisfactory comparison group can be identified, a quasi-experimental design can be used (McKenzie & Jurs, 1993). In this study, careful consideration was given to the validity of identifying a control group:

1. It was decided that a control group would not be appropriate.

The group of subjects in the present study all lived in a closed community. To deny any of the members of that community access to the intervention programme could have caused tension among them. It was a highly desirable programme with anticipated health benefits. During the introduction session to explain the programme, many members of the community attended and indicated their enthusiasm for participation.

2. It was decided that a separate comparison group could not be identified.

Finding a similar group within this geographical area was not possible. The subjects in the present study were from a middle-class socioeconomic background and a single racial group. Although they lived in a closed community, they all lived independently. The community was not an institution and consisted of 80% women.

However, since a time-series design was employed (see below), it was possible to divide the subjects into two groups prior to the final follow up testing based on their

personal choice to remain active or not following the cessation of the intervention programme.

Van Dalen's (1973) advice was that if it is not possible or advisable to make a random assignment of subjects to an experimental and control group, then another approach should be considered. A comparison group might be used, but it may be extraordinarily difficult to identify a truly similar group for comparison with an experimental group. His recommendation, which has been supported by a number of research design specialists, is to consider a time-series design (Borg & Gall, 1989; Johnson & Nelson, 2001; Runkel & McGrath, 1972).

A time-series design is a quasi-experimental approach (Johnson & Nelson, 2001). It is regarded as a quasi-experimental design. "The purpose of a quasi-experimental design is to fit the design to settings more like the real world settings...the use of these designs in kinesiology...has increased considerable in recent years" (Johnson & Nelson, 2001, p. 323).

The time-series design involves only one group. The purpose of the design is to determine if the changes that occur when the treatment is administered, are present when the treatment is removed (Johnson & Nelson, 2001).

McKenzie and Jurs (1993) recommended using a time series evaluation design when examining differences in programme effects over time. This approach involved taking several measurements both before and after the programme is implemented. They described it as an especially appropriate design for measuring the delayed effects of the programme. For example, a time-series design is recommended for evaluating the effectiveness of a weight loss programme, since the goal of the programme is for the weight loss to be sustained after the formal intervention programme has stopped (McKenzie & Jurs). Borg and Gall (1989) identified the time-series design as especially appropriate when trying to implement a programme that will try change a behaviour that is thought to be fairly stable.

Within the time-series design, the basis for claiming that a treatment has caused an effect is if there is an increase or maintenance in any changes achieved from a comparison of the pre-test to the first post-test after the intervention

programme (Thomas & Nelson, 2001). This type of design controls for a number of threats to internal validity, for example:

- Selection biases are controlled because the same subjects are used at each observation (Thomas & Nelson, 2001).
- If maturation is a factor, it will have affected all subjects (Thomas & Nelson, 2001).

Although the optimal design under some circumstances, the time-series design is not as popular as other designs. In some cases, the time-series design is not employed because it is thought that the time period between observations could introduce too many new variables, there could be mortality among the subjects, which would compromise the sample size, or the additional expenses involved in additional post-tests were considered to be excessive (Runkel & McGrath, 1972).

Procedures

Instruments

Both questionnaires and functional tests were used as methods of obtaining data in the present study. The questionnaires consisted out of Health Screening (adapted from Rimmer, 1994); self-designed Informed Consent (pre-test only); Barthel Index (Mahoney & Barthel, 1965); Resilience Scale (Connor-Davidson, 2003) and the Physical Self-Perception Profile (Fox, 1989). Anthropometric measurements were taken together with the two functional tests that assessed balance namely, the 8-Foot Up-and-Go (Rikli & Jones, 2001) and the Berg Balance Scale (Berg, 1989).

Questionnaires

Health Screening Form and Informed Consent

Cotton et al. (1998) state that the pre-screening process allows one to achieve the following:

- 1) "Identify medical conditions and/or medications that may place the client at risk when participating in certain activities" (p. 103)
- 2) "Discover possible contraindicated activities" (p. 103)
- 3) "Design an suitable exercise programme" (p. 103)
- 4) "Adhere to the legal and ethical requirements of the fitness industry" (p. 103)

Rimmer's (1994) exercise screening questionnaire was specifically adapted to meet the relevant needs of the older adult women within the present study (see Appendix B). Each individual screening form was assessed for any contraindications to exercise and necessary action was taken accordingly. This allowed the researcher to identify any individuals with special needs and possible "red flag" indicators prior to exercising. Special attention was given to ensuring the safety of the participants as well as to this crucial first step prior to the intervention, placing the safety of the subjects first.

Informed consent (see Appendix A) was obtained from each participant prior to participating in the study. Each subject was able to complete their form independently and no next of kin were needed to sign on the subject's behalf. Ethical codes stipulated by the American Psychological Association (2001) were included with the informed consent form as well as adhered to throughout this research. Such codes include the following key requirements:

- "Risks to participants are outweighed by the benefits of the research programme" (p. 112)
- "Participation is voluntary" (p. 112)
- "Risks to participants should be eliminated or minimised as far as possible, including psychological and social, as well as physical risks" (p. 112)
- "All information is treated as strictly confidential" (p. 112)
- "The participants have the right to be informed of the study" (p. 112)
- "Participants may withdraw at any time" (p. 112)

- “Participants are debriefed after the research programme” (p. 112)

Barthel Index

Florence Mahoney and Dorothea Barthel developed the original Barthel Index in America during 1965 (Nicholl, Hobart, Dunwoody, Cramp & Lowe-Strong, 2004). It was initially developed as a measure to assess the functional ability of patient's with neuromuscular and musculoskeletal conditions. It has also been used as a testing measure amongst patients that have suffered from stroke, cardiac problems, amputations, multiple sclerosis and amongst the aged (Mahonney & Barthel, 1965; Nicholl et al., 2004). The Barthel Index has been the most widely used ADL scale in rehabilitation medicine throughout the world and recommended for routine use amongst the elderly by the Royal College of Physicians (Burton, 1998; Sainsbury, 2005).

The Barthel Index represents a patient's ability to carry out 10 everyday tasks or ADL (Kwakkel, Wagenaar, Twisk, Lankhorst & Koetsier, 1999). A reliability study performed by Collin, Wade, Davies and Horne (1988) stated that the Barthel ADL Index is a valid measure of disability.

The 10 subtest items include (1) feeding, (2) moving to bed and return to standing, (3) personal grooming, (4) getting on/off the toilet, (5) bathing, (6) walking or propelling a wheelchair, (7) stair climbing, (8) dressing and undressing, (9) bowel and (10) bladder continence. Each subset item on the original Barthel Index is rated 0, 5, 10 or 15. A total score of 100 represents the highest level of independence although a perfect score does not necessarily mean that a person is able to perform instrumental ADL (Nicholl et al., 2004). An example of the Barthel Index is illustrated in Appendix I.

Resilience Scale

Resilience can be defined by Connor and Davidson (2003) as embodying the personal qualities that enable one to thrive in the face of adversity. Connor and Davidson developed a resilience scale for adults, namely the Connor-Davidson Resilience Scale (CD-RISC). "CD-RISC was developed as a brief self-rated

assessment to help quantify resilience and as a clinical measure to assess treatment response" (Connor & Davidson, 2003, p. 77). It shows a high internal consistency, validity and test-retest reliability. Connor and Davidson confirm that the CD-RISC could have potential to be used in both clinical practice and within research (Connor & Davidson, 2003).

It contains 25 items, all of which carry a 5-point range of responses. These are as follows: not true at all (0), rarely true (1), sometimes true (2), often true (3), and true nearly all of the time (4). The scale is scored according to how the subject has felt over the past month. The total score ranges from 0-100 with higher scores reflecting greater resilience. This is depicted in Appendix G, which indicates the contents of the CD-RISC used within the present study.

Physical Self-Perception Profile

Kenneth Fox's Physical Self-Perception Profile (PSPP) is widely used throughout research (Richards & Marsh, 2000). It is a multi-dimensional 30-item self-report instrument measuring an individual's self-concept. Evidence confirming the validity and reliability of this study has been proven cross-culturally, across genders and amongst American adults (Hayes et al., 1999).

Fox (2000) argued that self-perceptions can vary from one level to another and can be categorized as the following:

1. superordinate (i.e. global esteem)
2. domain (i.e. physical)
3. subdomain (i.e. sport competence)
4. facet (i.e. soccer ability)
5. subfacet (i.e. shooting ability)
6. state (i.e. I can do it)

The PSPP includes 30 items consisting out of five 6-item subscales: sport competence (athletic ability), perception of physical condition and fitness (physical

condition), perception of an attractive body (physical attraction), perception of physical strength (confidence in situations that require strength) and a superior self-worth (general feeling of satisfaction). The latter scale being the domain and the other being the subdomains as depicted in Figure 3.

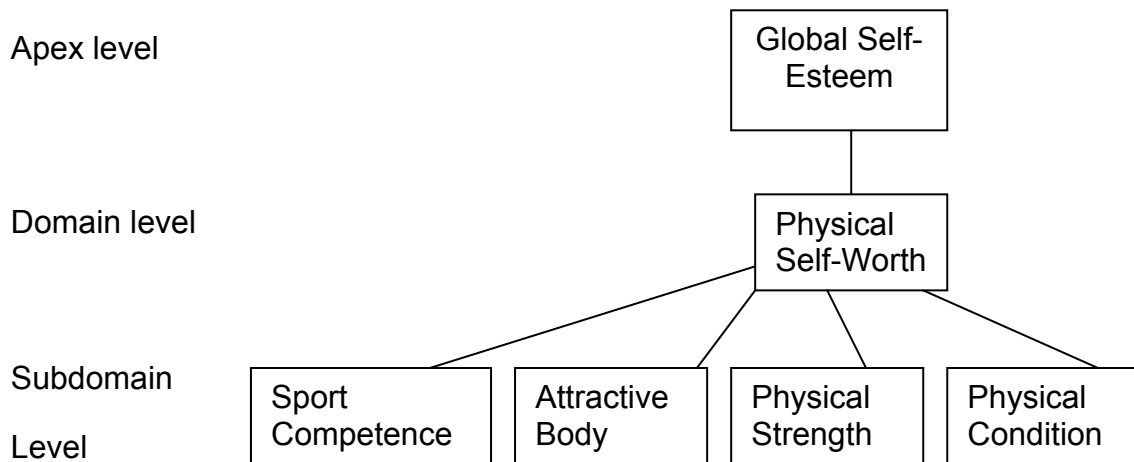


Figure 3. Three-tier hierarchical organizations of self-perceptions (Fox & Corbin, 1989).

The PSPP design consisted out a four-choice structured alternative format. The subject is first asked which kind of person best describes them and then to decide to what degree they are that kind of person. The result is a four choice response. The scores are then added of each subscale. Each response is assigned a value of one to four points. Each subscale, contains six items ranging from 6-24. The negative items are reversed so that the lowest scoring descriptor is placed first, and items from each of the subdomain are placed in sequence with the complete profile. Therefore, high scores represent high self-concepts. The exact layout of the Physical Self-Perception Profile is illustrated in Appendix H as referenced in Kelly, (2004).

Functional Tests

Physical mobility and balance testing form an essential part of the geriatric assessment (Bischoff, Stahelin, Monsch, Iversen, Weyh, Von Dechend, Akos, Conzelmann, Dick & Theiler, 2000). Anthropometric measurements were carried out together with the functional tests, assessing body weight and height. The two balance tests implemented within the present study were the 8-Foot Up-and-Go test (Rikli & Jones, 2001) and the Berg Balance Scale (Berg, 1989). They both assessed the subject's ability to balance and indirectly their ability to carry out ADL effectively without falling.

Anthropometric Measurements

Body weight, height and the Body Mass Index (BMI) were used to give the researcher an indication of the obesity profile of the study population. These measurements were taken on the same day as the questionnaires were completed due to time constraints. The BMI measurement would act as a guideline to the researcher to what fitness components of the programme he or she would need to pay more attention too. For example, if there was a high initial BMI score for most of the individuals, then a greater emphasis would be placed on the aerobic component of the programme in order to result in possible weight loss. Consequently, a decrease in weight as a result of the programme would result in an improvement in the individual's ability to carry out ADL effectively and therefore improve his/her psychological well-being.

According to Bedogni, Pietrobelli, Heymsfield, Borghi, Manzieri, Morini, Battistini and Salvioli (2001) BMI is the ratio of body weight in kilograms to height in square meters, and is the adiposity index most commonly used in adults. The subject weight (kg) is divided by the subject's height (m)². This number then falls into a specific category, namely underweight; normal; overweight or obese. Bedogni et al. (2001) stated that there is a lack of information available regarding the use of BMI as an adiposity index in the elderly. However, Cotton et al. (1998) listed ideal values for women between 60 to 69 years and 70 to 79 years of age at 27.3 and 27.8 respectively. In younger persons, a high body mass index is associated with an increased mortality risk. Conversely, in older adults, a low body

mass index is more strongly associated with a high mortality risk. For example, a low body mass index of $<23,6\text{kg/m}^2$ is independently associated with mortality (Somes, Kritchevsky, Shorr, Pahor & Applegate, 2002). In Table 10 the American College of Sports Medicine (2000) provides the different categories for BMI scores for all age groups.

Table 10.

Classification of Disease Risk Based on Body Mass Index for all Age Groups (ACSM, 2000, p. 64).

Category	BMI (kg/m²)
Underweight	< 18.5
Normal	18.5 – 24.9
Overweight	25.0 – 29.9
Obesity:	
Class 1	30.0 – 34.9
Class 2	35.0 – 39.9
Class 3	≥ 40

A substantial amount of literature argues that BMI should be used in conjunction with waist-to-hip ratio, as it does not differentiate between fat and non-fat tissue. However, this is rarely an issue with older adults as there is a loss muscle mass with age and the measurement will thus be predominantly that of fat-tissue. The only exception is older adult populations who participate in heavy resistance training, namely, master-level athletes (Jones & Rose, 2005).

All the women that took part in the present study were not involved in any masters sports and were all above 64 years of age, so it was not necessary to combine BMI with the waist-to-hip ratio measurement in order to get a true reflection of fat tissue. In addition, the BMI measurement was merely used more as a guideline for the researcher as to what proportions of fitness components to include in the movement programme than a scientific measurement as such.

The weight was measured in kilograms (kg) by using an electronic scale, which was calibrated prior to the commencement of the study. The following

procedures were used in measuring the weight of each subject in this study (De Ridder, 2003):

- “The subject should be weighed in clothing of a known weight so that a correction to nude weight can be made” (p. 24)
- “Measuring should be taken in the morning” (p. 24)
- “Check that the scale is reading zero, then the subject stands on the centre of the scale without support and with the weight distributed evenly on both feet” (p. 24)
- “The head is up and the eyes look directly ahead” (p. 24)

A stretch technique was used to measure the height (m) for each subject. The measurement device used was a stadiometer. The following procedures were followed in this study (De Ridder, 2003):

- “Subject was barefoot, standing erect with the heels together and the arms hanging naturally by the sides” (p. 20)
- “The heels buttocks, upper part of the back, and back of the head were in contact with the vertical wall” (p. 20)
- “The subject was instructed to look straight ahead and to take a deep breath” (p. 20)
- “With the subject's head in the correct position, the headpiece was brought down and in contact with the vertex (highest point of the skull) of the head” (p. 20)

8-Foot Up-and-Go Test

The "Get-Up and Go" test was initially developed by Marthias and colleagues to study the disturbance of balance in elderly people (Schoppen, 2002). Podsiadlo and Richardson (1991) modified the test to the Timed "Up and Go" test to get a more reliable outcome measure. Time taken to complete the test is directly linked to the level of functional mobility (Shumway-Cook, Brauer & Woollacott, 2000).

The 8-Foot Up-and-Go test is a modified version of a previously published 3-metre "Timed Up-and-Go" protocol. The purpose of this test is to assess agility and dynamic balance. The main reason for the reduction in distance from 3 metres to 2.44 metres was to increase the practicality of administering this test in areas with limited space. No accuracy was lost in shortening the distance (Rikli & Jones, 2001).

The 8-Foot Up-and-Go test was chosen for the present study for two particular reasons. The first reason being, the limited space available to complete the testing. The second, is that according to Schoppen, Boonstra, Groothoff, De Vries, Goeken & Eisma, (1999) this test shows a significant relation to the Berg Balance Scale ($r=0.81$), gait speed ($r=0.61$) and the Barthel Index ($r=0.78$). Past literature shows that performance on the up-and-go test can discriminate among various functional categories in older adults and is responsive to changes resulting from an increased level of physical activity (Podsiadlo & Richardson, 1991; Tinetti et al. cited in Rikli & Jones, 2001).

The 8-Foot Up-and-Go test measures, in seconds, the time taken by an individual to stand up from a seated position on a standard arm chair (43 cm in seat height), walk a distance of 2.44 metres (approximately 8 feet), turn, walk back to the chair and sit down again. After the instructor has demonstrated the correct technique of performing the test, the subjects have one practice trial followed by two test trials of which the fastest speed is recorded (see Figure 4).



Figure 4. A subject performing the 8-Foot Up-and-Go test (Rikli & Jones, 2001).

Studies have shown that it can detect expected differences between high-active and low-active older adults and is an excellent discriminator of performance changes (Rikli & Jones, 2001). There is a constant slowing of average times of the 8-Foot Up-and-Go test with age (as seen in Table 11). A study conducted by Miotto, Chodzko-Zajko, Reich, Supler (1999), also indicated that the 8-Foot Up-and-Go test scores of physically active older people were faster (4.9 seconds) than those of inactive older adults (5.7 seconds). An exact description of the 8-Foot Up-and-Go test used within the present study is illustrated in Appendix D.

Table 11.

Normal Range of Scores for Women (Jones & Rikli, 2005, p.82).

Exercise	60-64yrs	65-69yrs	70-74yrs	75-79yrs	80-84yrs	85-89yrs	90-94yrs
8-Foot Up-and-Go (seconds)	6.0-4.4	6.4-4.8	7.9-4.9	7.4-5.2	8.7-5.7	9.6-6.2	11.5-7.3

Berg Balance Scale

The fear of falling is a serious concern within the older adult population. Approximately 30% of community-dwelling persons aged 65 or older fall one or more times each year (Lajoie, Girard & Guay, 2002). The psychological sequelae (sometimes termed "post-fall syndrome") can be severe and can lead to a loss of self-confidence in one's ability to perform routine daily tasks, as well as social withdrawal, depression or confusion. Balance is critical to functional capabilities because it is a requirement for carrying out ADL.

However, the equipment required for studying balance in the laboratory is expensive and involves highly trained personnel. Furthermore, these measures are not easily accessible to researchers with limited budgets or clinicians in their daily practice (Berg, 1989). Berg and associates took these factors into account when they designed the Berg Balance Scale (BBS) and it is because of these same factors that the BBS was used as the measurement instrument of functional balance in the present study (Berg, Wood-Dauphinée, Williams & Gayton, 1989).

The BBS is a clinical test used to assess functional limitations in balance and mobility, as well as to measure improvements. Shumway-Cook et al. (2000) concluded in their study that the BBS was the best single predictor of falls in community-dwelling older adults. The BBS has demonstrated both validity and high test-retest reliability when administered to older individuals. The scale also has a high internal consistency, which facilitates interpretation of test scores. The test is simple and easy to administer, and is safe for elderly patients to perform (Shumway-Cook et al., 2000).

The administration of the test requires a stopwatch and a ruler and takes approximately 15-20 minutes to complete. According to Lajoie et al. (2002), the only downfall of the BBS is the time taken to administer this test. It consists of 14 test items, scored from zero to four on an ordinal rating scale (Shumway-Cook et al., 2000).

- To achieve the maximum score of four for a movement, subjects must perform the movements independently and hold the position for a prescribed amount of time, or perform the action within a certain time frame.
- Progressively fewer points are awarded as the time requirements are not met and as the subjects need greater assistance in the activity.
- Test items include sit-to-stand, transfers, retrieval of an object from the floor and other movements associated with daily functioning.
- The total possible score on the BBS is 56, which indicates excellent balance.

In a recent publication, Shumway-Cook et al. reported an average total score for the BBS of 52.6 and 39.6 for non-fallers and fallers respectively. Figure 5 illustrates a subject performing one of the items in the BBS, and Appendix C is an example of the scale as referenced in Shumway-Cook and Woollacott (1995), that was used for the purposes of the present study.



Figure 5. A subject performing one of the test items in the Berg Balance Scale (Berg, 1989).

Subjects

The subjects participating in the present study were all volunteers. Criterion-based sampling, defined by LeCompte and Goetz (cited in Thomas & Nelson, 2001) is choosing a sample according to specific criteria, which was implemented in this study. For example, subjects were chosen according to specific inclusion and exclusion criteria. The inclusion criteria for taking part in the study was that the subjects had to be female, over the age of 64, medically fit to exercise, and had to attend at least 17 out of 24 (70%) sessions of the movement competence programme. The exclusion criteria being that if any of the subjects were declared medically unfit or showed any contraindications to exercising then they would not be allowed to participate in the study. The subjects ranged from ages 64 to 86 with the mean age being 76 years. The women were drawn from a white racial group with a lower-middle socio-economic status.

A keen interest to exercise was demonstrated by the women. Initially 40 women were present at the introductory class while 34 women participated in the pre-testing. 30 women started the movement programme and of those, 21 women complied with the 70% attendance rate criteria. Data for those who attended at

least 70% of the classes were used for further statistical analysis. The main reasons for the dropout rate were illness (both physical and mental) or the women leaving for holiday during the course of the programme.

Nineteen of the women that took part in the 12-week movement programme lived in a retirement village where they lived independently in separate houses. However, there were three women that heard about the programme by word of mouth and joined from outside of the village but adhered to the inclusion and exclusion criteria. The movement programme was held within the retirement village's clubhouse, which was a medium-sized hall with a sound system already present. Permission to use this facility was granted and there were no costs involved. The space, however, was limited and could only hold a maximum of 30 women. Any further women that wanted to participate in the study were not allowed to due to the space available and in order not to jeopardise the performance of the group. The location was ideally suited to the needs of the study population, as the majority of the women did not have to travel long distances to exercise.

Data Collection

This section describes in detail the procedure followed within this study. It contains information regarding procedures used to capture data, i.e. pre- and post-testing, the intervention programme, follow-up testing, debriefing of subjects and treatment of data.

Pre-test

After the introductory session, a date was set and the pre-testing began. Due to the large amount of women interested in the study, two dates had to be assigned for pre-testing. On the first day the questionnaires and anthropometric measurements were completed while the two functional tests were performed on the second day. This reduced the pressure on the subjects to complete all the questionnaires and functional test during a short time period, resulting in more time for each individual to think clearly about each answer.

Notices were put up on all the notice boards in the clubhouse, reminding the women when they had to be present for the pre-testing. This included details of which individuals were needed to perform certain tests on specific dates, as well as what clothes were needed and what the women should bring along to allow the testing process to flow smoothly. The informative and educative part of the study was a very important aspect of the programme that involved a lot of administrative work for the researcher. This eliminated any uncertainties of any information regarding the details of the study among the subjects, caused partly by the forgetfulness of this particular population group, once again reinforcing the importance of structuring the particular programme to the specific needs of this special population. The subjects from the retirement village and a few from the surrounding area were tested in the clubhouse hall, which management kindly provided for the purpose of this study.

On arrival on the first day, the researcher welcomed the participants to the study and took a name list together with the relevant contact details of each participant.

Each subject was handed the following forms and questionnaires:

- Health Screening Questionnaire (Rimmer, 1994)
- Informed Consent (self-designed)
- Resilience Scale (Connor-Davidson, 2003)
- Barthel Index (Mahoney & Barthel, 1965)
- Physical Self-Perception Profile (Fox & Corbin, 1989)

The researcher kept a list of all the women that were present, who each received questionnaires and returned these once they had completed all five. In this way, a record was kept of all the subjects and it was ensured that none of the subjects left with the questionnaires or left without completing them.

Each subject completed the informed consent form as well as the health-screening questionnaire. The latter consisted of a medical history, known contra-

indications to exercising, and personal information such as age and date of birth. This is important information for the person administering the intervention programme in order to create a safe environment for the subjects. The date of birth was included as the researcher felt that in order to create a social support structure that would ultimately aid in an improvement in self-perception, it would be good if the exercise class could celebrate birthdays with the relevant person. Height and weight were then measured as soon as each subject had finished completing the questionnaire. This was done in a separate room to respect each individual's privacy.

To deal with any questions that the women had regarding the completion of the questionnaires, an extra biokinetics intern was present that was clearly informed of the information required prior to the testing. This contributed towards providing the subjects with the most accurate and true information and guidelines to help them complete the questionnaires as accurately as possible, resulting in valid information for data processing.

On the second day, all 30 subjects performed the functional tests. A biokineticist, a biokinetics intern and a scholar all assisted the researcher on the days allocated for testing. The biokineticist administered the 8-Foot Up-and-Go test by explaining the procedure to each subject and taking the time using a stopwatch. The time for both trials for each subject was then verbally communicated to the biokinetics intern who then recorded it for statistical purposes. The use of qualified personnel, who were already familiar with the test protocol prior to testing, reduced the possibility of inter and/or intra-rater errors occurring. The scholar was responsible for taking photos of the subjects performing each test. This was done in a respectful manner with prior consent from the group of women. The photos were then used to make a certificate for the women that were handed to them at the end of the study (Appendix J).

The researcher administered the Berg Balance Scale, which was the more complex of the two functional tests chosen for the study. It also involved special care to ensure that there were no injuries due to the fact that the researcher at the time knew very little about the subjects' balance abilities. Stations were constructed, with half of the women performing the 8-Foot Up-and-Go test and half

of the women performing the Berg Balance Scale. The biokineticist and researcher coordinated the flow of subjects between the two tests, making sure that each individual had performed both functional measures. Once they had finished at both stations times for the training sessions were scheduled, any further questions were addressed and they were free to go. The entire pre testing assessment took an hour to complete on both days of testing.

Intervention

The exercise sessions were organized to accommodate the schedule of the subjects. They were held twice a week on Mondays and Thursdays from 09:00–10:00. Although deconditioned persons may improve cardiorespiratory fitness with only twice-weekly exercise, optimal training frequency appears to be achieved with three to 5 workouts per week (ACSM, 2000). Although optimally it would have been better if the group could exercise three times a week, it was not possible in terms of their schedules. The whole intervention group chose the dates and times which suited the majority of the women by means of a unanimous vote.

When designing the 12-week movement competence programme the following goals were kept in mind by the researcher:

- To ensure that the movement competence programme was designed to be population specific. Not exceeding their ability, taking individual physical limitations into consideration but at the same time to make it challenging, adding in slight progression over time.
- To ensure that the programme was well rounded including the following fitness components, namely, flexibility, strength, balance and cardiovascular.
- Allow for an element of enjoyment throughout the programme. This is important for adherence to the programme and the psychological well-being of the subject. (Group or partner work, dancing, aerobics and variation were all used to achieve this goal.)

According to the Society of Geriatric Cardiology (n.d.) well-rounded physical activity programmes for the elderly include aerobic endurance exercises, balance

and strength training and flexibility/stretching exercises. The American College of Sports Medicine (2000) recommend that exercise programmes for the elderly should emphasise proper stretching, especially for the arm and shoulder, upper and lower trunk, neck and hip regions.

The goals of the movement competence programme were to improve each participant's:

- Functional independence during activities of daily living
- Overall health, for example weight loss, and physical well being
- Improvement in balance and thus, a reduce fear of falling
- Psychological improvements in self-perception for example
- The ability to cope with stressors (resilience) either from the social support provided by the group or an individual improvement in functional capacity
- Social improvements such as the formation of new friendships

The movement competence programme was split into 4 categories (as depicted in Figure 6):

1. Sitting and Standing exercises (S & S)
2. Mat exercises
3. Partner exercises
4. Aerobics

Each category or theme lasted a week and followed each other consecutively. Sitting and Standing (S & S) exercises then followed aerobics for example. This was then repeated three times. A detailed description of this programme is seen in Appendixes I. Appendix I only consist out of a summary of only some of the items included in the base programme, as well as the repetitions of each exercise and the purpose of function of the specific exercise. Progression was also added which was achieved by either increasing the sets or repetitions or

by increasing the duration of the activity. Both these ways increased the intensity of each exercise.

According to the American College of Sports Medicine (2000), the recommended rate of progression in an exercise conditioning programme depends on functional capacity, medical and health status, age, individual activity preferences and goals, and an individual's tolerance to the current level of training. Progression should be conservative and gradual for older adults. The initial stage, usually four to six weeks, should include low intensity exercise to permit adaptation with minimal risk for injury. Elderly subjects may need a longer period of adjustment before exercising at higher intensity levels. It is better to increase exercise duration initially rather than the intensity in order to avoid injury and ensure safety (YeanSub, 2006). Many of the progressions in the basic programme as well as the progressions to individualise the programme were based on these guidelines.

Subjects were constantly reminded at the beginning of each class to only perform the exercises that they felt comfortable with and work within their individual intensity tolerance. The researcher also memorised each subject's medical condition and adjusted the exercises accordingly. For instance, a woman with a hip replacement was given another exercise to do while the rest of the group performed hip adduction exercises. This was of critical importance to the researcher in order to prevent any further injury to the subject.

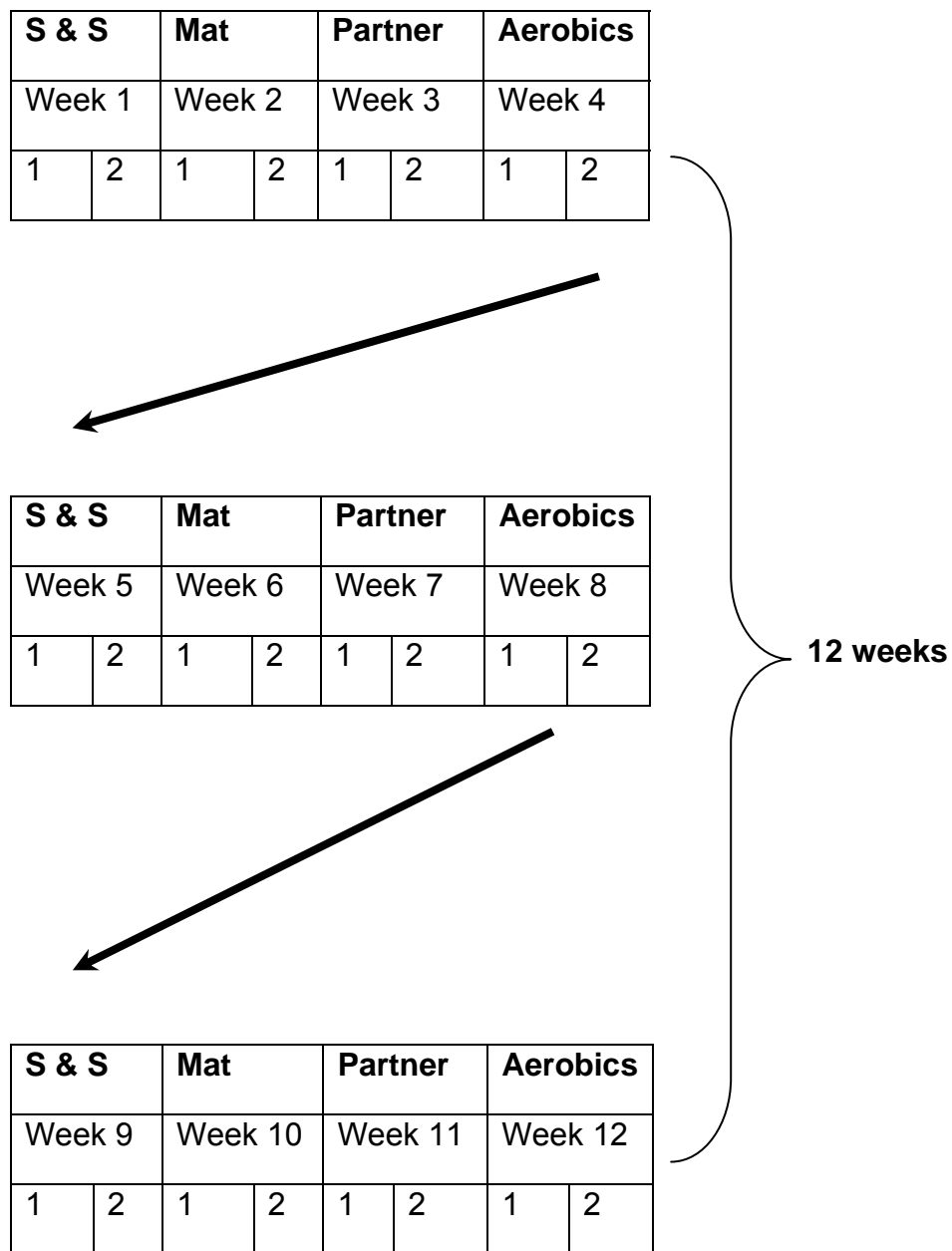


Figure 6. The structure of the intervention programme consisting out of a total of 24 sessions.

Attendance register was taken prior to the commencement of each class throughout the 12-week programme. Special attention was given to this activity as each subject had to abide to the 70% attendance rate in order for their individual data to be used for statistical analysis.

Post-test

The post-test was completed the day after the last movement session. The protocol included the questionnaires and two functional tests that were used in the pre-testing protocol. The same persons who administered the pre-testing of the tests were responsible for the post-testing. The reason for this was to reduce possible inter-rater errors, increasing the reliability of the test results.

Follow-up Testing

Follow up testing took place nine months after the subjects had completed the intervention programme. Only the psychological variables were re-tested by means of the Physical Self-Perception Profile (Fox & Corbin, 1989) and the Resilience Scale (Connor & Davidson, 2003). The reason for this was that the functional capacity improvements would be maintained if the subjects continued to exercise and be lost if they did not. However, post-testing could reveal the long-term or lasting impact of the programme on the secondary psychological variables of self-perception and resilience.

Debriefing of Subjects

The conclusion of the intervention programme included a social function held after the last session at the clubhouse of the retirement village. During this function the women were thanked for their time, enthusiasm, dedication and encouragement. The women were asked to share some of their thoughts about the programme and rated the programme as a success and all appeared to have enjoyed themselves thoroughly. A definite improvement was noticed in all of their moods as the programme progressed and we discussed this. At the beginning of the programme some of them expressed nervousness regarding exercise, but by the end of the programme they all stated that they felt a lot more confident to exercise.

Data Analysis

Unpaired and paired t-tests for dependent samples were applied to determine whether the movement competence programme led to a significant improvement in the functional capacity, self-perception and resilience of elderly women. The

alpha level of significance for the data analysis was set at $p < 0.05$. The data was analysed using SPSS data analysis software system.

Summary

All the subjects used in the present study, were all over the age of 64. Nineteen of the women lived in the retirement village with three women being community-based dwellers. The intervention group consisted of 21 participants.

In this study, the intervention programme focused on not only improving the functional capacity of the participants but the self-perception and resilience as well. The movement competence programme was specifically designed according to the specific needs of the population. The programme included all the fitness components, elements of fun and variety, and a rate of progression that progressively challenged the capabilities of each individual participant. The programme was not expensive in terms of apparatus needed and did not require any specialised facilities. Trained individuals assisted the researcher in both the pre and post-testing, which aided in the reliability of the measurements by reducing any inter-rater errors that might have occurred.

Pre-test and post-test data were collected using three questionnaires and two functional tests. The Resilience scale (Connor-Davidson, 2003) was used for the measurement of resilience; The Barthel Index (Mahoney & Barthel, 1965) measured the functional independence of the subjects in activities of daily living; and the Physical Self-Perception Profile (Fox & Corbin, 1989) measured the self-perception of the subjects. The two functional tests, being the 8-Foot Up-and-Go test (Rikli & Jones, 2001) and the Berg Balance Scale (Berg, 1989), were used to assess the balance and proprioception. The two psychological variables were re-tested nine months after the cessation of the intervention programme, to measure any long lasting effects that the programme had on the self-perception and resilience of the women that continued to exercise. The group had since split into 10 exercisers and 11 non-exercisers who all took part in the testing. The next chapter describes the results of the statistical analysis performed on the subject's information provided in both the pre and post-testing.

Chapter Four

Results and Discussion

This chapter presents the data gathered and analysed within the present study. The discussion of the research questions presented in Chapter 1 will follow the descriptive data of the subjects.

Descriptive Data

The descriptive statistics of the anthropometric measurements of the intervention group are illustrated in Table 12. The 21 women had an average age and height of 76.14 kg (SD = 5.44) and 1.61 m (SD = 0.07) respectively. According to Cotton et al. (1998) women between ages 60 and 79 years should have a Body Mass Index (BMI) score of approximately 27.8 kg/m². The women within this study had mean BMI values of 27.62 kg/m² prior to the intervention programme and 27.24 kg/m² after the intervention programme. With reference to the pre and post weight measurements as well as the BMI measurement results, there was no statistically significant change in weight as a result of the programme.

Table 12.

Descriptive Statistics of the Anthropometric Measurements of the Subjects in the Intervention Group.

	N	Mean	SD	Range
Age	21	76.14	5.44	64 - 86
Height (m)	21	1.61	.07	1.51 -1.76
Pre-weight (kg)	21	71.38	12.39	48 – 89
Post-weight (kg)	21	70.71	11.95	49 – 87
Pre-BMI	21	27.62	4.28	19 – 34
Post BMI	21	27.24	4.04	20 – 33

Research Question One

1. Can a movement competence programme improve the functional capacity of older adult women?

As previously mentioned the functional capacity of the subjects was assessed with the Berg Balance scale, the Barthel Index and the 8-Foot Up-and-Go test. The results of both the pre- and post-test measurements are illustrated in Table 13.

The total pre- as well as the post-test mean scores of the Berg Balance Scale and Barthel Index both indicated increases after the intervention from 48.95 (SD= 3.25) to 50.76 (SD= 1.95) and from 98.57 (SD= 3.91) to 99.76 (SD= 1.09). The latter increase was less noticeable showing a statistically insignificant difference of $p = 0.135$. There was a substantial decrease in the amount of time needed to complete the 8-Foot Up-and-Go test from an average of 7.97 seconds (SD= 2.89) prior to the intervention to a mean score of 5.74 seconds (SD= 1.67) after the movement programme. Furthermore the results indicate statistically significant differences ($p < 0.05$) in both the Berg Balance Scale ($p = 0.003$) and the 8-Foot Up-and-Go test ($p = 0.00$), which indicated an improvement in both the static and dynamic balance of the subjects post intervention.

Table 13.

Pre- and Post-test Scores on the Berg Balance Scale, Barthel Index and 8-Foot Up-and-Go Tests.

	Mean	SD	df	t	p
Berg Balance Scale					
Pre	48.95	3.25			
Post	50.76	1.95	20	-3.46	.003*
Barthel Index					
Pre	98.57	3.91			
Post	99.76	1.09	20	-1.56	.135
8-Foot Up-and-Go					
pre	7.97	2.89	20		
post	5.74	1.67	20	4.71	.00*

* $p < .05$

These results demonstrate that the movement competence programme used in this study was effective in improving the functional capacity of the older

adult women. These results support the findings of Jansson and Söderlund (2004), who found a statistically significant improvement in the Berg Balance Scale scores of elderly women who participated in a 12-week individually tailored home-based exercise programme. The intervention group in this study achieved a mean score of 48.95 (SD = 3.25) prior to the movement competence programme on the Berg Balance scale. This average increased to 50.76 (SD = 1.95) for the group after the exercise programme. This indicates a significant ($p < 0.05$) improvement in balance, which could have been attributed to the balance exercises included in the programme.

There was no significant improvement in the Barthel Index scores after the intervention programme. The average Barthel scores prior to the 12-week exercise programme were 98.57 (SD= 3.91) and it increased to 99.76 (SD= 1.09) afterwards. The maximum score for this Index is 100. The pre-test mean score for the subjects in this study was 98.57, already indicating an above average functional status with reference to bathing, grooming and so on. An initial high score does not allow for much improvement on the post-test.

The older adult women might have shown a high level of independence in activities of daily living as indicated by the Barthel Index prior to the intervention. However, their initial scores for dynamic balance were not as impressive, with a mean score of 7.97 (SD = 2.89) seconds on the pre-test. This figure is close to the 8.5 second mark which would classify them into the category of a “faller” (Rose, Jones & Lucchese, 2002). The average time the subjects took to complete the 8-Foot Up-and-Go test decreased to 5.7 (SD = 1.66) seconds following participation in the intervention programme. In addition, the maximum amount of time it took to complete the test decreased from 14.5 to 8 seconds. This represents an overall increase of the all the subjects' ability to carry out the test faster, which demonstrates an improvement in balance. Thus, there was a significant overall improvement in the subjects' dynamic balance as well as gait speed.

Research Question Two

2. Can a movement competence programme improve the self-perception of older adult women?

Table 14 presents the pre- and post-test measurements for each sub-domain of the PSPP (Fox and Corbin's, 1989) and for subjects who participated in the intervention programme.

Table 14.

Changes in Self-perception and Resilience of the Subjects in the Intervention Programme.

	Mean	SD	df	t	p
Sport					
pre	13.43	3.11			
post	13.90	3.85	20	-.764	.454
Body					
pre	14.29	5.76			
post	15.33	4.26	20	.856	.402
Condition					
pre	12.24	3.67	20	-2.88	.009*
post	16.10	7.46			
Strength					
pre	13.52	3.20	20	1.99	.061
post	14.90	4.01			
Self worth					
pre	12.48	3.40	20	-3.05	.006*
post	14.95	4.50			
PSPP total					
pre	65.95	15.05	20	-4.21	.000*
post	75.19	19.77			
Resilience					
pre	78.47	8.76	20	1.18	.253
post	76.29	9.70			

* $p < .05$

There were statistically significant differences ($p < 0.05$) for both the condition and self-worth sub-domains ($p = 0.009$ and $p = 0.006$ respectively). However, the strength sub-domain did not show a significant difference ($p = 0.06$). The pre- and post-test comparison of scores of physical self-perception also showed a p-value of 0.000, indicating a statistically significant improvement in the subjects' overall self-perception after the intervention programme.

This confirms the findings of Polman (2004) who found a positive effect of physical activity on the physical self-perceptions of both men and women. He also found that gender differences were apparent in physical self-perceptions, with women who exercised regularly showing higher levels of physical self-worth, sports competence and condition than those who followed a sedentary lifestyle.

The results of the present study demonstrated statistically significant differences in the condition and self-worth sub-domains as well as the total PSPP scores. This improvement could have been influenced by both gender and physical activity status. The women who participated in the programme may have provided social support for each other, which could result in them feeling a higher sense of self-worth that could also affect the way they would view themselves physically.

In addition, with the involvement in regular exercise for an extended period of time, the slight decrease in weight of the subjects from 71.38 kg (SD= 12.39) to 70.71 kg (SD = 11.96) could also have an effect on their perception of their physical condition. Polman (2004) provided support for this conclusion by stating that there is a relationship between physical self-perceptions and body composition. For females, higher fat percentages or BMI values were negatively associated with most of the sub-domains of the PSPP.

There were women who did not lose any weight. However, if they improve in muscle strength and balance as a result of the exercising, they also could experience an improvement in their confidence to be able to carry out activities of daily living. Further, they too could have perceived an improved perception of their physical condition. McAuley et al. (2005) noted mastering new skills and experiences could have a positive effect on a person's self-efficacy.

Research Question Three

3. Can a movement competence programme improve the resilience of the older adult women?

With reference to Table 14, there was no statistical significant difference ($p>0.05$) between the pre and post-test resilience scores of amongst the older adult women who participated in the intervention programme.

The reason for this is unclear. The results of the present study contradict the findings of Esche and Tanner (2005), who stated that a high level of physical activity correlates with a high level of resilience. This correlation is not as high, however, as the correlations found between resilience and other factors, such as sex (male), living with others, independence in independent activities of daily living (ADL), fewer depressive symptoms and a high self-rating of health (Esche & Tanner, 2005). Although there was a significant improvement in the Berg Balance Scale as well as the 8-foot up-and-go scores, indicating an increase in static and dynamic balance, which according to Esche and Tanner (2005), correlated highly with a high level of resilience, there was no statistically significant difference in the women's resilience.

Research Question Four

4. Can a movement competence programme have lasting effects on the self-perception and resilience of older adult women?

After the conclusion of the formal movement competence programme that was the intervention programme in this study, 10 women continued with their exercise programme and 11 women chose to stop exercising regularly. The follow-up testing took place 9 months later where all 21 subjects completed both the Physical Self-Perception Profile (Fox & Corbin, 1989) and the Resilience Scale (Connor & Davidson, 2003). The results presented in Table 15 compare the results of the two groups: Exercisers (Group 1) and non-exercisers (Group 2).

Table 15.

A Comparison of the Self-perception and Resilience Scores of the Exercisers (Group 1) and Non-exercisers (Group 2).

Variable	Mean	SD	p
Sport			
Group 1	16.40	4.12	
Group 2	13.64	3.96	0.12
Body			
Group 1	17.60	5.09	
Group 2	14.00	4.67	0.97
Condition			
Group 1	17.20	4.37	
Group 2	13.82	4.49	0.08
Strength			
Group 1	17.50	4.84	
Group 2	13.73	5.40	0.08
Self-worth			
Group 1	18.00	5.12	
Group 2	13.91	5.13	0.06
PSPP Total			
Group 1	86.70	22.70	
Group 2	69.09	21.88	0.52
Resilience			
Group 1	84.40	8.00	
Group 2	74.37	10.53	0.04*

* $p < .05$

When comparing the sub-domains of the Physical Self-Perception Profile (Fox & Corbin, 1989), there were no statistically significant differences ($p > 0.05$) between the exercisers and non-exercisers after a nine-month period. It must be remembered that these women had achieved significant improvements in their perceptions of their condition, self-worth and total self-perception after participation in the intervention programme.

A significant difference was reported on the variable of resilience, with the women who continued to participate in exercise demonstrating higher resilience

scores. Very little research has been completed on the topic of resilience, but it appears that for older adults, sustained participation in an exercise programme could have a positive impact. However, a short intervention, such as 12 weeks, is too short a period to achieve significant improvements. Resilience may be a more difficult variable to influence and the amount of time needed to change feelings of resilience may be longer than for some other perceptions about the self.

If a descriptive presentation of the results is made comparing changes in the mean scores of the subjects at the end of the formal exercise programme with their scores after nine months, a definite trend can be identified (see Table 16). The women in the group who continued an exercise programme nine months after the end of the intervention programme, continued to make improvements in every sub-domain of self-perception and on resilience. The women in the group who stopped exercising after the end of the intervention programme experienced a slight decrease in their scores in every sub-domain of self-perception and on resilience. This clear trend indicates that participation in formal exercise programmes can make a positive contribution to the self-perception and the resilience of older adult women.

Table 16.

Trends in Self-perception and Resilience as a Result of Continued Participation or Non-participation in an Exercise Programme.

	Mean Post-test All Subjects	Mean 9-month follow-up Exercisers	Mean 9-month follow-up Non-exercisers	Trend
Sport	13.90	16.40	13.64	Exercisers continue to improve. Non-exercisers decrease.
Body	15.33	17.60	14.00	Exercisers continue to improve. Non-exercisers decrease.
Condition	16.10	17.20	13.82	Exercisers continue to improve. Non-exercisers decrease.
Strength	14.90	17.50	13.73	Exercisers continue to improve. Non-exercisers decrease.
Self-worth	14.95	18.00	13.91	Exercisers continue to improve. Non-exercisers decrease.
PSPP total	75.19	86.70	69.09	Exercisers continue to improve. Non-exercisers decrease.
Resilience	76.29	84.40	74.37	Exercisers continue to improve. Non-exercisers decrease.

Chapter Five

Conclusions and Recommendations

Thirty women volunteered to participate as subjects in the movement competence programme offered in this study. Over the course of the 24 sessions, nine of the women dropped out. Attendance at less than 70% of the sessions (17 out of 24) resulted in categorising a subject as a “drop out.” This dropout rate represented less than one third of the total group of subjects, which according to the American College of Sports Medicine (2000), is relatively low.

The data gathered from the remaining 21 older adult women were recorded, analysed and reported as the results of this study. Because this was a time-series design, post-tests were administered immediately after the intervention programme concluded (the short-term effects of the programme) and again nine months later (the long-term effects of the programme). Of the 21 subjects completing the first post-tests, all 21 were able to complete the second post-test administration. However, 9 of the 21 had stopped exercising in the interim period. According to the American College of Sports Medicine (2000), 50% or less of those who decide to engage in health-related behaviours such as an exercise programme, choose to sustain their behaviour. Because more than half of the subjects in this study decided to adhere to the exercise programme after the initial 24 formal sessions, this adherence rate was considered good and the results of the second post-test acceptable for evaluating the long-term effects of the programme.

The following sections present the conclusions of this study in terms of the short-term and the long-term effects of participation in a movement competence programme on functional capacity, physical self-perception and resilience of older adult women. The last section presents ideas for future research.

Functional Capacity

Functional capacity is the ability to perform physical/functional ADL effectively. Functional capacity in this study was measured in term of static balance, ADL, and

dynamic balance/locomotion. Physiological factors that influence the ability to carry out ADL independently include muscle strength, balance, flexibility and coordination, all variables included in the content of the intervention programme in this study.

Short-term Effects

A significant improvement was achieved in the static balance and dynamic balance of the older adult women who participated in the intervention programme in this study. Because the subjects in the present study had a relatively high score, they were able to carry out most ADL with little difficulty on the pre-test and hence the lack of significant improvement in their Barthel Index scores was not surprising.

The results of this study confirm the findings of a similar South African study by Kolbe-Alexander et al., (2006) who were able to achieve significant improvements in the dynamic balance of older women in a 20-week programme. The present study was only 12 weeks in duration and measured static as well as dynamic balance, indicating that significant improvements can be achieved in a relatively short period of time.

The results of this study also confirm the findings of Vreede et al. (2005) who examined the effects of functional exercises performed twice a week for 12 weeks on women living in a health community. Although improvements were noted, those improvements were not significant. Within the present study, significant improvements were achieved after the 12-week exercise intervention programme.

Possible reasons for the significant improvement in the static and dynamic balance of the older adult women could be attributed to the content of the programme implement in this study. The American College of Sports Medicine (2000) indicated that a broad-based exercise programme should be used as part of a fall prevention programme. This includes strength, flexibility, balance and aerobic dance training. The present study incorporated all these components and it proved successful in improving the balance of the older adult women.

Strength

According to Bean et al. (cited in Eyigor et al., 2007) adequate muscle strength in the lower extremities is a predictor of functional performance. The intervention programme in this study included exercises such as the sit to stand, which strengthens primarily the quadriceps muscles. Therefore, through the strengthening of the lower extremities of the women, the programme contributed to improvements in overall functional capacity.

Balance

Another possible reason for the improvement in functional capacity shown by the older adult women could be the inclusion of specific static and dynamic balance exercises. It is known that balance deteriorates with age, and many older women are afraid of falling which may lead to impaired confidence in performing common daily activities (Jansson & Söderlund, 2004). Maduriera et al. (2006) showed that by performing balance training once a week for 12 weeks, elderly women improve their static balance and mobility and reduced their fall frequency. Additional literature has supported the success of balance training in the reduction of falls (Bauman & Bellhew, 1999; Chodzko-Zajko, 2006; Jansson & Söderlund, 2004; Mazzeo et al.1998;).

Flexibility

The inclusion of flexibility exercises such as stretching could also have resulted in an improvement in the functional capacity of the older adult women. Both Chodzko-Zajko (2006) and Mazzeo et al. (1998) demonstrated that stretching exercises which emphasize range of motion and flexibility have been shown to increase ankle and knee and joint and lower back flexibility in older adults. Stretches for the upper and lower extremities as well as the trunk and neck were used in the present study.

Aerobic Exercise

Aerobic exercises such as walking or dancing have been shown to improve functional ability (Chodzko-Zajko, 2006). They improve both the cardiorespiratory system of the individual as well as aid in mobility and flexibility. Aerobic activities

such as marching and different kinds of dancing were part of the intervention programme in this study.

Long-term Effects

Vreede et al. (2005) also followed a time series design in which 25% of the women completed follow-up testing nine months after the first post-test. A statistically significant improvement was found in the participants' performance of functional tasks. Within the present study, 100% of the women were tested nine months after the first post-test. Their static and dynamic balance showed continued improvement from their post-test scores. Because the improvements were significant after the initial 12-week intervention programme, it was unlikely that the additional improvements in the following nine months could also achieve statistical significance.

Physical Self-Perception

Physical self-perception was defined in this study in terms of five dimensions (sport competence, bodily attractiveness, physical strength, physical conditioning and physical self-worth) and a general self-perception.

Short-term Effects

The results of this study supported previous research that found improvements in physical self-perceptions as an outcome of participation in physical activity (Edwards, Ngcobo, Edwards & Palavar, 2005; Whaley, 2003; Polman, 2004). The women who participated in this study showed a significant improvement in their perceptions of their physical condition and their physical self-worth, as well as their general self-perception.

A possible reason for the improvement in these self-perceptions could be the significant increase in their static and dynamic balance abilities. This increase in functional capacity may have had a positive impact on their perceptions about their ability to perform daily activities. McAuley, Shaffer and Rudolph (1995) found that for older adults whose self-efficacy may be deteriorating along with their functional abilities, physical activity can provide a mastery experience that leads to

increased self-efficacy and in turn leads to an improved psychological well-being. As mentioned previously, self-perception is a general term encompassing all statements about the self, and includes the concept of self-efficacy. Eyigor et al. (2007) found within their study on older women, that as the women noticed improvements in their ability to perform their daily activities, an overall feeling of being more active was reported. This feeling contributed an increase in their general feelings of well-being, which then provided them with motivation to continue with exercise.

The mastery experience, in which older adults become more confident in performing a skill, may occur with moderate-intensity exercise (Netz, Becker & Tenenbaum, 2005). The intensity of the programme used within this study was of moderate intensity, which could explain the improvements in self-perceptions of the older adult women as a result of the mastering of new movement patterns.

Participation in physical activity has also been associated with a reduction in depressive symptoms (Paluska & Shwenk, 2000; Singh & Singh, 2000). Ruuskanen and Ruoppila (1995) reported that active older adults (ages 60 - 75) had fewer depressive symptoms than their non-active peers. Although the present study did not measure depression among the participants, it is possible that their participation in physical activity made a positive contribution to their psychological well-being, which could then have affected their physical self-perceptions. Paluska and Schwenk identified participation in aerobic exercise and strength training as factor in the significant reduction of depressive symptoms. The mode of exercise implemented in the present study included both aerobic dancing and strength training, which may have increased still further the positive impact of participation on the psychological well-being of the subjects.

The social aspects of the movement competence programme implemented in this study may also have contributed to the positive impact on self-perception. Whaley (2003) studied the relationship between body perceptions and social support in adult women's physical activity. Their findings indicated that a decline in body dissatisfaction was reported following sustained participation in a running group that emphasized social comparison. Eyigor et al. (2007) found that a group-based exercise programme had a positive impact on the physical performance,

muscle strength and quality of life in older women. The older adult women within the present study may have experienced feelings of social support in the group-based movement competence programme, which could have contributed to their psychological well-being and the significant improvement in their physical self-perceptions.

Not only was the exercise programme implemented in this study a group programme, but there was a specific effort to emphasise positive social interaction and enjoyment. Participants were often divided into partners to perform some exercises, which added to the social component and allowed for more social interaction to take place. In addition, aerobic dancing was performed during the warm-up and cool-down as well as during the aerobic sessions. These dances included exercises performed together to music that the participants were familiar with and enjoyed. Subjects were often called forward to demonstrate dance moves for the rest of the group. Each participant received a handout of all the women's birthdays and on the day of an individual's birthday, everyone sang to them. The variety of strategies used to promote enjoyment by the older adult women could have been one of the reasons for the improvement in their physical self-perceptions.

Long-term Effects

Although no additional significant improvements in self-perception were achieved in the nine-month period following the formal programme, it is important to note that the women who continued to participate in exercise showed an improvement in every dimension of self-perception. The women who stopped exercising stayed the same or showed a decrease in every dimension of self-perception, although the decrease was not statistically significant. This outcome supports the importance of continued participation since the gains achieved in the initial 12-weeks of the programme were maintained and even enhanced by the women who chose to continue.

Resilience

Resilience is a term used to describe a psychological quality that allows a person to cope with, and respond effectively to life stressors (Neill & Dias, 2001).

Short-term Effects

Within the present study, no significant difference was found in the resilience of the subjects after participation in the movement competence programme. There is very little research available examining the relationship between resilience and physical activity amongst older adult women, so it not clear why no significant improvements occurred. Neill and Dias (2001) searched the literature on resilience and found inadequate resources about how resilience can be enhanced. Nygren et al. (2005) reported that research on the relationship between physical and mental health among the oldest of the old is scarce.

Long-term Effects

Follow-up testing after nine months showed a significant improvement in resilience among the women who continued to exercise. There are possible reasons for this important result:

- Sustained exercise over the nine-month period may have led to an improvement in physical health due to that regular exercising, which in turn may have contributed to a steady increase in resilience that finally achieved a level of statistical significance. Humphreys (2003) found a significant correlation between rating of physical health and resilience. Further research certainly is needed to explore the relationship between good health and resilience (Foster, 1997). For example, in a study conducted by St Luke's Initiative (2005), 67% of respondents used physical activity as a way of coping with stress in their everyday life, of which 57% of them found it useful.
- Continued participation in exercise over a nine-month period may have added to each participant's resilience as an outcome of the social support they experienced by being part of a group. Their continued membership

may have allowed them to develop new and meaningful social relationships that were sustained for an extended period. Research has shown a positive relationship between social support and an improvement in resilience (Australian Psychological Association, 2007; Levant & Barbanel, 2002; Neill & Dias, 2001). Lastly, Levant and Barbanel stated that having something meaningful to participate in has been found to improve resilience.

Resilience is not a static phenomenon and may be influenced by many other factors (Humphreys, 2003). It is difficult to determine whether the participation in the physical activity was critical to the improvement in the resilience of the older adult women, or whether other indirect factors associated with participating in an exercise group (such as the social support provided) played a more central role. Humphreys concluded that if resilience is as a result of a collective group of factors, it is likely to vary over time. If collective group factors vary over time, so too will resilience. Although older adults show more resilience in dealing with stressors of everyday life when compared to younger adults, over time they may lose meaningful relationships, social support networks may be depleted and they may experience a decline in physical health. However, it is possible that through regular participation in exercise, improvement in both social support and physical health could contribute to the resilience of older adult women.

Recommendations for Future Research

Sustained participation is clearly the key to the success of any intervention programme. Significant results were achieved in this study for functional capacity and several dimensions of self-perception after a 12-week period, and significant results were achieved for resilience after an additional nine months of participation in an exercise programme. This is clearly an exciting direction for future research. The following represent a few possibilities:

- The role of social support in relation to self-perception and resilience was beyond the scope of this study, but it can be identified as a critical area for future research. According to Morgan (1989), it is necessary to distinguish between effects caused by exercising and confounding effects

caused by social or personal consequences of participating in supervised activities. Confounding variables such as the involvement in other groups (e.g., church groups, etc.) and from encouragement from family members require investigation.

- It is apparent that there is a shortage of research about resilience in general and specifically about resilience among the older population. Reichstadt et al. (2007) suggested that future research examine how psychological constructs relate to adaptation to chronic stress, including hardiness, resilience and coherence, as part of the process of successful aging.
- The relationship between resilience and participation in different types of physical activity would contribute to the body of knowledge. This study was limited only to a group-oriented movement competence programme.
- The time series design does not appear to be used as frequently as experimental designs, descriptive studies and case studies. The design provides information about the sustained impact of programmes and for that reason, could be used much more when studying the effects of participation in programmes.
- More research needs to be completed on the validity and reliability of measurement instruments when working with older adults. For example, Fox's Self-Perception Profile (used in this study) asked subjects to state whether they perceive themselves as athletic or not. Some of the subjects may have reported what they were like in the past, rather than how they felt in the present situation.

Final Remarks

Many individual's hope that they have quantitatively long lifespan; however, they may not want a longer life if the quality of that life is poor. Being physically independent and have the capacity to be active plays a large role in defining quality of life for all older individuals (Spirduso, 1995) The movement competence programme implemented within this study was effective in producing significant

improvements in both the functional capacity and selected dimensions of self-perception among older adult women. Sustained participation in the exercise programme also produced a significant improvement in resilience. This study has demonstrated the importance of movement programmes for older adult women in terms of developing and maintaining quality of life, not only in terms of independence (functional capacity) but also by improving psychological health (self-perception and resilience).

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Appendix A

Informed Consent

Name & Surname: _____

The exercise programme presented in this study is offered over a 12-week period, two times each week. Each session is one hour long. In order to participate in this programme:

1. You will be required to perform two physical tests at the beginning of the programme and the same two tests at the end of the programme. One test is a test of balance and the other is a test of standing and walking. You also will be interviewed personally at several different times during and after the programme, in order to determine your feelings about the programme itself.
2. In order for your test results to be useful in this study, you need to be present for at least 70% of the sessions.
3. The researcher may terminate the testing or the training sessions at any point in time if it is felt necessary or appropriate. You may also stop the testing or the programme at any time for you experience negative effects, for example, discomfort.
4. Please inform the researcher about your health status and your previous experiences with physical exercise, especially if you think it may affect how you feel during the testing sessions or the training programme. Your prompt communication about how you feel is very important.
5. You are responsible to fully disclose to the researcher, any information about yourself that might affect your participation in either the tests or the programmes.
6. The results of the tests and interviews are strictly confidential.
7. The researcher, Emma Louw or the Department of Sport Science, Stellenbosch University, will not be held liable for any injury obtained during the testing procedures.
8. I hereby declare that:
 - The researcher has explained the procedures in this study, to me.

- To the best knowledge I am currently free from any existing medical condition/other complaint/injury that would preclude me from full participation in this particular study.
- I give my written consent to Emma Louw, the researcher, to undertake the battery of tests, which form part of the above-mentioned study.

Subject's signature: _____

Date: _____

Emma Louw: _____

Date: _____

Appendix B

Health Screening Questionnaire

Name & Surname: _____

Age: _____

Height: _____ Weight: _____

BMI: _____

Please answer the following questions:

Yes

No

- 1) Do you have any chest pains that come on at rest or with exercise?
If yes, has a physician diagnosed these pains?

- 2) Have you ever had a heart attack?
If yes, when? Why? Medication?

- 3) Do you have high blood pressure?
- 4) Do you have diabetes?
Treatment: None _____ Pills _____
Diet _____ Insulin _____
- 5) Are you short of breath at rest, at night in bed, or after very mild exertion?
- 6) Do you have any ulcers or cuts on your feet that have not healed yet?
- 7) Have you lost 5 kg or more in the last 6 months or more, without trying?
- 8) Are you currently being treated for any heart or circulatory condition?

Vascular disease
Poor circulation to legs
Angina
Emphysema
Asthma
Other
conditions _____

Congestive heart failure
Stroke
Blood clotting
COPD

8) Do you have any orthopaedic problems?
If yes, please specify _____

9) Have you fallen more than twice in the past year (for any reason)?

10) Please specify any medication that you are currently taking on a regular basis?

11) Has your doctor ever diagnosed you with a heart murmur?

12) Do you smoke cigarettes daily, or have you quit smoking within the past two years?

13) If yes to the above question, how many cigarettes did/do you smoke per day?

14) Has your father, mother, brother or sister had a heart attack or suffered from cardiovascular disease before the age of 65?

15) Have you had your cholesterol tested within the last 5 years?
If yes, what was the result _____

16) Exercise patterns:

1) How many times per week do you exercise?

2) What type of exercise is it when you do exercise?

3) How many times per day do you exercise?

17) Is there any other reason that you are aware of that might prevent you from exercising?
Please specify _____

Appendix C

Berg Balance Scale

(Shumway_Cook & Woollacott, 1995, p.448-451)

1. Sitting to standing

Instruction: Please stand up. Try not to use your hands for support.

4-able to stand, no hands and stabilize independently

3-able to stand independently using hands

2-able to stand using hands after several tries

1-needs minimal assist to stand or to stabilize

0-needs moderate or maximal assist to stand

2. Standing unsupported

Instruction: Stand for two minutes without holding.

4-able to stand safely for 2 minutes

3-able to stand 2 minutes with supervision

2-able to stand 30 seconds unsupported

1-needs several tries to stand 30 seconds unsupported

0-unable to stand 30 seconds unassisted

IF SUBJECT IS ABLE TO STAND 2 MINUTES SAFELY, SCORE FULL MARKS FOR SITTING UNSUPPORTED, PROCEED TO POSITION CHANGE STANDING TO SITTING.

3. Sitting unsupported feet on floor

Instruction: Sit with arms folded for two minutes

4-able to sit safely and securely for 2 minutes

3-able to sit for 2 minutes under supervision

2-able to sit 30 seconds

1-able to sit 10 seconds

0-unable to sit without support for 10 seconds

4. Standing to sitting

Instruction: Please sit down.

4-sits safely with minimal use of the hands

3-controls descent by using hands

2-uses back of legs against chair to control descent

1-sits independently but has uncontrolled descent

0-needs assistance to sit

5. Transfers

Instruction: Please move from chair to bed and back again. One way toward a seat with armrests and one way toward a seat without armrests.

4-able to transfer safely with only minor use of hands

3-able to transfer safely with only minor use of hands

2-able to transfer with verbal cueing and/or supervision

1-needs one person to assist

0-needs two people to assist or supervise to be safe

6. Standing unsupported with eyes closed

Instruction: Close your eyes and stand still for 10 seconds

4-able to stand 10 seconds safely

3-able to stand 10 seconds with supervision

2-able to stand 3 seconds

1-able to keep eyes closed 3 seconds but stays steady

0-needs help to keep from falling

7. Standing unsupported with feet together

Instruction: Place your feet together and stand without holding

4-able to place feet together independently, stand 1 minute safely

3-able to place feet together independently, stand 1 minute with supervision

2-able to place feet together independently but unable to hold for 30 seconds

0-needs help to attain the position and unable to hold for 15 seconds

THE FOLLOWING ITEMS ARE TO BE PERFORMED WHILE STANDING
UNSUPPORTED

8. Reaching forward with outstretched arm

Instruction: Lift arm to 90°. Stretch out your fingers and reach forward as far as you can. (Examiner places ruler at end of fingertips when arm is at 90°. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position.

4-can reach forward confidently >10 inches

3-can reach forward >5 inches

2-can reach forward > 2 inches safely

1-reaches forward but needs supervision

0-needs help to keep from falling

9. Pick up object from floor

Instruction: Pick up shoe/slipper, which is placed in front of your feet

4-able to pick up slipper safely and easily

3-able to pick up slipper but needs supervision

2-unable to pick it up but reaches 1-2 inches from slipper and keeps balance independently.

1-able to pick up and needs supervision while trying

0-unable to try/needs assistance to keep from falling

10. Turning to look over left and right shoulders

Instruction: Turn to look behind you over left shoulder. Repeat to the right

4-looks behind from both sides and weight shifts well

3-looks behind one side only; other side shows less weight shift

2-turns sideways only but maintains balance

1-needs supervision when turning

0-needs assistance to keep from falling

11. Turn 360°

Instruction: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.

4-able to turn 360 safely in < 4 seconds each side

3-able to turn 360 safely on side only in < 4 seconds

2-able to turn 360 safely but slowly

1-needs close supervision or verbal cueing

0-needs assistance while turning

12. Stool touch

Instruction: Place each foot alternately on the stool. Continue until each foot has touched the stool four times.

4-able to stand independently and safely and complete 8 steps in 20 seconds

3-able to stand independently and complete 8 steps in > 20 seconds

2-able to complete 4 steps without aid with supervision

1-able to complete > 2 steps needs minimal assistance

0-needs assistance to keep from falling/unable to try

13. Standing unsupported, one foot in front

Instruction: (Demonstrate to the subject). Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot.

4-able to place foot tandem independently

3-able to place foot ahead of other independently and hold 30 seconds

2-able to take a small step independently and hold 30 seconds

1-needs help to step but can hold 15 seconds

0-loses balance while stepping or standing

14. Standing on one leg

Instruction: Stand on one leg as long as you can without holding.

4-able to lift leg independently and hold >10 seconds

3-able to lift leg independently and hold 5-10 seconds

2-able to lift leg independently and hold = or > 3 seconds

1- tries to lift leg; unable to hold 3 seconds but remains standing independently

0-unable to try or needs assistance to prevent fall

TOTAL SCORE /56

Appendix D

8-Foot Up-and-Go test

(Hart-Hughes & Haley, 2003, p. 9)

Equipment/Set up:

Place a chair (approximately 17 inches in height), against a wall or firm object for safety to prevent it from sliding backwards. Place a cone on the floor exactly 8ft away (distance measured is from the front of the edge of the chair to the back edge of the cone). Ensure a minimum of four ft of clearance beyond the cone to allow for turning room. A stopwatch is also required.

Starting position:

Patient is seated in the chair with hands on thighs and feet flat on the floor

Protocol:

Patient is instructed on the signal “go,” they are to rise from the chair (pushing off their thighs), walk “as quickly as possible” around the cone and return to a seated position in the chair. The participant is told that they will be timed, and should therefore walk as quickly as possible but not to run. Following a demonstration, the patient is allowed one practice followed by two test trials.

Scoring:

The clinician begins the timer when the “go” signal is given (even if the patient has not begun to move) and stops the time at the exact instant that the participants buttocks contacts the chair following the walk segment. Note the scores for both trials to the 1/10th second yet the faster of the two trials is recorded on the assessment form for evaluation purposes. Results obtained with this test may be compared to age-related normative values.

Appendix E

Pre-test: Score Sheet

Date: _____

Name: _____

Weight: _____

Surname: _____

Height: _____

Age: _____

BMI: _____

A) 8-Foot Up-and-Go test:

B) Berg Balance Scale:

1. Sitting to standing: _____
2. Standing unsupported: _____
3. Sitting unsupported feet on floor: _____
4. Standing to sitting: _____
5. Transfers: _____
6. Standing unsupported with eyes closed: _____
7. Standing unsupported with feet together: _____
8. Reaching forward with outstretched arm: _____
9. Pick up object from floor: _____
10. Turning to look over left and right shoulders: _____
11. Turn 360 degrees: _____
12. Stool touch: _____
13. Standing unsupported, one foot in front: _____
14. Standing on one leg: _____

Total Score: _____ / 56

Appendix F

Post-test: Score Sheet

Date: _____

Name: _____

Weight: _____

Surname: _____

Height: _____

Age: _____

BMI: _____

A) 8-Foot Up-and-Go test:

B) Berg Balance Scale:

15. Sitting to standing: _____

16. Standing unsupported: _____

17. Sitting unsupported feet on floor: _____

18. Standing to sitting: _____

19. Transfers: _____

20. Standing unsupported with eyes closed: _____

21. Standing unsupported with feet together: _____

22. Reaching forward with outstretched arm: _____

23. Pick up object from floor: _____

24. Turning to look over left and right shoulders: _____

25. Turn 360 degrees: _____

26. Stool touch: _____

27. Standing unsupported, one foot in front: _____

28. Standing on one leg: _____

Total Score: _____ / 56

Appendix G

Resilience Scale

Please be as HONEST as possible? All answers will be held strictly confidential.

Answer the following 25 items and give them a number according the rating scale bellow:

- 0 = not true at all
- 1 = rarely true
- 2 = sometimes true
- 3 = often true
- 4 = true nearly all the time

- 1) Able to adapt to change _____
- 2) Surrounded by close and meaningful relationships _____
- 3) Sometimes its fate or God can help. _____
- 4) Can deal with whatever comes _____
- 5) Past success gives confidence for a new challenge _____
- 6) See the humorous side of things _____
- 7) Coping with stress strengthens _____
- 8) Tend to bounce back after an illness or hardship _____
- 9) Things happen for a reason _____
- 10) Best effort no matter what _____
- 11) You can achieve your goals _____
- 12) When things look hopeless I don't give up _____
- 13) Know where to turn for help _____
- 14) Under pressure, I focus and think clearly _____
- 15) I prefer to take the lead in problem solving _____
- 16) I am not easily discouraged by failure _____
- 17) Think of self as a strong person _____
- 18) Make unpopular or difficult decisions _____
- 19) I can handle unpleasant feelings _____
- 20) I have to act on a hunch _____

- 21) Strong sense of purpose _____
- 22) In control of your life _____
- 23) I like challenges _____
- 24) I work to attain my goals _____
- 25) Pride in your achievements _____

Appendix H

Physical Self-Perception Profile

(Kelly, 2004, p. 50-53)

PHYSICAL SELF PERCEPTION PROFILE

(Fox, 1990)

THE PHYSICAL SELF PERCEPTION PROFILE (PSPP)

WHAT AM I LIKE?

These are statements which allow people to describe themselves.
There are no right or wrong answers since people differ a lot.

First, decide which one of the two statements best describes you.

Then, go to that side of the statement and check if it is just
"sort of true" or "really true" FOR YOU.

Really True for Me	Sort of True for Me	EXAMPLE		Sort of True for Me	Really True for Me
<input type="checkbox"/>	<input type="checkbox"/>	Some people are very competitive	BUT	Others are not quite so competitive	<input checked="" type="checkbox"/> <input type="checkbox"/>

REMEMBER to check only ONE of the four boxes

- | | | | | | |
|----|---|---|-----|--|---|
| 1. | <input type="checkbox"/> <input type="checkbox"/> | Some people feel that they are not very good when it comes to playing sports | BUT | Others feel that they are really good at just about every sport | <input type="checkbox"/> <input type="checkbox"/> |
| 2. | <input type="checkbox"/> <input type="checkbox"/> | Some people are not very confident about their level of physical conditioning and fitness | BUT | Others always feel confident that they maintain excellent conditioning and fitness | <input type="checkbox"/> <input type="checkbox"/> |
| 3. | <input type="checkbox"/> <input type="checkbox"/> | Some people feel that compared to most, they have an attractive body | BUT | Others feel that compared to most, their body is not quite so attractive | <input type="checkbox"/> <input type="checkbox"/> |
| 4. | <input type="checkbox"/> <input type="checkbox"/> | Some people feel that they are physically stronger than most people of their sex | BUT | Others feel that they lack physical strength compared to most others of their sex | <input type="checkbox"/> <input type="checkbox"/> |
| 5. | <input type="checkbox"/> <input type="checkbox"/> | Some people feel extremely proud of who they are and what they can do physically | BUT | Others are sometimes not quite so proud of who they are physically | <input type="checkbox"/> <input type="checkbox"/> |
| 6. | <input type="checkbox"/> <input type="checkbox"/> | Some people feel that they are among the best when it comes to athletic ability | BUT | Others feel that they are not among the most able when it comes to athletics | <input type="checkbox"/> <input type="checkbox"/> |

	Really True for Me	Sort of True for Me			Sort of True for Me	Really True for Me	
7.	<input type="checkbox"/>	<input type="checkbox"/>	Some people make certain they take part in some form of regular vigorous physical exercise	BUT	Others don't often manage to keep up regular vigorous physical exercise	<input type="checkbox"/>	<input type="checkbox"/>
8.	<input type="checkbox"/>	<input type="checkbox"/>	Some people feel that they have difficulty maintaining an attractive body	BUT	Others feel that they are easily able to keep their bodies looking attractive	<input type="checkbox"/>	<input type="checkbox"/>
9.	<input type="checkbox"/>	<input type="checkbox"/>	Some people feel that their muscles are much stronger than most others of their sex	BUT	Others feel that on the whole their muscles are not quite so strong as most others of their sex	<input type="checkbox"/>	<input type="checkbox"/>
10.	<input type="checkbox"/>	<input type="checkbox"/>	Some people are sometimes not so happy with the way they are or what they can do physically	BUT	Others always feel happy about the kind of person they are physically	<input type="checkbox"/>	<input type="checkbox"/>
11.	<input type="checkbox"/>	<input type="checkbox"/>	Some people are not quite so confident when it comes to taking part in sports activities	BUT	Others are among the most confident when it comes to taking part in sports activities	<input type="checkbox"/>	<input type="checkbox"/>
12.	<input type="checkbox"/>	<input type="checkbox"/>	Some people do not usually have a high level of stamina and fitness	BUT	Others always maintain a high level of stamina and fitness	<input type="checkbox"/>	<input type="checkbox"/>
13.	<input type="checkbox"/>	<input type="checkbox"/>	Some people feel embarrassed by their bodies when it comes to wearing few clothes	BUT	Others do not feel embarrassed by their bodies when it comes to wearing few clothes	<input type="checkbox"/>	<input type="checkbox"/>
14.	<input type="checkbox"/>	<input type="checkbox"/>	When it comes to situations requiring strength some people are one of the first to step forward	BUT	When it comes to situations requiring strength some people are one of the last to step forward	<input type="checkbox"/>	<input type="checkbox"/>
15.	<input type="checkbox"/>	<input type="checkbox"/>	When it comes to the physical side of themselves some people do not feel very confident	BUT	Others seem to have a real sense of confidence in the physical side of themselves	<input type="checkbox"/>	<input type="checkbox"/>
16.	<input type="checkbox"/>	<input type="checkbox"/>	Some people feel that they are always one of the best when it comes to joining in sports activities	BUT	Others feel that they are not one of the best when it comes to joining in sports activities	<input type="checkbox"/>	<input type="checkbox"/>

- | | Really True
for Me | Sort of True
for Me | | | Sort of True
for Me | Really True
for Me | |
|-----|--------------------------|--------------------------|--|-----|--|--------------------------|--------------------------|
| 17. | <input type="checkbox"/> | <input type="checkbox"/> | Some people tend to feel a little uneasy in fitness and exercise settings | BUT | Others feel confident and at ease at all times in fitness and exercise settings | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. | <input type="checkbox"/> | <input type="checkbox"/> | Some people feel that they are often admired because their physique or figure is considered attractive | BUT | Others rarely feel that they receive admiration for the way their body looks | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. | <input type="checkbox"/> | <input type="checkbox"/> | Some people tend to lack confidence when it comes to their physical strength | BUT | Others are extremely confident when it comes to their physical strength | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. | <input type="checkbox"/> | <input type="checkbox"/> | Some people always have a really positive feeling about the physical side of themselves | BUT | Others sometimes do not feel positive about the physical side of themselves | <input type="checkbox"/> | <input type="checkbox"/> |
| 21. | <input type="checkbox"/> | <input type="checkbox"/> | Some people are sometimes a little slower than most when it comes to learning new skills in a sports situation | BUT | Others have always seemed to be among the quickest when it comes to learning new sports skills | <input type="checkbox"/> | <input type="checkbox"/> |
| 22. | <input type="checkbox"/> | <input type="checkbox"/> | Some people feel extremely confident about their ability to maintain regular exercise and physical condition | BUT | Others don't feel quite so confident about their ability to maintain regular exercise and physical condition | <input type="checkbox"/> | <input type="checkbox"/> |
| 23. | <input type="checkbox"/> | <input type="checkbox"/> | Some people feel that compared to most, their bodies do not look in the best of shape | BUT | Others feel that compared to most their bodies always look in excellent physical shape | <input type="checkbox"/> | <input type="checkbox"/> |
| 24. | <input type="checkbox"/> | <input type="checkbox"/> | Some people feel that they are very strong and have well developed muscles compared to most people | BUT | Others feel that they are not so strong and their muscles are not very well developed | <input type="checkbox"/> | <input type="checkbox"/> |
| 25. | <input type="checkbox"/> | <input type="checkbox"/> | Some people wish that they could have more respect for their physical selves | BUT | Others always have great respect for their physical selves | <input type="checkbox"/> | <input type="checkbox"/> |
| 26. | <input type="checkbox"/> | <input type="checkbox"/> | Given the chance, some people are always one of the first to join in sports activities | BUT | Other people sometimes hold back and are not usually among the first to join in sports | <input type="checkbox"/> | <input type="checkbox"/> |

- | | Really
True
for Me | Sort of
True
for Me | | | Sort of
True
for Me | Really
True
for Me |
|-----|--------------------------|---------------------------|---|-----|---|---|
| 27. | <input type="checkbox"/> | <input type="checkbox"/> | Some people feel that compared to most they always maintain a high level of physical conditioning | BUT | Others feel that compared to most their level of physical conditioning is not usually so high | <input type="checkbox"/> <input type="checkbox"/> |
| 28. | <input type="checkbox"/> | <input type="checkbox"/> | Some people are extremely confident about the appearance of their body | BUT | Others are a little self-conscious about the appearance of their bodies | <input type="checkbox"/> <input type="checkbox"/> |
| 29. | <input type="checkbox"/> | <input type="checkbox"/> | Some people feel that they are not as good as most at dealing with situations requiring physical strength | BUT | Others feel that they are among the best at dealing with situations which require physical strength | <input type="checkbox"/> <input type="checkbox"/> |
| 30. | <input type="checkbox"/> | <input type="checkbox"/> | Some people feel extremely satisfied with the kind of person they are physically | BUT | Others sometimes feel a little dissatisfied with their physical selves | <input type="checkbox"/> <input type="checkbox"/> |

Appendix I

Barthel Index

(Mahoney & Barthel, 1965)

Activity Score

Feeding

0 = unable _____

5 = needs help cutting, spreading butter, etc. or requires modified diet _____

10 = independent _____

Bathing

0 = dependent _____

5 = independent (or in shower) _____

Grooming

0 = needs to help with personal care _____

5 = independent face/hair/teeth _____

Dressing

0 = dependent _____

5 = needs help but can do about half unaided _____

10 = independent (including buttons/ laces etc) _____

Bowels

0 = incontinent _____

5 = occasional accident _____

10 = continent _____

Bladder

0 = incontinent or catheterised _____

5 = occasional accident _____

10 = continent _____

Toilet Use

0 = dependent _____

5 = needs some help, but can do something alone _____

10 = independent _____

Transfers (bed to chair and back)

0 = unable, no sitting balance _____

5 = major help (one or two people, physical), can sit _____

10 = minor help (verbal or physical) _____

15 = independent _____

Mobility (on level surfaces)

0 = immobile or <50 yards _____

5 = wheelchair independent, including corners _____

10 = walks with help of one person (verbal or physical), >50 yards _____

15 = independent (but may use any aid) > 50 yards _____

Stairs

0 = unable _____

5 = needs help (verbal, physical, carrying aid) _____

10 = independent _____

TOTAL: _____

APPENDIX J

Tables of statistical analysis

Paired sample correlations of the subdomains of the Physical Self-Perception Profile

	Correlation	p
Pair 1 pre pspp sport total & post pspp sport total	.681	.001
Pair 2 pre pspp body total & post pspp body total	.405	.068
Pair 3 pre pspp condition total & post pspp condition total	.574	.007
Pair 4 pre pspp strength total & post strength total	.631	.002
Pair 5 pre pspp self worth total & post pspp self worth total	.587	.005
Pair 6 pre pspp total & post pspp total	.867	.000

Paired sample statistics of the Berg Balance Scale (BBS) and Barthel Index (BI)

	Mean	N	Std. Deviation	Std. Error Mean
Pre BBS total	48.9524	21	3.24771	.70871
Post BBS total	50.7619	21	1.94691	.42485
Pre BI	98.5714	21	3.91882	.85516
Post BI	99.7619	21	1.09109	.23810

Paired sample correlations of the Berg Balance (BBS) and Barthel Index (BI) Scale total scores

	N	Correlation	p
Pre bbs total and post bbs total	21	0.678	0.001
Pre BI and post BI total	21	0.501	0.021
PreR and PostR	21	0.576	0.006

Paired sample statistics of the 8-Foot Up-and-Go test

	Pre – 8-foot up-and-go	Post – 8-foot up-and-go
N	21	21
Mean (sec)	7.970	5.74
Std Deviation (sec)	2.8922	1.666
Minimum (sec)	.0	.0
Maximum (sec)	14.5	8

Paired sample statistics of the Resilience scale

	Mean	N	Std Deviation	Std. Error of the mean
Pair 1 PreR	78.47	21	8.75568	1.91065
PostR	76.29	21	9.69094	2.11474

The Paired Sample Differences of the subdomains of the Physical Self-Perception Profile

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Pre pspp sport total – post pspp sport total	-.47619	2.85690	.62343	-1.77664	.82426	-.764	20	.454
Pair 2 Pre pspp body total – post pspp body total	-1.04762	5.60782	1.22373	-3.60027	1.50503	-.856	20	.402
Pair 3 Pre pspp condition total – post pspp condition total	-3.85714	6.14236	1.34037	-6.65311	-1.06117	-2.878	20	.009
Pair 4 Pre pspp strength total post strength total	-1.38095	3.18553	.69514	-2.83099	.06908	-1.987	20	.061
Pair 5 Pre pspp self worth total - post pspp self worth total	-2.47619	3.72316	.81246	-4.17095	-.78143	-3.048	20	.006
Pair 6 Pre pspp total – post pspp total	-1.80952	10.05935	2.19513	-13.81706	-4.65914	-4.208	20	.000

Paired Sample Differences of the Berg Balance Scale, Barthel Index, 8-foot up-and-go and Resilience Scale totals

	Paired Differences					<i>t</i>	<i>df</i>	Sig. (2-Tailed)
	Mean	Std Deviation	Std. Error Mean	95 % Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Total pre bbs – total post bbs	-1.80952	2.40040	.52381	-2.90217	-.71688	-3.455	20	.003
Pair 2 Total pre BI - total post BI	-1.19048	3.50170	.76413	-2.78443	.40348	-1.558	20	.135
Pair 3 Total pre 8-foot up-and-go – total post 8- foot up-and-go	2.2290	2.1711	0.4738	1.2408	3.2173	4.705	20	0.000
Pair 4 Total pre R – total post R	2.19048	8.53006	1.86141	-1.69236	6.07331	1.177	20	.253

Appendix K

Baseline intervention programme

Abbreviations used in the table are as follows:

reps	repetitions
min	minutes
sec	seconds
unil.	unilateral
bilat.	bilateral
L & R	left and right
ROM	Range of Motion
TA	Transverse Abdominus

Exercise	Repetitions	Function
<p>Warm up: Dancing to a song</p> <p>Standing: Frontal & lateral flexion of neck Looking over L & R shoulders Shoulder ROM (L & R) Frontal Horizontal Shoulder alphabet Bilateral frontal & lateral raises Shoulder press position with finger stars</p> <p>Sitting on chair: Hands on shoulders with opposite elbow touching opposite knee Sit to stand (without support) Unilateral leg extension, knee flexion Sitting knee squeeze (adduction) Unilateral bicycle ride Unilateral calf raises Stork stands (L & R)</p> <p>Stretches (sitting)</p> <p>Standing: Mini bilateral squats (chair as support) Straight leg abduction (chair as support) Bending & picking up object Leg circles (straight leg)</p> <p>Cool down: Slow marching to song Breathing Stretching</p>	<p>4 min</p> <p>1 x 10 reps L & R hold 5 sec each 1 x 10 reps L & R hold 5 sec each 30 sec each side</p> <p>x 1</p> <p>2 x 10 reps L & R each Hold for 1 minute</p> <p>10 reps L & R</p> <p>2 x 10 reps</p> <p>1 x 10 reps L & R 2 x 10 reps with 5 sec squeeze</p> <p>15 reps L & R 2 x 15 reps L & R 30 sec on each leg 2 x 20 sec</p> <p>2 x 20 reps</p> <p>2 x 10 reps L & R</p> <p>10 times</p> <p>2 x 10 reps L & R</p> <p>2 min 1 min 2 min</p>	<p>Warm up muscles, cardiorespiratory exercise & enjoyment</p> <p>} Flexibility of the neck & shoulder</p> <p>Isometric strengthening of shoulders Strengthening shoulder muscles Strengthening of shoulder joint, fingers & finger ROM & flexibility</p> <p>Stretching thoracic & lumbar spine muscles & flexibility</p> <p>Strengthening lower extremities & balance Hip flexibility & quadriceps strengthening</p> <p>Isometric strengthening of adductors</p> <p>Hip flexor & quadriceps strengthening Calf strengthening Balance training Flexibility</p> <p>Quadriceps, hamstring & gluteus strengthening</p> <p>Abductor strengthening Functional & Balance exercise Hip flexibility</p> <p>Cardiorespiratory exercise, co-ordination, balance & enjoyment Injury prevention</p>

Exercise	Repetitions	Function
<p>Warm up: Dancing to a song</p> <p>Standing: Hamstring curls (chair is support) Balancing L foot in front of R foot Stork stands with unilateral knee flexion Standing pelvic tilts Hip circles Mini wide squats Unil. Knee lift & bilat. shoulder press Star jumps Weight shifting</p> <p>Sitting on chair: Unil. & Bilat. Knee to chest Sit to stand (no support) Toe taps Seated calf raises Boxing arms Scapula pinches Shoulder rolls Straight leg raise with ankle circles</p> <p>Cool down Stretching Breathing</p>	<p>4 min</p> <p>2 X 10 L & R Hold 2 x 30 sec 30 sec on each leg 2 X 10 reps, 5 sec hold 20 times clock & anti clockwise 2 X 10 reps, hold 3 sec 2 X 10 reps L & R 2 X 10 left and right 1 X 10 reps eyes open, 1 X 10 reps eyes closed</p> <p>2 X 10 reps each leg unil. & bilat. 2 X 12 reps 2 X 30 sec 2 X 20 reps 1 min 10 X 5 sec hold 20 reps forward, 20 reps backwards 10 reps clock & anticlockwise L & R</p> <p>4 min 1 min</p>	<p>Warm up muscles, cardiorespiratory exercise & enjoyment</p> <p>Hamstring strengthening } Balance training</p> <p>Core activation & strengthening Hip flexibility Quadriceps, hamstrings, & gluteus strengthening Co-ordination, quadriceps & shoulder strengthening Co-ordination, hip & shoulder flexibility Balance & proprioception training</p> <p>Hip flexibility & lower back strengthening Strengthening lower extremities, balance & functional Strengthening Tibialis anterior & co-ordination Calf muscles strengthening Isometric arm strengthening Rhomboid strengthening Shoulder mobility Quadriceps strengthening & ankle ROM</p> <p>Injury prevention Bring heart rate down</p>


Exercise	Repetitions	Function
<p>Warm up: Exercising to song Standing: Stork stands Stork stands with straight leg lift & point</p> <p>Mat work (individual supine): Pelvic tilts Pelvic lifts Isometric abdominals Knee to chest (unil. & bilat.) Supine hip turnouts Pilates table top Cycle abs (TA activation) Adapted cycle abs Cross over stretch</p> <p>Mat work (partner back to back): Straight leg raise Heel slide & hip turnout Resistive back press Butterfly stretch</p> <p>Mat work (individual prone): Supermans (on all 4's lifting opposite arm & leg keeping pelvis stable) Adapted supermans Hip extension Donkey kicks</p> <p>Cool down: Breathing combined with slow movements</p>	<p>4 min</p> <p>2 X 30 sec on each leg Hold for 30 sec on each leg, L & R</p> <p>2 X 10 reps, hold 3 sec 2 X 10 reps, hold 3 sec 1 X 15 reps, hold 5 sec Hold 10 sec X 5, L & R 1 X 10 reps L & R 1 X 10 reps 2 X 20 sec 2 X 20 sec 2 X 20 sec</p> <p>2 X 10 hold 3 sec, L & R 1 X 10 on each leg Hold 10 sec X 5 3 X 20 sec</p> <p>1 X 10 reps on each side</p> <p>1 X 10 reps on each side 1 X 10 reps with 3 sec hold, L & R 1 X 10 reps on each leg</p> <p>5 min</p>	<p>Warm up muscles, cardiorespiratory exercise & enjoyment</p> <p>Balance training Balance training & quadriceps strengthening</p> <p>} Core strengthening</p> <p>Lower back stretching Hip flexibility TA strengthening Core strengthening Core strengthening Lower back stretch</p> <p>Quadriceps & hip flexor strengthening Hip flexibility Isometric abdominals Groin stretch</p> <p>Core stabilization</p> <p>Core stabilization Gluteul strengthening Hip flexibility</p> <p>Cardiorespiratory recovery</p>

Exercise	Repetitions	Function
<p>Warm up: Exercising to song</p> <p>Mat work (individual supine): Pelvic tilts Pelvic lifts & leg lifts Hip rolls Cycle abs (TA activation) Pilates table top Modified hip lifts Knee to chest (unilat. & bilat.) Vertical leg circles Mini crunches (arms behind the head or assisted) Unilateral breast stroke legs Vertical arm circles Scapula pinches and shrugs</p> <p>Mat work (individual prone): Lower back stretch Supermans (on all 4's & prone)</p> <p>Prone lying & flutter kicks Floor touching shoulder ROM Getting up slowly (unassisted)</p> <p>Standing (partner): Stork stands with hip extension hold Stork stands with eyes closed</p> <p>Cool down: Slow marching & exercising to music Breathing Stretching</p>	<p>4 min</p> <p>2 X 10 reps, hold 3 sec 2 X 10 reps, hold 3 sec L & R, 20 reps 2 X 20 sec 1 X 10 reps 1 X 10 reps Hold 10 sec, X 5, L & R 1 x 10 reps clock & anticlockwise, L & R 2 X 8 reps</p> <p>20 reps L & R 1 X 10 reps clock & anticlockwise, L & R 2 X 10 reps, hold 3 sec</p> <p>Hold 5 sec x 10 reps 2 X 10 reps in both positions</p> <p>8 sec X 3 5 reps</p> <p>2 X 30 sec 2 X 30 sec</p> <p>3 min 1 min 2 min</p>	<p>Warm up muscles, cardiorespiratory exercise & enjoyment</p> <p>Core strengthening Core strengthening Oblique stretching & hip flexibility } Core strengthening</p> <p>Hip flexibility & lower back stretching Hip flexibility Core strengthening</p> <p>Hip flexibility Shoulder ROM Rhomboid & trapezuis strengthening</p> <p>Lower back stretch Core stablization & lower back strengthening Gluteul strengthening Shoulder ROM</p> <p>Balance training & gluteal strengthening Balance & proprioception training</p> <p>Cariorespiratory recovery & injury prevention</p>

Exercise	Repetitions	Function
<p>Warm up: Group dance</p> <p>Standing (partner): Holds each others hands- leans to the left & to the right The can-can dance Mini forward lunging Mini squats (toes out & in) Storkstands Storkstands (progression-eyes closed) Abduction (L & R) Long back stretch Calf raise (unilat & bilat.) Side bending Chest stretch Partner push ups Marching (high knees-left-right-left.)</p> <p>Partner individual: Squatting (toes out & in) Weight shifting (side & forward) Mini forward lunge Calf raise (unilat & bilat.)</p> <p>Partner sitting: Touch your toes Spine stretch Assisted crunches Adduction knees</p> <p>Cool down: Co-ordination & balance dance</p>	<p>4 min</p> <p>20 counts both ways</p> <p>1 min</p> <p>1 min</p> <p>20 sec in each direction</p> <p>2 X 30 sec on each leg for each partner</p> <p>2 X 30 sec on each leg for each partner</p> <p>Hold 10 sec, X 3 reps</p> <p>Hold 10 sec, X 3 reps</p> <p>20 reps each position</p> <p>Hold 10 sec X 3 on each side</p> <p>Hold 10 sec, repeat 3 times</p> <p>10 push ups for each partner</p> <p>1 min</p> <p>20 counts in each direction</p> <p>20 repetitions on each leg</p> <p>20 reps, L & R</p> <p>20 reps each position</p> <p>Hold 5 sec, repeat 5 times</p> <p>Hold 5 sec, repeat 5 times</p> <p>As many as possible</p> <p>Hold 5 sec repeat 10 times</p> <p>5 min</p>	<p>Warm up muscles, cardiorespiratory exercise & enjoyment</p> <p>Balance & co-ordination</p> <p>Balance, co-ordination & hip flexibility Balance & quadriceps strengthening Balance & lower extremity stretching Balance Balance & proprioception training Abduction strengthening Lower back stretch Calf muscle strengthening Latissimis dorsi stretch Chest stretch Shoulder strengthening Leg strengthening & co-ordination</p> <p>Upper thigh & gluteal strengthening Balance training Quadriceps strengthening & balance Calf strengthening</p> <p>Hamstring stretch Lower backs stretch Abdominal strengthening Adductors & glut medius strengthening</p> <p>Cardiorespiratory recovery & balance training</p>

Exercise	Repetitions	Function
<p>Warm up: Dance</p> <p>Partner exercises (mat): Leg circling Tandem Bike ride Tandem Pelvic lift Trunk raising</p> <p>Partner exercises (standing): Opposite knee touch Opposite arm & knee touch Holding hands: - Wide squats (toes turned out) - Stork stands (bent knee) - Side bend (adapted) - Both look in opposite direction</p> <p>Hip turnouts (opposite legs) Abduction (L & R) Leg extension (L & R) Partner grapevine walk Backward walk</p> <p>Partner exercises (seated) Sit to stand Cross over hands (clapping) Wide push ups (seated) rocking</p> <p>Group exercises: Handshake circle dance Heel figure of 8 walk</p> <p>Cool down: Stretching & breathing with partner</p>	<p>4 min</p> <p>10 reps for each partner in both directions 30 sec 20 reps for each partner 2 x 10 reps for each partner</p> <p>30 sec 30 sec</p> <p>2 x 10 reps Hold for 30 sec & repeat 10 reps Hold for 5 sec 6 times (3 on each side)</p> <p>10 reps one each leg 2 x 10 reps on each leg 2 x 10 reps on each leg</p> <p>1 min 30 sec</p> <p>30 reps 30 sec 30 sec</p> <p>3 min 2 min</p> <p>1 min</p>	<p>Warm up muscles, cardiorespiratory exercise & enjoyment</p> <p>} Core & leg strengthening & hip flexibility</p> <p>} Co-ordination, Balance, quadriceps strengthening, hip & shoulder flexibility</p> <p>Upper thighs & gluteal strengthening Balance training Latissimis dorsi stretching Neck flexibility Hip flexibility Abductor strengthening & hip flexibility Hip flexibility & gluteal strengthening Co-ordination & Balance Co-ordination & Balance</p> <p>Quadriceps strengthening Co-ordination Shoulder strengthening</p> <p>} Cardiorespiratory exercise, balance & co-ordination</p> <p>Cardiorespiratory recovery</p>

Table 7. Week 4: Aerobics

Exercise	Repetition	Function
Warm up:		Warm up muscles, cardiorespiratory exercise & enjoyment
Interval marching & stretching	5 min	
1) Song – dance	4 min	 <p data-bbox="1702 821 1960 893">Cardiorespiratory exercise</p>
<i>REST</i>	2 min	
2) Song – dance	4 min	
<i>REST</i>	2 min	
3) Song – dance	4min	
<i>REST</i>	2 min	
4) Song – dance	4 min	
<i>REST</i>	2 min	
5) Song – dance	4 min	
<i>REST</i>	1 min	
Cool down:		Cardiorespiratory recovery & injury prevention
Breathing & stretching	5 min	

Appendix L
Certificate handed to all the women who took part in the programme



This Certificate is awarded to



for completing the



“MASTERS” EXERCISE CLASSES



of 2006



Congratulations!

