EFFECT OF A 12-WEEK ENDURANCE EXERCISE PROGRAMME ON COGNITIVE FUNCTION, MOBILITY AND QUALITY OF LIFE OF PATIENTS WITH MILD TO MODERATE DEMENTIA

BY

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CERTIFICATION

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DEDICATION

This work is dedicated to my darling wife

Biola

and lovely daughter

Oluwatobiloba

whose support and prayer I appreciate throughout the programme.

ABSTRACT

Dementia is a syndrome characterised by progressive and usually irreversible cognitive deficits severe enough to compromise activities of daily living. Regular endurance exercise is a proven modality in preventing secondary health conditions among individuals with chronic illness, by maintaining mobility, enhancing functional ability, improving cognitive function and Quality of Life (QoL). There is however paucity of information on the effects of endurance exercises on overall health of Patients With Dementia (PWD). The effects of an Endurance Exercise Programme (EEP) on cognitive function, mobility and QoL of PWD were therefore investigated.

A quasi-experimental study involving 85 consenting patients with mild to moderate dementia recruited from the dementia clinic of the Ibadan-Indianapolis Dementia Research Project, Ibadan was carried out. Participants were systematically assigned into Exercise Group (EG) and Control Group (CG). Out of the 85 (EG=37; CG=48) that started only 55 (64.7%) comprising 24 EG and 31 CG completed the study. For the duration of their participation both groups received physician-prescribed routine medication while only the EG participated in the EEP thrice weekly for 12 consecutive weeks. The EEP comprised a seven-station circuit which included shoulder-elbow-wrist joint movements, pelvis and trunk rotation, double knee-to-chest, alternate straight-leg lifting, free-cycling in the air, brisk walking and stairs climbing exercises. Cognitive function, mobility, QoL were the outcomes measured using Community Screening Instrument in Dementia (CSID), Time Up and Go (TUG) test, and Dementia Quality of Life (DQoL) respectively at baseline and at the end of the 4^{th}, 8^{th} and 12^{th} weeks. Data

were analysed using descriptive statistics, repeated measures ANOVA, independent t-test, Mann-Whitney U and Kruskal-Wallis tests at p=0.05.

There were no significant differences between the EG and CG in age (79.7 ±6.7 vs. 77.7 ±7.0), baseline TUG scores (10.9 ±4.9 vs. 10.3 ±4.9) and CSID scores (40.6 vs. 44.8) but the CG had significantly higher baseline DQoL scores (28.1 vs.55.3). There was no significant difference between the baseline and 12th week TUG scores for the EG (10.9 ±4.9 vs.10.0 ±2.8) and CG (10.3 ±4.9 vs. 10.7 ±4.1). Within-group CSID scores comparison revealed significant difference increase in the EG and CG across 12 weeks. The DQoL in the EG showed significant increase while no significant difference was seen in the CG over 12 weeks. Post-hoc analysis showed that the difference in CSID scores for the CG was between baseline and 8th week , and 4th and 8th weeks; while significantly different pairs in DQoL for the EG was between the baseline and 4th week, baseline and 12th week, and 4th and 12th weeks. The 12th week comparison showed no significant difference in the CSID, TUG, and DQoL scores between the two groups.

Twelve weeks of endurance exercise programme improved cognitive function and quality of life of patients with mild to moderate dementia. Endurance exercise programme is beneficial and therefore recommended for this group of patients.

Keywords: Dementia, Endurance exercise programme, Cognitive function, Quality of Life
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TABLE OF CONTENTS

LIST OF TABLES

TABLE

LIST OF PLATES

PLATES

CHAPTER ONE

INTRODUCTION

1.1 Introduction

World society is ageing at an unprecedented rate with over 925million people worldwide who were 55 years of age and older (World Population Prospects, 2006) and it is expected that the proportion of elderly individuals will increase to thirty percent by 2025 and forty-one percent by 2050. Ageing is associated with an increase in multiple of chronic conditions such as dementia that sometimes translate into cognitive disability (Martin and Zimprich, 2003; Newson and Kemps, 2006). Dementia is defined as a documented decline in multiple cognitive functions such as memory, language, visuospatial ability that is sufficiently severe to interfere with daily life in an alert individual (Small et. al., 1997). This progressive decline is observed in two or more cognitive domains that are severe enough to render a person dependent on others which suggest neurodegenerative disorder (Launer et. al., 1999). These cognitive deficits are the clinical hallmark of dementing illnesses.

Boustani et. al., (2003) highlighted cases of dementia of which Alzheimer's disease (AD) and cerebro-vascular ischeamia (Vascular dementia) are the two most common types. Alzheimer disease accounts for 50 to 75 percent of all cases of dementia (Ogunniyi et. al., 1997; Boustani et. al., 2003). Other frequent causes of dementia include vascular disorder which either occur alone or in combination with AD in ten to twenty percent of cases (Ogunniyi et. al., 1998); dementia with Lewy bodies in ten to fifteen percent and

fronto-temporal dementia in five to fifteen percent. Advancing age has been identified as the major risk factor for dementia with a doubling of risk every five years after the age of 65 years (Brookmeyer et. al., 1998).

Alzheimer's disease International (2007) observed that dementia is the most common and serious disorder in later life, with a prevalence of five percent and incidence of two percent per year in those greater than 65 years of age. This equates to 0.5 million people with dementia at any one time and 200,000 new cases every year in the United Kingdom. Studies by Launer et. al., (1999) reported that AD is the commonest etiology with prevalence of approximately two percent among persons between 60 and 64 years of age and that the prevalence increases exponentially every five years thereafter, reaching 40 percent among persons older than 80 years of age.

A study conducted among people of age 65 years and older in two communities: the Yorubas in Ibadan, Nigeria and African Americans in Indianapolis, United States of America reported a prevalence of dementia and Alzheimer's disease as 2.29 percent and 1.41 percent respectively. Prevalence rates in community-dwelling individuals alone in Indianapolis were 4.82 percent and 3.69 percent for dementia and Alzheimer disease respectively. In both combined nursing homes and community sample, prevalence rates were 8.24 percent and 6.24 percent respectively. These prevalence rates of dementia and AD were significant (Hendrie et. al., 1995). This number of AD cases has increased from one in first decade of 20th century to an estimated 25 million around the world (Whitehouse, 2007; Alzheimer's disease International, 2007).

Dementia causes irreversible decline in global intellectual, social and physical functioning (Smith et. al., 2005). A number of common non-cognitive symptoms also provide problems not only for the person with dementia but also the carers. Non-cognitive neuropsychiatric symptoms are also common with presentations of array of neuropsychiatric symptoms such as agitation, aggression, delusion, hallucination, repetitive vocalization and wandering among other symptoms observed in 60 percent to 98 percent of patients with dementia (Lyketsos et. al., 2000; Lyketsos et. al., 2002). The most obvious are agitation, aggression, psychosis, sexual disinhibition, eating problems and abnormal vocalization (Hendrie, 1998; Wancata et. al., 2003). Others include sleep dysfunction (Kuhn et. al., 2005) and depression (Beeri et. al., 2002). These neuropsychiatric symptoms are also associated with increased hospital length of stay and placement of older adults with dementia in nursing facilities (Hendrie, 1998; Wancata et. al., 2003). Beeri et. al., (2002) noted that 30 percent of the cost of caring for patients with AD is attributed directly to the management of neuropsychiatric symptoms. Thus intervention aimed at treating neuro-psychiatric symptoms could have a tremendous impact on patients, caregiver and the society as a whole (Bloom et. al., 2003).

Regular exercise is a mainstay of preventive health care for individuals of all ages (Logsdon et. al., 2005). Research is accumulating evidence to suggest that oldest adults can improve on their cardiovascular function and increase flexibility, balance and strength with systematic exercise training (Lazowski et. al., 1999; Meuleman et. al., 2000). Studies involving older adults have shown that exercise reduces risk of chronic illness, maintain mobility and function enhance mood and even improve cognitive function (Logsdon et. al., 2005).

According to the United States of America Census Bureau (2008), the global mid-year population of the elderly has increased to 721.5 million, while that of Nigeria increased to 7.2 million. An increment of 4.8 percent was observed in Nigeria over the previous year. Therefore, the need to improve the total care of people with dementia cannot be overemphasized.

Aadlandsvik (2008) noted that dementia is still rather poorly understood, and consequently also poorly managed in the community, and even in society as a whole. Although there is no cure for dementia, quality of life of patients with dementia can be improved (Graff et. al., 2007; Torpy et. al., 2007). Studies have shown that cognitive impairment is frequently exacerbated by medications and that the use of psychotropic drugs is often accompanied by significant side effects which include sedation, depression, falls, incontinence, parkinsonism, dyskinesia and extrapyramidal symptoms (Kawas, 2003). A number of studies have linked dementia with physical deterioration such as under-nutrition (Wolf-Klein and Silverstone, 1994), impaired balance and reduced speed of walking (O'Keeffe et. al., 1996; Pettersson et. al., 2002), gait disturbances such as decreased step length and gait apraxia with co-existing extrapyramidal symptoms (Román et. al., 2002) and higher risk of falls and fractures (Wolfson, 2001). Others include rapid decline on measures of mobility (Bourret et. al.,2002), reduced muscle mass associated with loss of independence (Dvorak and Poehlman, 1998).

1.2 Statement of the Problem

Endurance exercise has been prescribed as non-pharmacologic intervention on the cognitive loss, quality of life and functional independence of individuals with dementia. Other studies have reported beneficial effect of exercise as a deterrent to onset of clinical manifestation of dementia (Laurin et. al., 2001; Yaffe et. al., 2001; Larson et. al., 2006). The above studies however were either retrospective or prospective cohort studies which relied on subjective report of physical activity from individuals with dementia. Few intervention studies (Meuleman et al., 2000; Cott et al. 2002; Teri et. al., 2003) previously evaluated the benefit of aerobic exercise on behavioural symptoms without any assessment on cognition and quality of life in the subject population. This study was therefore designed to seek and find answers to the following questions.

1. Would a twelve-week endurance exercise programme have significant effect on cognition of participants with mild to moderate dementia?
2. Would a twelve-week endurance exercise programme have significant effect on mobility of participants with mild to moderate dementia?
3. Would a twelve -week endurance exercise programme have significant effect on the quality of life of participants with mild to moderate dementia?
4. Would a twelve -week endurance exercise programme have significant effect on the cardiorespiratory fitness of participants with mild to moderate dementia?

1.3 Aim of Study

To find out if individuals with mild to moderate dementia taken through the 12-week endurance exercise programme would be better than their counterpart who

did not engage in the exercise programme (control) in terms of cognition, mobility, cardiorespiratory endurance and quality of life.

1.4 Hypotheses

1.4.1 Major Hypothesis

1. There would be no significant difference in the pre- and post-twelve weeks endurance exercise training on the severity of cognitive loss, mobility, quality of life and cardiorespiratory endurance of participants with mild to moderate dementia.

1.4.2 Sub-Hypotheses

1. There would be no significant difference in the pre- and post- twelve week endurance exercise training in memory scores of participants with mild to moderate dementia.
2. There would be no significant difference in the pre- and post- twelve week endurance exercise training in attention/calculation scores of participants with mild to moderate dementia.
3. There would be no significant difference in the pre- and post- twelve week endurance exercise training in language scores of participants with mild to moderate dementia.
4. There would be no significant difference in the pre- and post- twelve week endurance exercise training in language comprehension scores of participants with mild to moderate dementia.

5. There would be no significant difference in the pre- and post- twelve week endurance exercise training in fluency scores of participants with mild to moderate dementia.
6. There would be no significant difference in the pre- and post- twelve week endurance exercise training in orientation scores of participants with mild to moderate dementia.
7. There would be no significant difference in post-intervention cognitive scores of exercise participants with mild to moderate dementia compared with control participants.
8. There would be no significant difference in the pre- and post- twelve week endurance exercise training in mobility scores of participants with mild to moderate dementia.
9. There would be no significant difference in post-intervention mobility scores of exercise participants with mild to moderate dementia compared with control participants.
10. There would be no significant difference in the pre- and post- twelve week endurance exercise training in self- esteem scores of participants with mild to moderate dementia.
11. There would be no significant difference in the pre- and post- twelve week endurance exercise training in positive-affect scores of participants with mild to moderate dementia.

12. There would be no significant difference in the pre- and post- twelve week endurance exercise training in feelings of belonging scores of participants with mild to moderate dementia.
13. There would be no significant difference in post-intervention Dementia Quality of Life (DQoL) scores of exercise participants with mild to moderate dementia compared with control participants.

1.5 Delimitation

This study was delimited as follows:

1.5.1 Participants

(a) Inclusion Criteria

The following categories of participants with dementia were included in this study:

1. Participants diagnosed and certified fit for the study by the Neurologist.
2. Participants who attended Dementia Research Project Clinic, University College Hospital, Ibadan.
3. Participants diagnosed as having mild to moderate dementia using Clinical Rating Scale 1-2 (Morris, 1993).
4. Participants who were not involved in any other form of exercise training during the course of the study.
5. Participants who can communicate in either English and or Yoruba language.

(b) Exclusion Criteria

The following categories of patients were excluded:

1. Participants who had history of musculoskeletal, neurological or cardio-pulmonary disorder which could be negatively affected by their involvement in the exercise training programme of the study
2. Participants who had either or both visual and auditory impairment which could affect their participation in the exercise training.
3. Participants who had a current diagnosis of clinical depression.

1.5.2 Parameters

The following parameters were measured:

a. Cognitive scores using Community Screening Instrument for Dementia (CSID) (Hall et. al., 2000)

b. Mobility – Time "Up and Go" (TUG) (Podsiadlo and Richardson,1991).

c. Cardio respiratory fitness – 6 Minute Walk Test (American Thoracic Society, 2002)

d. Quality of life – Dementia Quality of life (DQoL) (Brod et. al., 1999).

e. Anthropometric variables – waist to hip ratio circumference, body mass index.

1.6 Limitation

1. The compliance of the participants with the physician prescribed medication could not be ascertained during this study.

2. The aim and purpose of the study was clearly stated to the participants before the commencement of the study. However the truthfulness with which questionnaires were completed by participants might not be absolute and this might affect the outcome of the study.

1.7 Significance of the Study

1. The findings of this study have indicated that endurance exercise enhances cognition in mild to moderate dementia patients.
2. The study showed that involvement in endurance exercise programme led to improvement in mobility among patients with dementia subsequent to their adherence to instruction not to engage in any other form of exercise training during the course of the study.
3. The outcome of this study has shown that patients with dementia could improve on their quality of life when engaged in endurance exercise.
4. Cardiorespiratory fitness of patients with dementia could be sustained following participation in endurance exercise programme.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Dementia is defined as acquired, progressive impairment in two or more cognitive areas that is severe enough to render a person dependent on others (Launer et. al., 1999). Dementia is a loss of brain function and it is not a single disease. Dementia refers to a group of illnesses that involve memory, behavior, learning and communicating problems (Healthline, 2007). It is the leading cause of disability among adult patients (Launer et. al., 1999), occurring usually in older age and but rarely in people under age 60 (Healthline, 2007).

2.2 Types of Dementia

The two major causes of degenerative (non-reversible) dementia are Alzheimer's disease and vascular dementia (loss of brain function due to a series of small strokes) (Healthline, 2007).

(a) Alzheimer's disease

Alzheimer's disease (AD) is a chronic neurodegenerative disorder and the most common cause of dementia (Desai and Grossberg, 2005; Ravaglia, 2005; Li et. al., 2007). It is a dementia syndrome that progresses insidiously, eventually altering memory, higher intellectual function, language, praxis and visuospatial and other cognitive abilities (Ross

et. al., 1997). Desai and Grossberg (2005) noted that AD is one of the principal causes of disability and decreased quality of life among older adults.

Typical early features of AD include difficulty retaining new information and failure of cueing to help jog remembrances. Changes in mood and behaviour are initially very mild and may include social withdrawal that can mimic the symptoms of minor depression. Both the behaviour and mood change may simply reflect the patient's difficulty in dealing with an environment he or she finds increasingly confusing. As the illness progresses, most patients begin to exhibit word hesitancy and circumlocutions that progress to a reluctance to initiate conversation and use of phrases loosely connected to a unified thought (Karlawish and Clark, 2003).

In the prodomal state of AD called the amnesic variant of mild cognitive impairment, there are reports of memory loss and subnormal performance on a measure of memory (Petersen et. al., 1999). They suggested that persons with mild cognitive impairment are at increased risk for progression to AD - 12 percent per year compared with 1 to 2 percent for match controls with normal memory. Also, symptoms may be present for as long as 7 years before they become severe enough to indicate diagnosis.

The diagnosis of AD is primarily one of inclusion and usually can be made using standardized clinical criteria. Galvin et. al., (2007) suggested that incorporating a brief, simple inventory of personality trait in Blessed Dementia scale, quality of life may improve the identification of individual with dementia with Lewy bodies.

(b) Vascular dementia

Vascular dementia (VaD), a direct consequence of cerebrovascular disorders, is the second most common dementia after Alzheimer's disease. The condition is not a single disease; it is a group of syndromes relating to different vascular mechanisms (Alagiakrishnan, 2011). In middle age a higher cardiovascular risk factor increased the risk of vascular dementia 25 years later (Kalmijn, 2000). The prevalence of vascular dementia is high worldwide and is particularly high in Asia (Fratiglioni, 1999). There are several subtypes of vascular dementia, which vary in their causes, pathogenesis, and clinical phenotypes namely multi-infarct, subcortical vascular, mixed cortical and subcortical vascular, post-stroke dementia. Mild cognitive impairment associated with small-vessel disease (subcortical vascular MCI) has been reported to be a prodromal stage of subcortical vascular dementia.

(c) Fronto-temporal dementia

Frontotemporal lobar degeneration- a non-Alzheimer dementia has emerged as the most common cause of dementia in patients below the age of 65 (Miller, 2007). The Neary criteria established by a consortium of international researchers with an interest in fronto-temporal dementia defined 3 major subtypes of Fronto-Temporal Lobar dementia: a frontally predominant syndrome (fronto-temporal dementia), a temporally predominant syndrome (semantic dementia), and a left frontally predominant syndrome (progressive nonfluent aphasia) (The Lund and Manchester Groups, 1994). Fronto- temporal dementia (FTD) is an extraordinarily complex and partially understood disorder that is clinically and neuropathologically distinct from AD (Miller, 2007)

In the 1980s and 1990s, clinical and imaging studies led to the realization that FTD was caused by degeneration in specific frontal and anterior temporal cortical circuits (Rosen et. al., 2002). More recently, Seeley and colleagues (2006) have suggested that specific cells, von Economo neurons, were the primary site of neurodegeneration in FTD. Landmark studies in 1998 and 2006 have revealed that familial cases of FTD can be caused by mutations in 2 distinctive genes located within 1 kilobase of each other on chromosome 17, the genes coding for tau or for progranulin (Poorkaj et. al., 1998; Wilhelmsen, 1998; Baker et. al., 2006). For its diagnosis, the Neary Criteria emphasize 5 main core criteria: (1) insidious onset, (2) early loss of social conduct (disinhibition), (3) early loss of personal conduct (apathy), (4) loss of insight, and (5) emotional blunting.

(d) Dementia with Lewy bodies (DLB)

Dementia with Lewy bodies (DLB) is a leading cause of degenerative dementia in elderly adults. This condition is linked to abnormal protein structures in certain areas of the brain (Healthline, 2007). Treatable causes of dementia include normal pressure hydrocephalus, brain tumors, and dementia due to metabolic causes, thyroid conditions, low vitamin B12 levels, and infections (Healthline, 2007).

2.3 Clinical symptoms

(a) Memory Loss

Memory loss is the impairment in the ability to learn new information or to retrieve previously learnt information (Petersen et. al., 1999). It is among the most common cognitive changes noted by elderly patients or by their families and friend (Ogunniyi

et.al., 1997). In normal aging, decreased ability to retrieve information can cause annoying memory lapses that do not impair the ability to perform activity of daily living (Laurin, 2001). These changes are largely the result of decline in frontal lobe function which is measured as executive function that is the ability to organize, plan and focus on a topic (Schacter, 1997). However, memory loss that impairs the ability to perform activities of daily living strongly suggests neurodegenerative dementia (Desai and Grossberg, 2005).

Another cause of memory loss is mild cognitive impairment which describes persons who do not have functional impairments that meet criteria for dementia but whose cognitive function falls between the changes associated with normal aging and dementia (Ritchie and Touchon, 2000). This mild cognitive impairment may represent a predementia state (Ritchie and Touchon, 2000). Impairment in frontal lobe function cause many patients with dementia to underestimate the severity of cognitive problems (Poorkaj, et. al., 1998).

(b) Neuropsychiatric symptoms

Behavioural problems are thought to be pervasive and devastating to patients with dementia and their families (Teri et. al., 1998). They found out that overall numbers of behavioural problems significantly increased with increased cognitive impairment. A number of common non-cognitive symptoms also provide problems not only for the person with dementia but for the carers. The most obvious are agitation, aggression, mood disorders and psychosis. Others include sexual disinhibition, eating problems and abnormal vocalization. These behavioural problems were not significantly associated with patient's age, gender, duration or age at onset of dementia (Teri et. al., 1998).

Disabilities caused by behavioural problems can be potentially devastating in cognitive impaired patients. These behavioural symptoms can be a major cause of stress, anxiety and concern for caregivers (Martinón-Torre et. al., 2004). Clinically depressive symptoms are common among patients with dementia. These symptoms occurred in 40 percent of patients with dementia as against 12 percent of non-demented age-matched controls (Lyketsos et.al., 1997). Prevalence of depressive symptoms of 15 percent to 49 percent has been noted in dementia clinic (Lyketsos et. al., 1997).

Agitation is a major problem in older patients with dementia. Agitation and aggression have always been difficult behaviours to manage and when it is severe, agitation can be a behavioural emergency that requires urgent and immediate intervention (Martinón-Torre et. al., 2004). Teri and coworkers (1999) noted that anxiety symptoms were common occurring in 70 percent of subjects. These symptoms were significantly correlated with activity of daily living impairment and other behavioural disturbances, including wandering, sexual misconduct, hallucination, verbal threats and physical abuse, comobidity of anxiety –depression was also prevalent with 54 percent of their sample having both.

Teri et. al., (1998) observed that behavioural problems found associated with level of impairment such as wandering agitation, incontinence and poor personal hygiene are thought to be characteristics of the dementia and therefore predictable. They also observed that behavioural problems such as hallucination, irrational suspicions, falls and restlessness were not associated with the level of impairment and are likely to be idiosyncratic. They further advised that problems associated with level of impairment

should probably be incorporated into education and intervention programs while problems found not associated with level of impairment should be addressed as needed on an individual basis. These behavioural disturbances and psychiatric symptoms have been described as factors that make caring for an individual with dementia to be stressful (Donaldson et. al., 1997).

(c) Mobility/Physical function

Physical function and cognitive functions are likely connected especially in aging. Cognitive ability is essential for conducting physical tasks; performing physical tasks, in return, may enhance or maintain cognitive ability. The cognitive benefits from physical exercise may results from the connection between physical function and cognitive function, especially at advanced old age when cognitive decline is more likely (Wang et. al., 2004).

Two studies conducted on healthy individuals with no history of major illness, reported that gait speed could be observed before the development of cognitive impairment (Camicioli et. al., 1998). These studies suggested that motor function decline might be associated with pathologic changes related to the progression to dementia. Verghese et. al., (2002) also reported that gait abnormality may precede and predict non-AD dementia; although motor slowing and gait disorder were also observed in patients with AD (O'Keeffe et. al., 1996; Goldman et. al., 1999)

In a recently concluded cohort studies involving 2,288 participants by Wang and associates (2006) to investigate whether poor physical function precedes the onset of dementia. They observe that persons with poor physical function (10-ft timed walk, chair-

stand time, standing balance and grip strength) were at an increase risk for developing dementia and had an increased risk rate of cognitive decline during the 6 years follow up (Wang et. al., 2006). Their findings suggest that poor physical function may precede the onset of dementia and higher level of physical function may be associated with a delay onset; slow gait might be an early sign and poor handgrip later sign of development of dementia in older adults.

In a study of associations between cognitive function, gait speed and self-reported measures of physical function in 3,035 healthy mobile participants, Fitzpatrick and associates (2007) found that associations between cognition and usual-paced walking were on borderline, and no relationships were found with self-reported measures of physical function including activity of daily living. They concluded that performance-based measures better predict early cognitive decline than do subjective measures, and tasks requiring greater functional reserve, such as fast-paced walking, appear to be the most sensitive in assessing these relationships.

2.4 Risk Factors of Dementia

Advancing age, family history of dementia, educational level, and presence of the apolipoprotein E genotype (*APOE*) ε4 allele remain the only established risk factors for Alzheimer's disease (Cummings and Cole, 2002).

(a) Age

Age is the best studied and strongest risk factor for the dementia syndrome. The incidence rate among people aged 65 to 69 years is about 2.4 cases per 1,000 person-years, and incidence approximately doubles in each subsequent 5-year period. A significant rise in the prevalence of dementia begins around age 75; rates of 1 percent to 3.5 percent in persons aged 65 to 74 years jump to 6 percent to 15 percent in those ages 75 to 84 years (Jorm and Jolley, 1998). Ogunniyi and co-workers (2006) in the Indianapolis-Ibadan study also noted in a cohort of 2,494 elderly Nigerians that old age is an important significant risk factor.

(b) *Family History*

Family history of dementia, similar to advancing age and the *APOE4* allele, frequently has been associated with an increased risk of Alzheimer's disease and is generally considered a definite risk factor (Fratiglioni, 1996). Canadian Study of Health and Aging (1994) found an increased risk of Alzheimer's disease that increased significantly by two to threefold for family history of dementia. Same association was observed by Launer et. al., (1999) in contrast with the study by Lindsay and co-workers (2002). They opined that these contradictory findings might reflect misclassification of the information because of recall bias and/or the uncertainty of information collected with the help of informants in retrospective investigations compared with longitudinal studies. In a case-control study, Mayeux et. al., (1993) observed that relatives of patients whose onset of Alzheimer's disease began at older age did not have an increased risk of Alzheimer's disease, whereas there was an increased risk for first-degree relatives of patients whose onset occurred at early age.

Individuals whose parents both had Alzheimer's disease have a 54 percent cummulative risk of developing this condition by age 80. This risk is about 1.5 times greater than the risk faced by those with one parent with Alzheimer's disease and nearly 5 times greater than for those with neither parent affected. First-degree relatives of patients with Alzheimer's disease have a cumulative lifetime risk of 39 percent approximately twice the risk of Alzheimer's disease in the general population (Lautenschlager et. al., 1996). Lindsay et. al., (2002) noted that family history of dementia was not associated with Alzheimer's disease while an increased risk of Alzheimer's disease was observed for subjects who had the *APOE4* allele, since family history of dementia is believed to be a potential indicator of this genetic factor.

(c) Educational Level

The association between low educational level and the risk of Alzheimer's disease is consistent with findings from several retrospective and prospective studies (Ott et. al., 1995; Letenneur et. al., 1999). In a study carried out among 930 non-demented elderly Nigerians living in urban community, Ogunniyi and coworkers (1991) found that 17 percent of the subjects with at least 6 years of education performed better on all aspects of cognition assessed ($p<0.001$). The differences in performance were statistically significant on assessment of general knowledge, intelligence, abstract thinking, depth of information and immediate recall ($p<0.001$) but not for calculation, orientation, attention and language comprehension. It was suggested by Katzman (1993) that education effect might include increased brain reserve.

(d) Wine/Alcohol

Several studies have reported that regular wine consumption was associated with a reduced risk of Alzheimer's disease (Lindsay et. al., 2002; Ogunniyi et. al., 2006). Results from the PAQUID Study, a longitudinal study of community residents, showed a similar negative relation between wine consumption and Alzheimer's disease (Orgogozo et. al., 1997). This protective effect remained significant after more in-depth statistical analyses were conducted by Lemeshow and coworkers in 1998. It has been suggested that specific substances in wine, but not in other alcoholic beverages, could be responsible for this positive effect on nerve cells in dementia (Tredici et. al., 1999).

(e) Genetic Mutation

Genetic factors have an important role before age 60, when the disease is caused either by a mutation in the amyloid precursor protein on chromosome 21 or, more commonly, by an unidentified gene on chromosome 14 (Schellenberg et. al., 1992). Three common alleles, e2, e3, and e4 determine the six apolipoprotein E phenotypes E2/2, E2/3, E2/4, E3/3, E4/3, and E4/4. The *e*4 variant of apolipoprotein E is associated with the sporadic form and some familial forms with onset after the age of 60 years. Plasma apolipoprotein E phenotypes modulate lipoprotein concentrations, particularly that of low density lipoprotein cholesterol (Kalmijn et. al., 2000).

The mechanism for the effect of APOE 4 on the risk of AD is not clear, but it probably involves an increase in the deposition of amyloid ß in the brain (Selkoe, 1997). Ogunniyi et. al. (2000) observed that there was a lack of association between Alzheimer's disease and possession of the apolipoprotein E epsilon4 allele in the Nigerian sample, unlike the

finding in African Americans, where significant association was shown. However, Blacker and Tanzi (1998) reported that about 20 percent to 30 percent of the general population and 45 percent to 60 percent of people with late-onset Alzheimer's disease have the apolipoprotein E-4 gene.

A study of a random sample of 980 elderly Finnish subjects by Kuusisto and colleagues (1994) showed that the presence of the e4 allele is associated strongly with Alzheimer's disease. They found that the e4 allele frequency was twice as high in patients with Alzheimer's disease as in subjects without dementia (0.359 vs 0.165). The study further showed a clear dose-response relation between the number of e4 alleles and the prevalence of Alzheimer's disease. The presence of one allele increased the risk 2.7-fold and the presence of two alleles 9.3-fold.

(f) Cardiovascular Risk

Cardiovascular risk factors are associated with vascular dementia. The presence of lacunar infarctions leading to symptomatic change is independently related to diastolic blood pressure, serum creatinine, tobacco smoking, carotid stenosis, male sex, and a history of diabetes (Longstreth et. al., 1998). A cross-sectional study found all indicators of atherosclerosis (vessel wall thickness, plaques of the carotid arteries, and the ratio of ankle-to-brachial systolic blood pressure) to be associated with all dementias, with odds ratios ranging from 1.3 to 1.9 (Hofman et. al., 1997).

(g) Physical Activity

Inactivity and a lack of physical exercise can seriously compromise the health and well-being of older adults, including those with dementia. Overall functional performance

improves with exercise in older persons, and physical exercise interventions may minimize functional decline (Harada et. al., 1995). Physical activity may also reduce the risk of developing dementia, since older males with low walking rates (less than 0.25 mile a day), showed a 1.8-fold increased risk of dementia compared with those that walked more than two miles a day (Abbott et. al., 2004) and women with high levels of baseline physical activity had a lower risk of cognitive deterioration (Yaffe et. al., 2001). Laurin and associates (2001) found a relationship between high levels of self-reported physical activity and reduced risk of cognitive impairment, odds ratio (adjusted for age, sex, and education) = 0.58.

(h) Caloric Intake

Caloric intake has been shown to affect aging in animals and possibly in humans (Weindurch and Sohal, 1997). The balance of macronutrients in the diet may also affect oxidative stress unrelated to total caloric intake (Jacob, 1999), which in turn may be involved in the pathogenesis of Alzheimer disease (AD) (Pitchumoni and Doraiwamy, 1998). In a longitudinal study involving 242 cases of incident AD in 4023 person-years of observation with 4 years of follow-up (6 cases per 100 person-years) by Luchsinger et. al., (2002), it was revealed that the risk of AD is associated with higher total calorie intake and fat intake in individuals homozygous or heterozygous for the APOE 4 allele. However this was not observed in individuals without the APOE 4 allele where calorie and fat intake were not associated with risk of AD.

Jacob (1999) suggested that relation between total caloric intake and intake of specific macronutrients and AD could be mediated through oxidative stress and its effect on

amyloid ß deposition, which generates reactive oxygen species that are toxic to neurons (Sagara et. al., 1996; Pitchumoni and Doraiwamy, 1998).

(i) Obesity

Current trends in research have implicated cardiovascular risk factors in the development of Alzheimer's type dementia apart from vascular-type dementia (Launer et. al., 2000). Gustafson et. al., (2003) stated that it is possible that obesity contributes to both these major forms of cognitive impairment although it is often assumed that obesity is a risk factor for cardiovascular disease simply by virtue of its association with other risk factors (Elias et. al., 2003). In a systematic reviewed longitudinal population-based study on increased body mass index (BMI) and dementia by Gorospe and Dave (2007), they supported the hypothesis that increased BMI is independently associated with increased risk of dementia.

They further stated that the maintenance of normal weight throughout one's lifespan is a worthwhile intervention for the prevention of dementia, aside from the prevention of other established medical comorbidities. This study was supported by Ward et. al., (2005) that elevated BMI is associated with lesser brain volume in middle-aged adults who may already be experiencing differentially greater brain atrophy, and may potentially be at greater risk for future cognitive decline (Whitmer et. al., 2005); persons diagnosed as having dementia had significantly higher midlife BMI than those who maintained normal cognitive function (Kivipelto et. al., 2001).

In a related study, The Personnes Agees QUID (PAQUID) study by Nourhashémi et. al., (2003) subjects aged ≥ 65years with a BMI < 21 had an increased risk of developing

dementia as compared with subjects whose BMI was between 23 and 26 (odds ratio = 1.48, 95% CI = 1.08 to 2.04). However, a low BMI does not in itself seem to be a risk factor for dementia. Gustafson et. al., (2003) showed that BMI was, on average, 3.6 higher at the age of 70 years among women who developed Alzheimer disease 10 to 18 years later compared with those who did not develop dementia.

2.5 Epidemiology of Dementia

The prevalence of other common dementias including vascular dementia (VaD); the combination of AD and vascular dementia and dementia with Lewy bodies range from 15 percent to 20 percent (Kaufer et. al., 1996). It is estimated that 8 percent of people who are 65 years old suffer from the most common form of dementia, AD (Ritchie and Kildea, 1995). Bachman and associates (1993) observed that disease prevalence rises with age and at least 30 percent of people who are 85 years are afflicted with AD.

Among Canadians aged 65 years or older, AD accounts for almost two-third of prevalent cases of dementia (Canadian Study of Health and Aging, 1994). In Italian population-based cohort study by Ravaglia et. al., (2005) it was noted that the incidence rates per 1,000 person-years were 37.8 (95% CI = 30.0 to 47.7) for dementia, 23.8 (95% CI = 17.3 to 31.7) for AD, and 11.0 (95% CI = 7.2 to 16.9) for VaD. This translates into more than 400,000 new cases of dementia expected per year in Italy. In the United States alone an estimated 1.9 – 4 million persons are living with Alzheimer's disease, the most common type of dementia, (Health Education and Human Services Division, 1998).

A study conducted among residents aged 65 years and older in two communities: Yoruba living in Ibadan, Nigeria and African Americans in Indianapolis, Indiana to report on

prevalence study of dementia and Alzheimer's disease observed that prevalence rates of dementia (2.29%) and Alzheimer disease (1.41%) in Ibadan sample were significantly lower than an Indianapolis sample. In the community-dwelling subject in Indianapolis prevalence rates were 4.82 percent and 3.69 percent for dementia and Alzheimer disease respectively while in the combine nursing home and community sample prevalence rates were 8.24 percent and 6.24 percent respectively. These prevalent rates of dementia and AD were significant (Hendrie et. al., 2001). In a Nigeria community study, Ogunniyi et. al., (1997) reported that cognitive deficit commonly took the form of memory and judgment impairment while financial mismanagement was the most frequent impaired activity of daily living in more than half of the cases comprising mainly of Alzheimer's disease subjects.

2.6 Diagnosis

A definite diagnosis of dementia are especially challenging in its early stages, partly because of the difficulty in distinguishing it from the mild decline in memory that can occur with normal aging and from mild cognitive manifestations of other neuropsychiatric conditions such as depression (Ross et. al., 1997). Systematic studies indicate that the frequency of unrecognized memory impairment or dementia could range from 50 percent to 90 percent of cases (Ryan, 1994). Physicians detect dementia not apparent to patients or caregivers with family members not recognizing dementia symptoms in up to 53 percent of dementia cases during screening (Ross et. al., 1997). Therefore the need for accurate diagnosis has become more important now that several prescription medications for the treatment of mild to moderate AD are available.

However, it is becoming less tenable to take a watchful waiting approach to making diagnosis because more advanced AD may be less amenable to therapy, even a year delay in reaching a therapeutic decision may compromise care (Silverman et. al., 2002). Daniel et. al., (2002) stated that evaluation of dementia in patients with early symptoms decline is clinically challenging. The diagnosis of AD is primarily one of inclusion and usually can be made using standardized clinical criteria (Desai and Grossberg, 2005). Dementia may be diagnosed when a patient has two or more problems in brain function and may involve language, memory, perception, emotional behaviour or personality, and cognitive skills (such as calculation, abstract thinking, or judgment) with forgetfulness usually appearing first (Healthline, 2007).

2.7 Management

The goals of treatments in patients with AD have been to improve or at least slow the loss of memory and cognitive and to maintain independent function (Schmidt et. al., 1996; Healthline, 2007). Traditionally, cognitive problems have been the main focus of interest in treatment and research for people with dementia. There is a compelling need for therapies that prevent, defer the onset, slow the progression, or improve the symptoms of AD (Schmidt et. al., 1996).

Chemotherapy

Patients with AD often have cholinergic deficits in association with the disease (Ellis, 2005). Cholinergic deficits in VaD are due to ischemia of basal forebrain nuclei and of cholinergic pathways and can be treated with the use of the cholinesterase inhibitor (ChEIs) agents used in AD **(**Erkinjuntti et al., 2004). Cholinesterase inhibitors are the

drugs that have proven most effective for the primary treatment of Alzheimer's disease in which donepezil hydrochloride, galantamine hydrobromide, and rivastigmine tartrate are the current mainstays of symptomatic treatment for patients with mild to moderate AD (Kawas, 2003; Ellis, 2005). In clinical trials for all the three agents, beneficial effects on standard measures of cognitive and global function have been observed in patients with mild to moderate AD. Also several authors have reported efficacy of cholinesterase inhibitors for behavioral symptoms (Tariot, 2000; Clegg, 2001; Grutzendler and Morris, 2001) The choice between these three agents is largely based upon cost, individual patient tolerability, and physician experience, as efficacy appears to be similar (Trinh, 2003; Raina, 2008; Qaseem, 2008). Cholinesterase inhibitors are dosed in two phases for the treatment of dementia, an initial dose-escalation phase to achieve a therapeutic dose and a maintenance phase where the therapeutic dose is given for long-term therapy (Inglis, 2002). Inglis, 2002 reported range of side effects of Cholinesterase inhibitors such as gastrointestinal events (mostly nausea and vomiting). Other side effects associated with ChEIs include central nervous system events, extrapyramidal symptoms, sleep disturbances and cardiorespiratory events, associated with cholinergic activity in the cortex, caudate nucleus, brainstem and medulla, respectively, and muscle cramps and weakness, cardiorespiratory events and urinary incontinence, associated with peripheral cholinergic activity. These symptoms are mostly reported during the maintenance phase of therapy. The favourable tolerability and safety profiles of these agents make them suitable first-line therapy for dementia. (Inglis, 2002).

In managing the behavioural and psychological symptoms of dementia (BPSD), clinical guidelines and good clinical practice recommend that pharmacological interventions be

used only after other non pharmacological methods have been tried (Woods, 2004). Cholinesterase inhibitors are the drugs that have proven most effective for the primary treatment of Alzheimer's disease, and four- tacrine, donepezil, rivastigmine, and galantamine (Kawas, 2003). However, controlled clinical trials have shown that cholinesterase inhibitors can improve or delay decline in memory and other cognitive functions in AD patients (Raskind, 2000). Treatment with cholinesterase inhibitors can begin at any time after diagnosis, because their efficacy, though limited, is established for patients with mild or moderate disease (Mayeux and Sano, 1999). Knopman et. al., (1996) found that the use of cholinesterase can reduce the proportion of patients (more than half) requiring nursing home placement over a given period of time. Other cholinergic agents also had been found to have beneficial effects with respect to reducing behavioural problems, improving patients' functional abilities and decreasing caregiver burdens (Raskind, 2000). These drugs presumably act by increasing the availability of acetylcholine, the loss of which is the primary neurotransmitter deficit in Alzheimer's disease (Kawas, 2003).

Memantine, the other class of compounds commonly used to treat people with Alzheimer's disease, is a noncompetitive NMDA (N-methyl-D-aspartate) receptor antagonist, making it distinct from cholinesterase inhibitors, (Dementia Guide, 2010). Also and Sherriff (2003) found that there is a beneficial effect of memantine (20 mg/day) for patients with moderate to severe Alzheimer disease on cognition and functional decline but not in the clinical impression of change.

The use of antioxidants is another approach to treatment. Antioxidants presumably work by reducing free-radical production and oxidative injury to the brain (Kawas, 2003). A randomized, double-blind, two-year clinical trial involving 341 patients by Sano et. al., (1997) suggested that either vitamin E (alpha-tocopherol at a dose of 1000 IU twice a day) or selegiline (a selective monoamine oxidase inhibitor) was beneficial for patients with moderately severe Alzheimer's disease. They found out that anti-oxidant medications delayed the time to clinically meaningful end points, including institutionalization and deficits in activities of daily living, such as the ability to bathe and dress.

Hormonal therapies for AD have been the focus of research attention in recent years with estrogen replacement therapy observed to have shown cognitive benefits in healthy elderly women (Schmidt et. al., 1996). On the other hand, several large trials have failed to show that estrogen (alone or in combination with progesterone), offer benefit in the treatment of Alzheimer's disease (Henderson et. al., 2000; Mulnard et. al., 2000). Recently concluded works by Women's Health Memory Study observed that postmenopausal women receiving estrogen replacement therapy, either a combined estrogen/progesterone preparation or estrogen alone, showed evidence of deleterious cognitive effect and were more likely to develop dementia (Shumaker et. al., 2003; Schneider, 2004).

Yaffe et al (2002) found that testosterone can exert its effects on cognitive independently or indirectly via conversion to estrogen in male brain. Testosterone supplementation in placebo-controlled clinical trials of relative short duration (1 to 12 months) by Cherrier

and co-workers (2001) was reported to improve spatial cognitive and working memory. Harmen et. al., (2001) noted that male aging is associated with a gradual, progressive decline in serum levels of total testosterone, bioavailable testosterone and free testosterone. The gradual decline in testosterone level is associated with decreased muscle mass and strength, osteoporosis, decrease libido, mood alterations and change in cognitive and other conditions that may be reversed with testosterone replacement (Morley, 2000). However serious health consequences are reported with hormonal replacement therapy such as increased risk for deep venous thrombosis, hemorrhagic stroke among others (Hulley et. al., 2002; Wasserheil-Smoller et. al., 2003). Recently in 2006 the Agency for Health Care Research and Quality examined this issue and concluded that hormone replacement therapy was not proven to be beneficial for long-term cognitive function

The symptoms in virtually all patients with Alzheimer's disease extend beyond cognitive loss with depression occuring in 25 to 50 percent of patients, agitation in 50 to 70 percent, and psychotic symptoms such as paranoid delusions and hallucinations in 30 to 60 percent. Treatment of these symptoms can improve the quality of life for both the patient and the caregiver (Kawas, 2003). In randomized clinical trials, haloperidol and the atypical antipsychotic agents- risperidone and olanzapine, when compared with placebo, reduced the rates of agitation, delusions, and hallucinations by about 20 to 30 percent (Frenchman and Prince, 1997; Katz et. al., 1999).

Psychotherapy

It is obvious step to apply well established psychological therapies such as cognitive – behavioural therapy for depression (Scholey and Woods, 2003) and relaxation for anxiety (Suhr et. al., 1999) to people in the early stages of dementia when display such symptoms. Psychotherapy may be of some benefit in patients with dementia, some adaptation of the techniques is required because of cognitive loss in which involvement of carer is often necessary (Cheston, 1998). The effect of behavioural intervention was carried out by Teri and associates (1997) their patients were randomized to one of four reatment conditions: behaviour therap concentrating on pleasant events; behaviour therapy concentrating on problem solving; usual care; and a waiting list group (who received nothing). They found out that behavioural intervention significantly reduced depression not only in patients but also in their carers. Also, in randomized controlled trial by Hopman-Rock and associates (1999) to test the effects of the Psychomotor Activation Programme (PAP) on the behaviour and cognition of demented elderly people living in eleven different homes for the elderly in the Netherlands, it was observed that the experimental group improved in cognition and there was increase in positive group behaviour in participants with relatively mild cognitive problems.

Because cognitive impairment is frequently exacerbated by medications, Brookmeyer et. al., (1998) advised that medication should be used minimally with particular attention to the use of prescription sleeping pills, anti-anxiety medications and over-the-counter preparation for sleep and cold symptoms. They noted that patient with AD will typically become lost while driving before they have difficulty with the process of driving itself. Non-pharmacologic interventions for dementia include behavioural training, care giver

education and supportive services. This intervention may be directed at patients or their caregivers (Boustani et. al., 2003). Most recently, there has been increased attention on the development of new cognitive techniques to treat persons with progressive neurodegenerative conditions such as Alzheimer disease (Acevedo and Loewenstein, 2007).

There is a long tradition of psychological therapies for people with dementia but rarely have they been rigorously evaluated making it difficult for commissioners and providers to plan services from a solid evidence base, and also making it difficult to draw comparisons with pharmacological interventions (Orrell and Woods, 1996). Cognitive stimulation therapy (CST) for people with dementia was developed from the findings of two Cochraine reviews, incorporating aspects of psychological therapies found in scientifically rigorous trials to improve cognitive behaviour significantly (Spector et. al., 2001).

2.8 Exercise in the Management of Dementia

Regular exercise is a mainstay of preventive health care for individuals of all ages (Logsdon et. al., 2005). However, proven strategies to delay onset or reduce risk for dementing disorders would be greatly beneficial. (vanGelder et. al., 2004) found that even in old age, participation in activities with at least a medium-low intensity may postpone cognitive decline. Over the past decades there has been increasing focus on the influence of a number of lifestyle factors: including intellectual engagement, social interaction, nutrition and physical activity, on the cognitive vitality of older adults.

Regular exercise is a mainstay of preventive health care for individuals of all ages. Research with older adults has shown that exercise reduces risk of chronic illness, maintain mobility, enhance mood and even improve function (Logsdon et. al., 2005). They suggested that exercise programmes are particularly likely to improve health, mood and quality of life for individual with dementia. The physical and mental benefits of exercise are universally recognized but seldom available to persons with early to moderate stage dementia. Difficulty in initiating and maintaining purposeful behaviour, couple with the inability to travel independently preclude most community-dwelling dementia sufferers from accessing organized fitness programme (Arkin, 1999). Ebel (1992) listed therapeutic strategies in which the physical therapist can positively impact on Alzheimer patient care and reduce caregiver burden, whether the patient is at home or in an institution. This can be accomplished in part by:

1. Designing a daily exercise programme;
2. Making modifications to the environment to decrease sensory stress and facilitate autonomy;
3. Designing appropriate cues to help the patient with activities of daily living;
4. Evaluating home safety, equipment needs and falls prevention; and finally
5. Teaching safe transfers and bed-bound care.

Both prospective and retrospective human epidemiological studies have examined the influence of exercise and physical activity on cognition and dementia (Kramer et al, 2006). Kramer et. al., (2006) observed that the incidence rate of dementia was 13.0 per

1000 person – year for participants who exercised 3 or more times a week compared with 19.7 per 1000 person-year for those who exercised fewer than 3 times per week. The risk reduction associated with exercise was greater in those with lower performance level. They concluded that regular exercise is associated with delay in onset of dementia.

Colcombe and Kramer (2003) surveyed literatures that examined fitness training effects on the cognitive function of non-demented in older adults. The result was affirmative with moderate effect size (0.48) for fitness training obtained in the analysis. Fitness training broadly influenced a variety of cognitive processes, the largest positive effect were observed for executive control processes which include component of cognition such as planning, scheduling, working memory, inhibitory processes and multi-tasking. In a related study by Heyn and associates (2004) who conducted a meta-analysis to examine whether exercise is beneficial for people with dementia and related cognitive impairments. They noted that exercise has effect in a variety of physiological, behavioural and cognitive end point. Also a moderate effect size of 0.57 very similar to that observed by Colcomber and Kramer (2003) for non-demented older adults was obtained.

In a randomized controlled trial by Teri et. al., (2003) on exercise and behavioural management in patients with AD (Reducing Disability in Alzheimer Disease), they found out that exercise training for patients with AD combined with teaching of caregivers how to manage behavioural problems may help decrease the frailty and behavioural impairment that are often prevalent in patients with AD. They observed that at 3 months, patients in RDAD group had improved scores for physical role functioning compared

with worse score for patients in routine medical care group-RMC (mean difference 19.29; 95% CI, 8.75-29.85; P<0.01). At 2 yrs, RDAD group continued to have better physical role functioning scores than RMC (mean difference 10.89; 95% CI, 3.62-18.16; P=0.03) and showed a trend (19% vs 50%) for less institutionalization due to behavioural disturbance.

Rogers et. al., (1990) hypothesized several mechanisms which may potentially explain the protective effects of physical activity on cognitive function. They opined that physical activity is likely to sustain the brain vascular health by lowering blood pressure, improving lipoprotein profiles and promoting endothelial nitric oxide production. There is also evidence that exercise may improve aerobic capacity and cerebral nutrients supply (Ide and Secher, 2000). Experimental studies have demonstrated that physical exercise activity facilitate learning, increasing the expression of genes promoting neurogenesis and neural plasticity (Cotman and Engesser-Cesar, 2002).

2.9 Burden of Dementia on Caregivers

Dementia, a condition characterized by a global decline in cognitive functioning, is a major public health problem worldwide (Health, Education and Human Services Division, 1998). Caring for individuals with dementia is a major consideration in most developing countries that do not have the resources to provide comprehensive care in institutions (Ogunniyi et. al., 2005). Care giving for an elderly person with dementia is arguably one of the more difficult endeavors an individual will encounter, one that often has a negative influence on the caregiver including depression and physical health

problems (Crespo et. al., 2005). Serious mental and physical effects on the carers of patients suffering from AD have been well documented (Haley, 1997).

It is reported that disruptive behaviour (depression, agitation and irritability) is seen to have a more devastating impact on caregivers, as compared with cognitive problems (Donaldson et. al., 1998). Other disruptive behaviours such as sleep disturbances (i.e. night restlessness and wandering) also contribute to caregiver distress (Hope et. al., 2001) and are a predictor of institutionalization (Schur and Whitlatch, 2003). Depression occurs in up to 50 percent of carers and the physical effects include impaired immune function, raised plasma lipids and blood pressure, poor self-care and higher use of medication (Teri, 1994; Schulz et. al., 1995). Listed factors particularly associated with stress on carers include variety of psychiatric symptoms and behavioural disturbances such as depression, delusions, hallucination, aggressive and wandering are often predict family caregiver burden (Donalson et. al., 1998) and the breakdown of care at home (Schur and Whitlatch, 2003). Interventions that have tried specifically to reduce carer's burden in patients with AD emphasized the need for education and information which is greatly valued by carers (Haley et. al., 1992).

2.10 Economic Implication of dementia

Dementia exerts a huge toll on healthcare system and as mean-life expectancy continues to rise, the magnitude of this problem is growing (Small et. al., 1997). In a recent review of studies examining costs of care for AD, Bloom et. al., (2003) found health expenditure estimates ranging from $1,500 to $91,000 per case and $5.6 to $88.3 billion in total US costs. In the United States, more than $90 billion will be spent on AD related expense

each year (Ernst and Hay, 19944). Taylor et. al., (2004) predicted that federal expenditure for dementia is expected to triple by 2014. Also, 30 percent of the cost of caring for patients with AD is attributed directly to the management of neuropsychiatric symptoms (Berri et. al., 2002). In the United Kingdom, the economic cost of caring for people with dementia is immense totalling between £7-15 billion (Lowin et. al., 2001). The annual societal cost of dementia is approximately $100 billion –for health care and related cost as well as lost wages for patients and family caregivers (Arno, 1999).

2.11 Quality of life

Quality of Life involves the physical, psychological, and social domains of life (WHO, 2007) hence QoL has emerged as an important concept in dementia care over the past 2 decades for dementia care providers and researchers (Whitehouse, 2003) and important outcome measure in dementia care because it provides a broad measure of the daily experience for persons with dementia (Kwasky, 2010). Kwasky (2010) identified the 5 concepts most often related to QoL for PWD and explored the nature of the relationships. These concepts are cognitive function, emotional states, activity of daily living, communication, and caregiver/patient perception. Korczyn and Davidson (1999) defined quality of life as a self perceived conceptualization on the part of the individual, based on his or her assessment of their well-being. Logsdon et al (2002) observed that this definition assume that individuals have the intellectual capacity to make subjective judgments about their life. Rabins and associates (1999) noted that many questions have been raised about the ability of persons with dementia to make such judgment and about

the point at which they become unable to do so. Therefore, quality of life (QoL) in patients diagnosed with dementia is of critical importance (Logsdon et. al., 2002).

Reliable and valid measurement of patient's QoL is essential to evaluate the effectiveness of treatment intervention and to gain a better understanding (Logsdon et. al., 2002). Methods of assessment of QoL in patients with dementia include self-reports by the individual with dementia (Brod et. al., 1999), proxy reports by a family member or caregiver (Albert et. al., 1999) and direct observation of behaviour assumed to be related to QoL (Lawton et. al., 1999).

Self-report directly involves the individual in the assessment, taking into account his or her subjective experience and place value on the perspective the person who has the most to gain or lose from treatment. This respect for the autonomy of the individual is very important from clinical and ethical point of view. Comprehension of questions and selection of appropriate responses can be facilitated by the use of explicit instructions, face to face administration by a trained interviewer, and use of visual cues to remind the respondent of the response options (Logsdon et. al., 2002). Trigg et. al., (2007) observed that cognitive limitation and lack of insight have been seen as barrier to self – reporting in QoL assessment of people with dementia.

Proxy reports (reports of close relative or caregiver of the affected person) circumvent the cognitive limitations that are problematic for the person with dementia ((Logsdon et. al., 2002). Investigations on both cognitively intact and cognitively impaired individuals by Sainfort et. al., (1996) found that proxies consistently rate QoL lower than do the affected individuals themselves. This proxy rating may be influenced by the proxy's own

expectations and belief system, the prior relationship with the person rated, and current levels of depression or burden (Logsdon et. al., 1999). Direct observation of behaviour has the advantage of being more 'objective' in that ratings can be based on predefined behaviours and consistently rated over time. The limitation of this approach includes uncertainty about whether what is being observed is what the individual considers to be important to his or her QoL (Logsdon et. al., 1999).

2.12 Dementia quality of life instrument (DQoL)

Dementia quality of life (DQoL) instrument was designed to assess QoL by direct interview with dementia patients. The scale is unique because it is the only scale developed exclusively to be administered to patients. It was observed that 96 percent of the participants were able to respond to questions appropriately, thus suggesting that person with mild to moderate dementia can be considered good informant of their own subjective states, paving the way to consider patient responses rather than proxy measures as the gold standard for assessing QoL for persons with dementia. Dementia Quality of Life (DQoL) is appropriate for use with patients in the mild to moderate stages of dementia because it relies solely on patient-input (Brod et. al., 1999).

It is a 29-item scale and one global item ("overall, how would you rate your quality of life") that measures 5 domains of QoL: Positive Affect (6 Items); Negative Affect (11 Items); Feelings of Belonging (3 Items); Self Esteem (4-Items) and Sense of Aesthetic (5 Items). The instrument takes appropriately 10 minutes to administer. The DQoL yields score on 5 sub-scales but subscale scores are not summed to reach an overall or global measure of QoL. Item – stems were made as simple as possible and a 5 point scale is

used to present multiple choice response choices to patients. Screening questions ensure that patients understand questionnaire instructions and the response format for the scale (Brod et. al., 1999).

Internal consistency reliabilities for subscales were moderate to high (0.67 – 0.89). Two-week test retest reliability for a subset has also to be found to range from 0.64 to 0.90. Convergent validity was indicated by correlation with scores on the Geriatric Depression Scale and for DQoL subscales to be r = - 0.48 (self-esteem), - 0.61(positive affect), - 0.64 (absence of negative affect), - 0.42 (feelings of belonging) (Brod et. al., 1999).

2.13 "Time up and go" test (TUG) for measuring Mobility

The time Up and Go (TUG) test was introduced in 1991 by Podsiadlo and Richardson as a modification of the Get up and Go test of Mathias et. al., (1986). The TUG is a general physical performance test used to assess mobility, balance and locomotor performance in elderly people with balance disturbances. It also assesses the ability to perform sequential motor tasks relative to walking and turning. It incorporates time as the measuring component to assess general balance and function (Schoppen et. al., 1999)

The TUG has been shown to have validity by virtue of its correlation with measure such as the Berg Balance scale (Freter and Fruchter, 2000), gait speed (Bennie et. al., 2003), stair climbing (Hughes et. al., 1998) and functional indexes (Podsiadlo and Richardson, 1991). The test has the ability to discriminate between patients on the basis of residential status (Bishoff et. al., 2003); falls (Shumway-cook et. al., 2000) and mortality (Nikolaus et. al., 1996). The procedure requires documenting the time in seconds that subjects

required to "rise from a standard arm chair, walk to a line on the floor 3 meters away, turn, return and sit down again" (Mathias et. al., 1986).

Participants who took less than 20 seconds to complete the test were independently mobile of basic transfers such as tub or shower transfer, climb stairs or go outside alone. In comparison of those who took 30 seconds or more were dependent on help for basis transfers and none could go out alone (Podsiadlo and Richardson, 1991). Hacker and Mollinger (2002) reported that on average, healthy individuals between the ages of 60-80 years complete the TUG in 10 seconds or less while men and women between the ages of 80-89 years old take on average of 10 ± 1 and 11 ± 3 seconds respectively to complete. A cut-off point score of ≥ 13.5 seconds has been shown to predict falling in community dwelling frail elders but yet to be verified by other studies (Shumway-cook et. al., 2000).

Rockwood et. al., (2000) examined the test-retest reliability of TUG as part of the Canadian study of Health and Aging to be adequate. They also reported test-retest reliability for all participants (ICC = 0.56); for individual without cognitive impairment alone (ICC = 0.50); and for those with cognitive alone (ICC = 0.56). The result of this study is substantially lower than the results of Bohanon and Schaubert (2005) and Podsiadlo and Richardson (1991) who recorded 0.80 and 0.99 respectively when examining the test retest reliability of the TUG in elderly and frail individuals. They suggested that this may be due to the fact that unlike other similar studies, they did not exclude medically instable patients and further did not control for certain factors (e.g settings in which the TUG was re-administered) in their study.

2.14 Community screening instrument for dementia (CSID)

Community Screening Instrument for Dementia (CSID) is prepared by 10/66 – dementia research group containing 25 items. Group of researchers 10/66 who have come together to try to encouraging active collaboration between research group in different developing countries and between developed and developing countries in the field of dementia. It is affiliated to Alzheimer Disease International (Alzheimer and Related Disorders Society of India, 2003).

The Community Screening Interview for Dementia (CSID) was developed as a screening instrument for dementia for use in cross-cultural studies. It consists of two components, a cognitive test for non-literate and literate populations, and an informant interview regarding performance in everyday living. The adaptability and utility of the CSID in populations from very different socioeconomic backgrounds has been demonstrated (Hall et. al., 2000).

The CSID Korean version of CSID is a reliable screening instrument for dementia, irrespective of educational level and cultural differences among various populations (Kim et al, 2004). They also observed that CSID-Korean version was reliable and valid instrument to screen dementia in Korean Community and concluded that it could be used not only in community setting but also in clinical settings and for cross-cultural researches. The internal consistency, interrater reliability and test-retest reliability of the Taiwanese version were found to be good. The CSID was highly correlated with scores on the Mini-Mental State Examination (MMSE) and was a good instrument in

differentiating dementia from depression and normal subjects with low education (Liu et. al., 2005).

2.15 Physical fitness

Physical fitness is a dynamic state of energy and vitality that enables one to carry out daily tasks, to engage in active leisure-time pursuits, and to meet unforeseen emergencies without undue fatigue (Cooper Institute, 2001). It has also been defined as the general capacity to adapt and respond favourably to physical effort. It is characterized by (1) an ability to perform daily activity with vigour, and (2) a demonstration of traits and capacities that are associated with low risk of premature development of hypokinetic disease e.g. those associated with physical inactivity (Wilder et. al., 2006.)

Physical fitness is often divided into two different components: health related and performance or motor related components (Cooper Institute, 2001): Performance-related physical fitness refers to an optimal work or sport performance which consist of speed, power, balance coordination, agility and reaction time whereas health-related physical fitness refers to an ability to successfully carry out daily tasks and to maintain good health which also comprise cardio respiratory endurance, muscular endurance, flexibility and body composition. Both health-related and performance-related fitness can be improved by regular physical activity (Anspaugh, 1997).

Cardiorespiratory fitness

Cardiorespiratory fitness is the most important component of physical fitness and has almost become synchronous with it. It refers primarily to the capacity of heart and lungs to deliver oxygen to skeletal muscles, and maximal aerobic power is an indicator of the

maximal capacity of oxygen delivery. Individuals with a high maximal aerobic power can undertake demanding physical task without suffering fatigue (Sparks and Todd, 1997). According to Fahley et. al., (1999) cardio-respiratory fitness is measured by maximal oxygen consumption expressed as VO_2 max. These exact measurements which are influence by factors such as age, gender, heredity, inactivity and disease are taken in laboratories (direct). However, indirect assessment may include utilizing the 1.5mile walk/run test, 12 minutes walk test, 880 yards walk test, 6 minute walk test, the 3 minute step test or the Astrand-Rhyming bicycle ergometer test (Kisner and Colby, 1996: Fahley et. al., (1999).

To become physically fit, individual must participate regularly in some form of physical activity that uses large muscles groups and challenge the cardio respiratory systems. Such activities involve more than two minutes of continuous efforts (Hoffman and Collingwood, 1995: Kisner and Colby, 1996). Factors affecting cardio respiratory endurance are type of training activity involve, frequency of participation, duration of total fitness programme and initial level of cardio respiratory fitness.

Six Minutes Walking Test (6MWT)

There are several modalities available for the objective evaluation of functional exercise capacity. The most popular clinical exercise tests in order of increasing complexity are stair climbing, a 6MWT, a shuttle-walk test, detection of exercise-induced asthma, a cardiac stress test (e.g., Bruce protocol), and a cardiopulmonary exercise test(Wasserman,et.al., 1999). The ease of performing a 6-minute walk test (6MWT) falls between stair climbing and testing for exercise-induced asthma (Enright, 2003).

Walking tests are more reliable than other performance-based measures in elderly persons, such as timed chair stands and weight lifting which is a quick and inexpensive performance-based measure, and an important component of quality of life, since it reflects the capacity to undertake day-to-day activities or, conversely, functional limitation (Jette, 1999). In an attempt to accommodate patients with respiratory disease for whom walking 12 minutes was too exhausting, a 6-minute walk was found to perform as well as the 12-minute walk therefore the 12-min exercise test has been modified and shortened to a 6-min walking test.

The 6MWT exercise procedure has been used extensively in patients with cardiovascular or pulmonary disease, elderly, frail, and severely limited patients who cannot be tested using standard (and more expensive) maximal cycle ergometry or treadmill exercise tests (Peeters and Mets, 1996 : Cooper and Store 2001; Troosters et. al., 2002). Enright (2003) also reported that most community-dwelling elderly persons can quickly and safely perform this functional status test in the outpatient clinic setting and may be used clinically to measure the impact of multiple comorbidities, including cardiovascular disease, lung disease, arthritis, diabetes, and cognitive dysfunction and depression, on exercise capacity and endurance in older adults. It is easier to administer, better tolerated, and better reflects activities of daily living than other walk tests (Solway et. al., 2001).

The self-paced 6MWT assesses the submaximal level of functional capacity. Most patients do not achieve maximal exercise capacity during the 6MWT; instead, they choose their own intensity of exercise and are allowed to stop and rest during the test. However, because most activities of daily living are performed at submaximal levels of

exertion, the 6MWD may better reflect the functional exercise level for daily physical activities (Steffen et. al., 2002; McNamara et. al., 2003). The 6-min walking test gives only a rough estimate of the general functional status of the patients (Reybrouck, 2003).

The 6MWT has been validated by high correlation with workloads, heart rate, oxygen saturation, and dyspnea responses when compared to standard bicycle ergometry and treadmill exercise tests in middle-aged adults 30–32 and in elderly persons (Peeters and Mets, 1996; Montgomery and Gardner, 1998). McNamara and associates (2003) reported a significant correlation (r=0.73) between 6MWD and peak oxygen uptake for patients with end-stage lung diseases. A problem for clinical application is the paucity of normal reference data across different age and gender groups that are available to use as reference values for clinical evaluation (Steffen et. al., 2002).

2.16 Principles of exercise training

Intensity

Intensity is described as the amount of energy needed to perform a particular exercise or activity which is expressed as a percentage of maximal heart rate or heart rate reserve (Fitness-fact, 2011) and is displayed in heart beats per minute (Fitness-fact, 2011). The intensity of aerobic training can be measured by heart rate (sport-fitness-advisor, 2011). For resistance training, intensity usually refers to a percentage of the person's repetition maximum (RM). The repetition maximum figure represents the greatest amount of weight that can be lifted in good form for a specific exercise and a specific number of times (Fitness-fact, 2011).

It has suggested that moderate intensity exercise is ideal between 60%- 80% of maximum heart rate for individuals and circumstances (Stress Management for Health Course, 2011). Most anti-aging experts are in agreement that one's maximum heart rate between 60% and 80% is a good and reliable index of intensity. Your maximum heart rate is calculated simply by the following formula: 220 less your age (Lam, 2011).

Duration

Duration refers to the total time an exercise session or activity is conducted. For aerobic training, duration is usually expressed in terms of minutes. For resistance training, duration refers to either the time of a single contraction. Duration can also be used to represent the length of a single resistance training session (Fitness-fact, 2011). Fifteen to fifty minutes of continuous or discontinuous aerobic activity is the minimal required for health and fitness (Lam, 2011). For flexibility training, duration is represented by both the time of the hold on an individual stretch or the total time of the stretching workout itself. The individual stretches are expressed in terms of seconds while the workouts are usually associated with minutes (Fitness-fact, 2011).

Frequency

The frequency of exercise is a balance between providing just enough stress for the body to adapt to and allowing enough time for healing and adaptation to occur (sport-fitness-advisor, 2011). Frequency represents the number of training sessions per week irrespective of type of training - aerobic, resistance or flexibility training. It is expressed in terms of times per day or days per week (Fitness-fact, 2011). Three to five times a week of aerobic activities has been considered by most sports experts to be appropriate

for individuals. The aerobic exercise could be further broken down into smaller blocks of ten minutes each without sacrificing anti-aging effect (Lam, 2011). It is reported that little or no benefit is attained over and above this amount during aerobic training. (sport-fitness-advisor, 2011).

Progressive Overload

To promote continued fitness gains, one must consistently subject the body and its respective systems to progressively greater workloads. This progressive overload can be in terms of longer durations of training, increased intensity levels, greater amounts of resistance, increased frequency of training, or a combination of one or more of these variables. Progression to higher intensities of exercise should be based on individual exercise tolerance (Cleveland Clinic, 2011). Cleveland Clinic (2011) highlighted methods of progression for challenging aerobic fitness. Among are increase the speed, increase the resistance and increase the duration. Either of these methods or a combination will improve aerobic fitness.

Adaptation

There is need for the body and its respective systems to progressively subjected to greater workloads to promote fitness gains. This progressive overload can be in terms of longer durations of training, increased intensity levels, greater amounts of resistance, increased frequency of training, or a combination of one or more of these variables (Fitness-fact, 2011). It is generally recommended to progressively increase the intensity effect by approximately 5-10% per month (Lam, 2011).

2.17 Table 1: Summary of previous studies on dementia and exercise

Authors	Participants/ Setting	Programme	Measures	Outcome
Teri et al. 2003	Community-dwelling AD Patients 76 intervention 77 control	Intervention: Aerobic/endurance activities, strength, balance and flexibility training for three months, duration of 30 min a day, by caregivers Control: Routine medical care	Physical function measures Mood questionnaires	↑ physical function ↑ mood
Hopman-Rock et al. 1999	Nursing home residents 45 intervention 47 control	Intervention: Twice weekly Psychomotor activation (PAP) for 45mins during 6 months by behaviour in activity leaders. PAP consists of sporting activities, games and hobby activities to stimulate both cognitive and psychosocial function Control: usual activities	Behavioural questionnaires	↑positive group those with mild problems
MacRae et al. 1996	Nursing home residents 19 intervention 12 control	Intervention: five days a week walking programme for 12 weeks, increasing duration by 10% each week (from 14.5 to 22 min), by a research assistant Control: Weekly social visits for 22 weeks, by a research assistant	Walk endurance capacity; Physical activity level; Mobility measures; Quality of life questionnaires.	↑walking endurance capacity; No significant change in other measures; Slight ↑feelings of depression.

Schnelle et al 1995	Nursing home Residents 36 intervention 40 control	Intervention: Mean of 13 min of daily walking or wheeling exercises and sit to stands, next to a behavioural intervention consisting of extra incontinence care, verbal interaction and one to two stands and one transfer if toileted, for eight weeks, by research staff Control: The same behavioural intervention for a mean of eight min, for eight weeks, by research staff	Physical activity measures; Frequency of agitation; Test administration not blinded.	↑ physical activity and mobility endurance; ↓ agitation in both groups
Alessi et al 1995	Nursing home residents 33 intervention 32 control,	Intervention: Sit-to-stand repetitions/transferring and walking/wheelchair propulsion for five min every two hours for five days a week, by research personnel Control: Rowing and walking/wheelchair propulsion for 30 min three times a week for nine weeks	Physical function measures Daytime observations Sleep monitors	↑ mobility endurance No change in sleep measures
Meulemaan et al. 2000	Nursing home residents 26 intervention 32 control	Intervention: Three-times-a-week resistance training and two-times-a-week endurance training for four to eight weeks, by a physical therapist and aide	Strength and endurance measures Functional ability (ADL measure)	↑strength ↑functional ability in those most dysfunctional at baseline

		Endurance training increased from an initial 10 min to 30 min Control: No study-provided intervention		
Cott et al. 2002	Nursing home residents with AD 30 intervention 19 control	Intervention: Walking and talking in pairs for 30 min five days a week for 16 weeks, by a research assistant Social visit control: Conversation while sitting in pairs, in the same frequency, by research assistant Control: No study-provided intervention	Communication measures; Ambulation; Functional status (mental disorganization or confusion, physical disability, socially irritating behaviour disengagement.	No change in Communication ↑Ambulation and functional status.

CHAPTER THREE

MATERIALS AND METHODS

3.1. Participants

Participants for this study were individuals with mild to moderate dementia as diagnosed by Neurologists and recruited at Dementia Research Project Clinic, University College Hospital, Ibadan. The participants were 85 consenting individuals within age range of 65 and 90 years who had also met other inclusion criteria of this study.

Inclusion Criteria

The following categories of participants with dementia were included in this study:

1. Participants diagnosed and certified fit for the study by the neurologist.
2. Participants who attended Dementia Research Project Clinic, University College Hospital, Ibadan.
3. Participants diagnosed as having mild to moderate dementia using Clinical Rating Scale 1-2 (Morris, 1993).
4. Participants who were not engaged in any other form of exercise training during the course of the study.
5. Participants who communicated in either English and or Yoruba language.

3.2 Materials

The following instruments were used for data collection.

1. Height-meter (Prestige, India; serial no- 110009): This was used to measure the height of participants in meters. It was calibrated from 0-200cm and was recorded to the nearest 0.01m.
2. Weighing scale (Prestige, Indian; serial no- 110009): A portable weighing scale was used to measure the body weight of the participants and was read to the nearest kilogramme. It was calibrated in kilogramme with a range of 0-120kg.
3. Sphygmomanometer (Accoson, England; serial no- 0121): A mercury-in-glass sphygmomanometer was used to measure arterial blood pressure in mmHg. It has a range of 0-300 mmHg.
4. Stethoscope (Littman's model, USA; serial no- 38-90173353-5): This was used in conjunction with sphygmomanometer to measure blood pressure.
5. Stop watch (Digital Sport-time, China): This was used to time pulse rate measurement, duration of exercise and other timing in the study. It was calibrated in seconds.
6. Exercise Mats: These were used in exercise stations where non-weight bearing exercises were performed.
7. Chair: A chair (45cm high) with a back support and arm rest was used during the Time "Up and Go" test (TUG) to measure mobility (Podsiadlo and Richardson, 1991).
8. Community Screening Instrument in Dementia: This was used to score cognition of participants with dementia (Hall et. al., 2000) (Appendix II).

9. Dementia Quality of Life Instrument: This was used to measure the health related quality of life in participants with dementia (Brod et. al., 1999). (Appendix III).

10. Tape measure (Butterfly brand, China): It was used to measure waist and hip circumference, and distance for the TUG test.

11. Cone: A brightly coloured cone was used to mark off the end of turning point of the 3- meter path (Steffen et. al., 2002).

12. Cassette and CDs: This comprised of contemporary music which was used to provide aerobic exercise music and dictated the rhythm of the exercise. The music introduced a stimulating and exciting exercise environment and enhanced body movement in the course of exercise.

13. Staircase: This is a stair wooden frame with four steps of about 18, 14, 13 and 11cm high each on the ascent side and three steps of 21, 16 and 20cm high each on the decent side. It is 57cm high and its gradient on ascent and decent sides are 0.71 and 1.04 respectively. All steps are 50cm wide with rails on both sides. Participants climbed this during sessions of endurance exercise.

3.3 Methods

3.3.1 Research Design

The study was a quasi-experimental design with pretest, intervention and posttest. Participants were consecutively recruited into 2 groups *viz*. Group 1 (Experimental Group) and Group 2 (Control Group) until participants had been recruited. The first participant was assigned into either of the groups by toss of a coin, where head stood for

group one and tail for group two. The first participant went to group 1 while the next was assigned to group 2 based on the outcome of the toss of the coin. Consequent participants were alternately assigned to group one or two as they became available and informed consent to participate in the study was obtained from each of them.

3.3.2. Sample Size and Sampling Technique

Consecutive sampling technique was used to recruit participants in exercise and control group each from Dementia Research Project Clinic, University College Hospital, Ibadan. Participants were patients attending the centre for treatment of dementia.

The sample size was determined as follows:

$N = Z\alpha\ pq/d^2$ (Bamgboye, 2008)

$=1.96 \times 0.0229 \times 0.9771 / 0.06 \times 0.06$

$=24$

=24 per group

N= minimum of sample size

Zα = 1.96 at 95% Confidence Interval

p = proportion / prevalence of dementia cases (2.29% or 0.0229- Hendrie et al, 1995)

q = 0.9771 (p+q=1)

d = 0.06 (observe difference)

Experimental/Exercise Group:

This group received both prescribed pharmacological therapy and endurance exercise training during the 12 weeks of the study. The measurements for the participants' parameter were taken at the baseline and repeated at 4^{th}, 8^{th} and 12^{th} week.

Control Group:

The participants in this group received only the prescribed pharmacological therapy for a period of twelve weeks without exercise training. The baseline measurements for the participant's parameters measured were taken at the baseline and repeated monthly till the end of the study.

3.3.3 Procedure for Data Collection

Ethical approval was sought and obtained from the Joint University of Ibadan/University College Hospital (UI/UCH) Ethical Review Committee (ERC) before commencing the study. The objective and procedure of the study were explained to each of the participants. All instructions and explanations pertaining to the study were given before the commencement of the study. Such information includes diet, mode of dressing during exercise and completion of questionnaires. Informed consent of the participant and close relative was sought and obtained (Appendix I). A brief medical history of each participant was obtained and followed by objective assessment in order to ascertain that the participant met the inclusion criteria for the study. The following biodata of each participant were taken: sex, age (Ogunniyi and Osuntokun, 1993), height and weight (Osness et. al., 1996), blood pressure and pulse rate. Some of the outcome measured

blinded were Community Screening Instrument for Dementia, Quality of life and Cardiorespiratory fitness test.

1. ***Height***: The participant was asked to stand with his back against the height meter, barefooted, knee straight and the hands by the side. The horizontal projection from the scale was brought in contact with light pressure on the vertex of the head of the participant. Height measurement was taken as the distance between the vertex and the heels and was recorded to the nearest 0.1 cm (Osness et. al., 1996).
2. ***Weight***: The participant was in light apparel without shoes and stood on the weighing scale looking straight ahead with hands by the sides. The weight was read off on the scale and recorded to the nearest kilogramme (Osness et. al., 1996).
3. ***Blood Pressure***: Participant sat with the arm in horizontal-supported position at the heart level. The cuff of the sphygmomanometer was wrapped on subject's left arm with lower boarder not less than 2.5cm above the cubital fossa while the diaphragm of the stethoscope was placed over the brachial artery in the antecubital fossa. The cuff was rapidly inflated until the pressure was 180mmHg in the brachial artery. The pressure was then lowered by 5mmHg at a time until the first Korotkoff sound (systolic pressure) suddenly became faint (diastolic pressure) (Ganong, 1997)
4. ***Pulse Rate***: Participant sat with the forearm pronated and wrist slightly flexed and rested for five minutes. After which the radial pulse was felt with tips of the fingers against the vessel at the lower end of the radius. The beat was counted for

30 seconds and was multiplied by two to obtain the number of pulse per minute (Ganong, 1997).

5. ***Respiratory Rate***: Thoracic excursion during breathing of the participant was taken per minute. Number of breath was counted within 30 seconds which was then multiplied by a factor of two to obtain the respiratory rate for the full minute. It was recorded in breath/minute (Ganong, 1997).

6. ***Community Screening Instrument for Dementia***: The Community Screening Instrument for Dementia (CSID) is a 42-item instrument bilingual assessment questionnaire administered to participants. This was read out to participants who answered verbally and demonstrated actions as required. The completion of the questionnaire was done in the order the items appeared in the questionnaire. Scoring was done by summing all the scores recorded for the participants; thus the higher the scores, the better the cognition (Hall et. al., 2000).

7. ***Quality of life in Dementia***: This was assessed using Dementia Quality of Life by Brods et. al., (1999). It is a patient administered 29-item questionnaire in English language and was translated to Yoruba by a Yoruba language expert at Tai Solarin University of Education, Ijebu- Ode. Back-translation was also done by another language expert in the same institution. Participants were asked to respond to questions about his or her life. Participants were instructed to choose answer verbally from one of 5-point response set scales as spelt out by the researcher. Participants' scores for each of the subscale was computed by summing the scores of participants' responses to the items that comprise the subscale. Scoring was reversed for the items in the third domain (Negative Affect)

as thus 5 to 1, 4 to 2, 3 to 3, 4 to 2 and 1 to 5 in order to sum up all the scores in Dementia Quality of Life questionnaire (Owolabi, 2010) as higher scores indicate better performance. It has internal consistency for subscales were moderate to high (0.67- 0.89). Convergent validity with scores on the Geriatric Depression Scale and for DQoL subscales were - 0.48 (self-esteem), - 0.61 (positive affect), -0.64 (absence of negative affect), -0.42 (feelings of belonging).

8. ***Mobility***: This was assessed using Time Up and Go Test (Podsiadlo and Richardson, 1991). Participants were in sitting position (back supported) with the arms on the arm-rest of the chair. Participants stood up from the chair, walked a distance of 3 metres, turned around, walked back to the chair and sat down. This was performed as quickly as possible. One practice trial was permitted to the individual to familiarise the participants with the task. Timing commenced with the verbal instruction "go" and "stop" when the participant returned to seated position. The participants wore their regular footwear. No physical assistance was given during the task. The score was the time taken to complete the test activity in seconds (Podsiadlo and Richardson, 1991).

9. ***Hip Circumference***: Participant stood with the feet together, the maximum girth around the buttock at the trochanteric level was measured using a tape measure and recorded to the nearest 0.1 cm (McArdle et. al., 2000).

10. ***Waist Circumference***: Participant was asked to be in standing position with the feet together. The minimum girth around the waist, which in some subjects corresponded to the abdominal girth, was measured with the aid of a tape measure to the nearest 0.1 cm (McArdle et. al., 2000).

11. ***Body Mass Index (BMI)***: This represents the ratio of body weight to height squared.

BMI = Wt (kg)/ Ht^2 (m) (Calle et. al., 1999)

12. ***Cardiorespiratory fitness test***: This was conducted using the 6 Minute Walk Test (6MWT). The participant wore a comfortable clothing and footwear, sat on a chair located near the starting position for at least 10 minutes before the test started. The participant walked a course of 18 meters in length at his/her own pace and independent of others as fast as he/she feels comfortable. The turnaround points were marked with a cone (orange traffic cone) by the researcher. On the signal 'Ready, Go' the participant began at the designated spot and walked the necessary laps until the participant completed the 6MWT. The distance covered was recorded at the completion of 6MWT. A single trial was allowed (ATS Statement: Guidelines for the Six-Minute Walk Test, 2002).

3.3.4 Exercise Training Procedure

Participants were asked to wear a light vest and a pair of canvas shoes to allow for ease of movement during the exercise training.

I. Warm up session was a brief period of slow paced exercise between five to seven minutes that preceded endurance exercise with aerobic music. This included head rotation, shoulder and arm circles, waist bend and twist, and alternate leg stretch in standing (Powers and Dodd, 1999).

II. Exercise Training

This included exercise training to the upper and lower limbs and trunk arranged in a circuit of 7 stations as follows:

Station 1 –Upper limbs: Repeated flexion and extension of shoulder, elbow & wrist joints (3mins).

Station 2 – Trunk; Stride standing- Pelvis and trunk rotation/sagital Movement (3mins).

Station 3 – Double knee to chest in supine lying (3mins).

Station 4 – Supine Lying – alternate straight leg raising (3mins).

Station 5 – Free – cycling in the air in lying (3mins).

Station 6 - Brisk walking and changing direction to avoid obstacles (3mins).

Station 7 – Stair Climbing (3mins).

Each participant spent 3 minutes in each station. A total of twenty-one minutes was spent as the duration of the endurance exercise in all the stations with interval of one minute rest between the stations. The tempo of exercise was self-paced within the rhythm provided by the music. The participants worked at intensity of 65 percent HRR at the beginning of the study (Prentice, 1999) and progressed monthly. Progression in exercise training was done by increasing the duration of exercise training to four minutes after four weeks (Prentice, 1999).

III. Cool Down

This was the period of slow walking/free dancing to the background music for about 5 minutes following the main exercise training session.

1V. Duration of Study

The endurance exercise training was carried out 3 times weekly (Powers and Dodd, 1999) on alternate days for twelve consecutive weeks.

3.3.5 Venue

The study was carried out at Ile-Adebisi, Idi-Ikan, Ibadan.

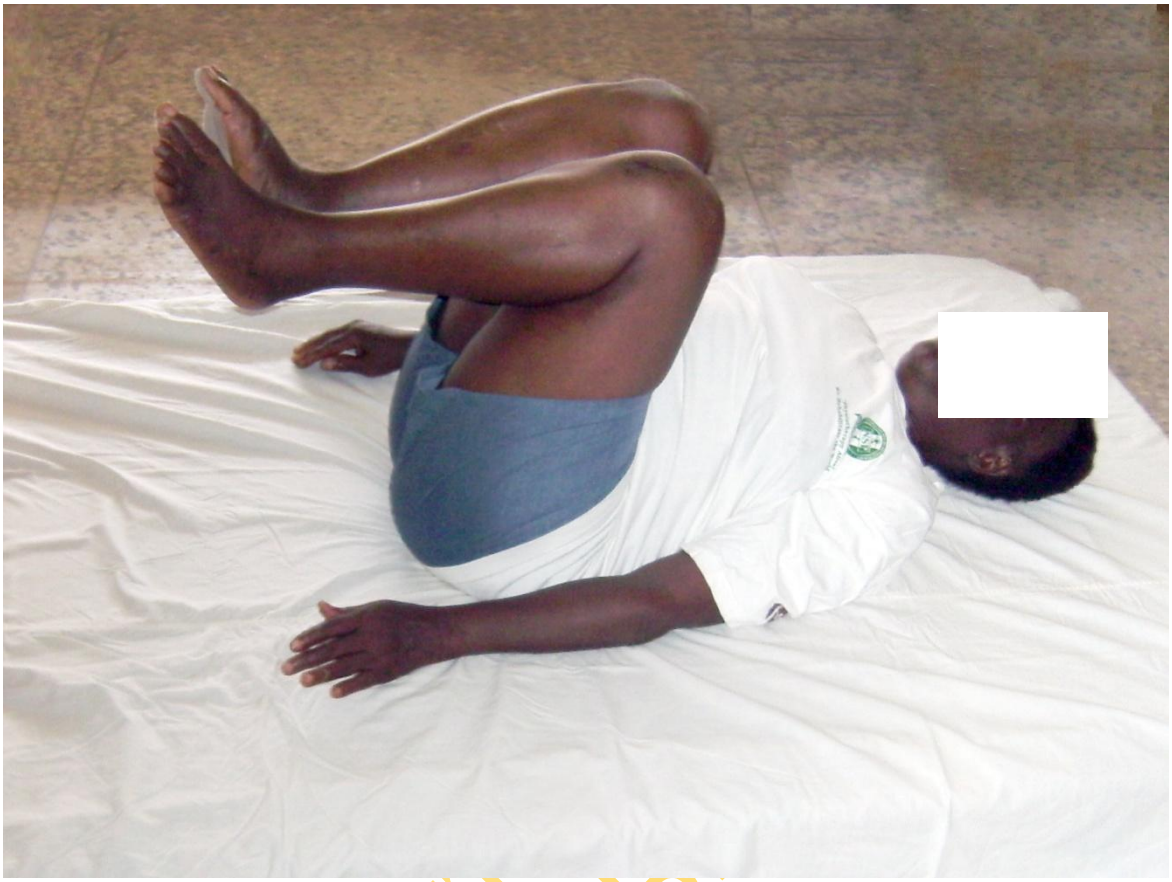

PLATE 1: Participant undergoing free – cycling in the air in lying.

PLATE 2: Participant undergoing alternate straight leg raising.

PLATE 3: Participant undergoing repeated flexion and extension of shoulder, elbow & wrist joints.

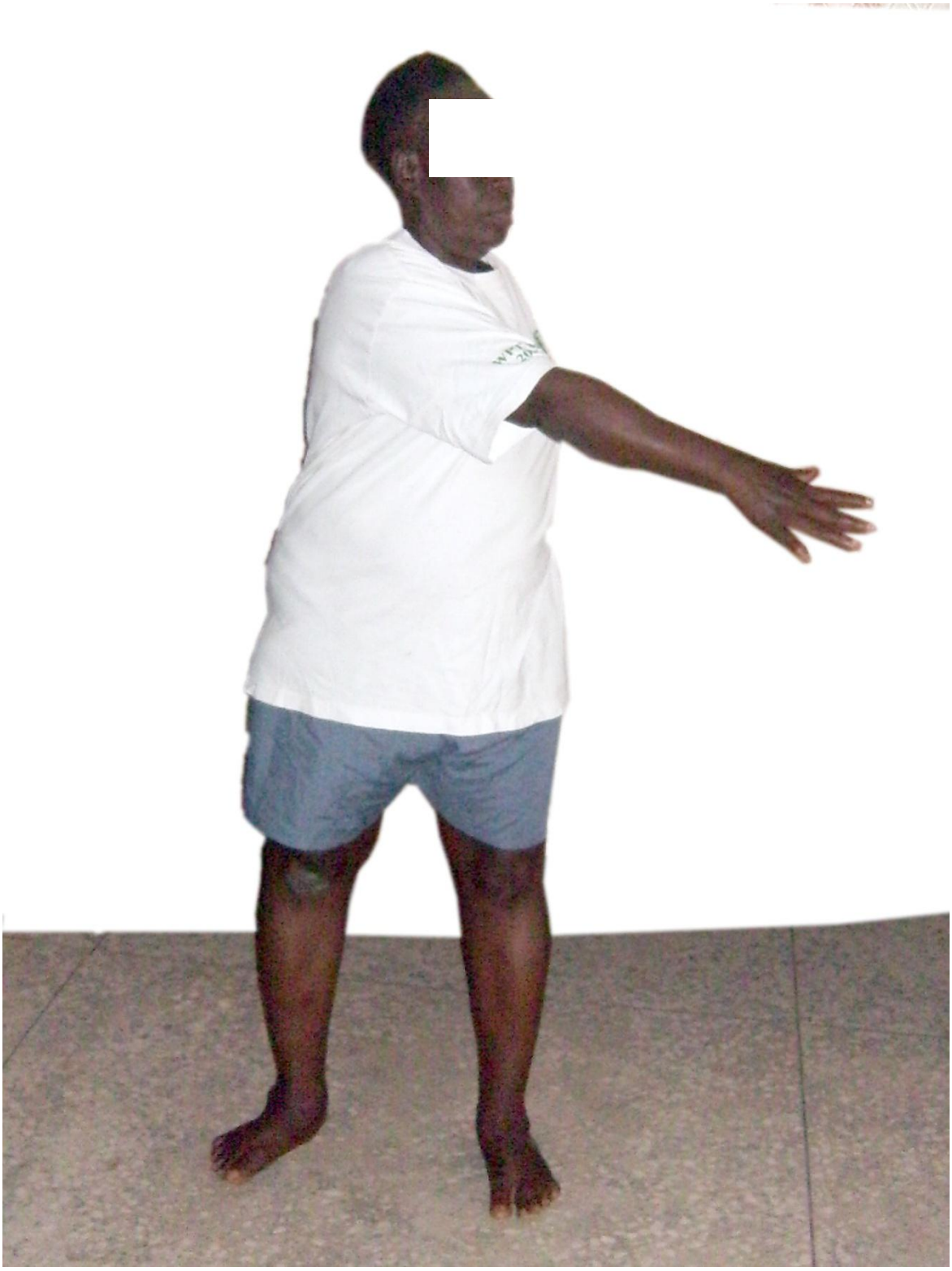

PLATE 4: Participant undergoing stride standing- Pelvis and trunk rotation/sagital.

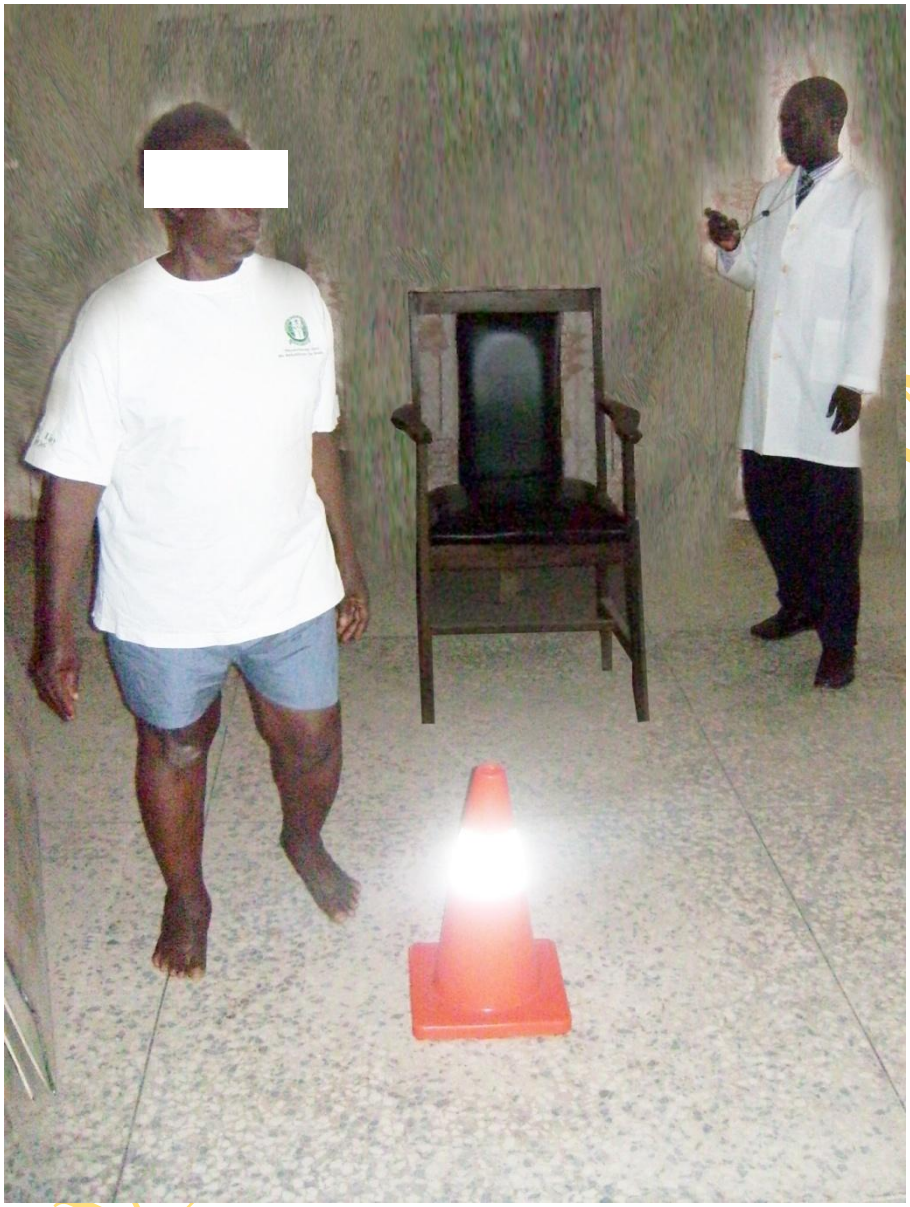

PLATE 5: Participant undergoing 'Time Up and Go Test.'

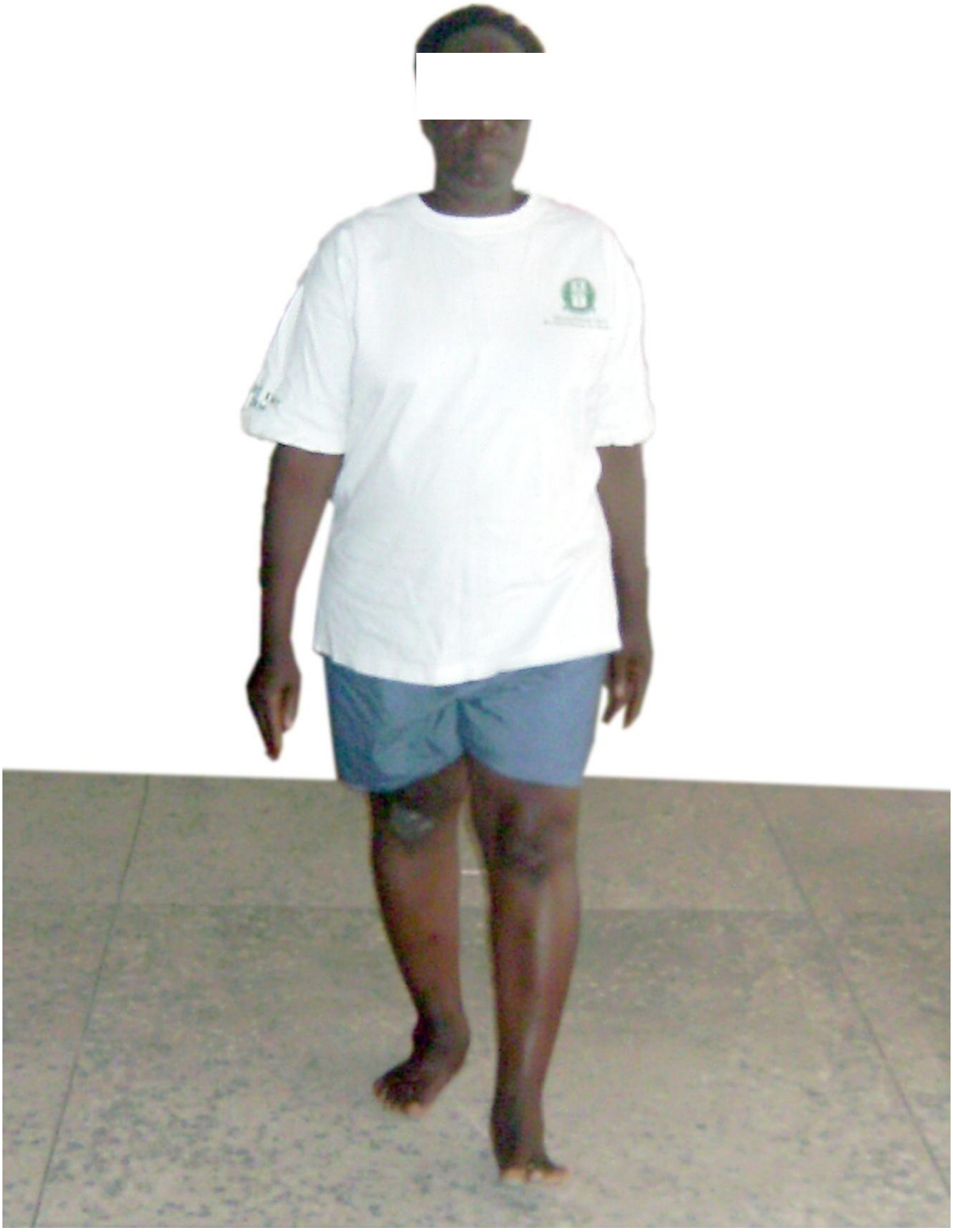

PLATE 6: Participant undergoing brisk walking and changing direction to avoid obstacles.

3.4 Data Analysis

1. Descriptive statistics were computed for all the data obtained - weight, height, blood pressure, pulse rate, severity of cognitive loss, mobility, quality of life, cardiorespiratory endurance, body mass index and waist to hip ratio circumference.
2. Repeated ANOVA was used to compare participants' variables in each of the 2 groups at baseline, 4^{th}, 8^{th} and 12^{th} week of the programme. Post-hoc analysis was used to find where there are significant pairs.
3. Difference in the mean severity of cognitive loss and quality of life were analysed with Kruskal Wallis statistical test followed by Bonferroni correction for changes across the study period.
4. Independent t-test was used to compare the experimental and control group at each of the time intervals.
5. Mann-Whitney U was used to compare non-parametric data between the experimental and control group.

Level of significance (α) was set at 0.05.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 RESULTS

A total number of 85 consenting participants were involved in the study of which 37 were in Exercise Group (EG) and 48 in the Control Group (CG). Among the 37 in the EG, 34 (92%) participants were females while three (8%) were males. The 48 CG participants comprised of 40 (83%) females while eight (7%) were males. Out of the 85 consenting participants, only 55 completed their participation in the study of which 24 and 31 belong to the EG and CG respectively. Seventy-two participants with moderate dementia and thirteen with mild dementia were in the study.

4.1.1 Biodata of the Participants at Baseline.

The Exercise Group (EG) had mean age of 79.72 $\pm$ 6.66 years while their mean height and weight were 1.56 $\pm$ 0.07m and 51.37 $\pm$ 12.22 kg respectively. In the Control Group (CG), the mean age was 77.73 $\pm$ 6.97 years with mean height and weight of 1.58 $\pm$ 0.07m and 57.30 $\pm$ 11.34kg respectively. There were no significant differences in the mean age, weight, height, baseline heart-rate (HR), respiratory-rate (RR), waist-hip ratio (WHR), body mass index (BMI) of CG and EG participants ($P>0.05$) at baseline while the mean baseline systolic blood pressure (SBP) of EG participants was significantly higher than those of the CG ($P<0.05$). Comparison of the mean biodata/anthropometrics and cardiovascular variables are presented in Tables 2 and 3 respectively.

Table 2: Comparison of mean bio-data/anthropometrics of participants in Exercise and Control Group at baseline

Variables	EG n= 37	CG n=48	t-value	p-value
Age (yrs)	79.72 ± 6.66	77.72 ± 6.97	1.41	0.72(NS)
Wt	51.37 ± 12.22	57.30 ± 11.34	2.23	0.98(NS)
Ht	1.56 ± 0.07	1.58 ± 0.07	1.07	0.43(NS)
WHR	0.94 ± 0.06	0.94 ± 0.07	0.03	0.63(NS)
BMI	21.00 ± 4.59	23.02 ± 4.57	0.60	0.26(NS)

KEY

Values are expressed as mean ± standard deviation

EG = Exercise Group
CG = Control Group
Ht = Height (m)
Wt = Weight (kg)
BMI = Body mass index (kg/m^2)
WHR = Waist hip ratio
NS = Not Significant
S = Significant
n = number of participants

Table 3: Comparison of mean cardiorespiratory parameters of participants in the Exercise and Control Group at baseline

Variables	EG n=37	CG n=48	t-value	p-value
SBP	151.05 ± 19.70	144.56 ± 24.92	1.31	0.04 (S)
DBP	85.00 ± 13.51	78.96 ± 13.25	2.08	0.87(NS)
HR	79.16 ± 13.87	76.58 ± 11.32	0.95	0.31(NS)
RR	21.26 ± 3.98	21.71 ± 7.47	0.33	0.66(NS)

KEY:

Values are expressed as mean ± standard deviation

SBP = Systolic Blood Pressure (mmHg)
DBP = Diastolic Blood Pressure (mmHg)
HR = Heart Rate (bests/sec)
RR = Respiratory Rate (cycles/sec)
EG = Exercise Group
CG = Control Group
NS = Not Significant
S = Significant
n = Participants

Table 4 shows the comparison of mean baseline values of outcome measures of domains in Community Screening Instrument in Dementia (CSID) questionnaire for cognition and domains in Dementia Quality of life (DQoL) questionnaire to assess Quality of Life (QoL): while Table 5 shows the comparison of mean baseline values of Time Up and Go Test (TUG) for mobility and 6 Minutes Walk Test for cardiorespiratory fitness of the participants. The outcome measures which exhibited significant differences ($P<0.05$) at baseline were some domains of cognition- Attention/Calculation, Language comprehension, and all domains of DQoL- Self-esteem (SE), Positive Affect (PA), Negative Affect (NA), Feelings of Belonging (FB) and Sense of Aesthetics (SA). All these measures were significantly lowered in EG participants when compared with CG ($P< 0.05$).

4.1.2 Changes in Anthropometric variables of Participants in the Exercise and Control Groups at baseline and over 12-week period.

Table 6 shows changes in BMI and WHR of participants in the EG and CG across the study period. There were no significant difference in the BMI and WHR of participants in the EG and CG at the end of the twelve week study.

4.1.3 Changes in Cardio-respiratory variables of Participants in Exercise and Control Groups at baseline and over 12-week period.

A within group comparison of change in the mean values of cardiorespiratory parameters in EG and CG is presented in Table 7 and 8 respectively. All the cardiorespiratory

Table 4: Comparison of outcome measures (Non- Parametric) of participants in the Exercise and Control Group at baseline

Variables	EG (n=37)	CG (n=48)	Z-value	p-value
Memory	55.39	63.52	1.06	0.29(NS)
Language	63.75	68.47	1.10	0.27(NS)
Attention/calculation	55.22	72.64	2.37	0.01(S)
Orientation	54.53	74.61	1.80	0.07(NS)
Fluency	56.96	70.70	1.25	0.21(NS)
Language Comprehension	45.38	72.98	3.01	0.00(S)
Praxis	54.79	66.51	0.76	0.45(NS)
Cognition (CSID)	40.64	44.82	0.78	0.44(NS)
Self Esteem ($DQol_1$)	32.30	52.36	3.73	0.00(S)
Positive Affect $DQol_2$	31.81	68.27	3.88	0.00(S)
Negative Affect ($DQol_3$)	35.47	69.96	2.66	0.00(S)
Feeling of Belonging ($DQol_4$)	32.49	75.36	3.74	0.00(S)
Sense of Aesthetic ($DQol_5$)	34.75	73.45	2.99	0.00(S)
Quality of life (DQoL)	28.06	55.33	4.70	0.00(S)

KEY:
Values are expressed as mean ± standard deviation
EG = Exercise Group
CG = Control Group
CSID = Community Screening Instrument in Dementia
n = number of participants
NS = Not Significant
S = Significant

Table 5: Comparison of outcome measures (Parametric) of participants in the Exercise and Control Group at baseline

Variables	EG n=37	CG n=48	t-value	p-value
TUG	10.92 ± 4.90	10.27 ± 4.94	0.60	0.63(NS)
6MWT	308.87 ± 73.30	333.72± 68.05	2.16	0.03(S)

KEY:

Values are expressed as mean ± standard deviation
EG = Exercise Group
CG = Control Group
TUG = Time Up and Go Test (secs)
6MWT= 6 Minutes Walk Test (metres)
NS = Not Significant

Table 6: Changes in anthropometric variables of participants in the Exercise and Control Groups at baseline and over a 12-week period

Variables	Wk 0	Wk 4	Wk 8	Wk 12	F-value	p-value
BMI (EG)	21.00 ± 4.59	21.30 ±4.58	20.95 ± 3.93	20.80 ± 4.14	0.07	0.98(NS)
BMI (CG)	23.02 ± 4.57	22.99 ± 4.64	22.87 ± 4.36	23.11 ± 4.37	0.02	0.99(NS)
WHR (CG)	0.93 ± 0.06	0.92 ± 0.07	0.91 ± 0.06	0.91 ± 0.06	1.30	0.29(NS)
WHR (EG)	0.94 ± 0.08	0.92 ± 0.07	0.93± 0.04	0.93± 0.05	0.17	0.92(NS)

KEY:

Values are expressed as mean ± standard deviation
EG = Exercise Group
CG = Control Group
WHR = Weight Hip Ratio
BMI = Body Mass Index (kg/m^2)
NS = Not Significant

Table 7: Changes in cardiorespiratory parameters of participants in the Exercise Group at baseline and over a 12-week period

Parameters	Wk 0 n=37	Wk 4 n=33	Wk 8 n=29	Wk 12 n=24	F- value	p-value
SBP	151.05 ± 19.70	133.82 ± 21.60	134.14 ± 20.62	132.50 ± 24.54	5.91	0.00(S)
DBP	85.00 ± 13.51	75.29 ± 11.07	73.44 ± 10.10	75.00 ± 13.51	6.60	0.00(S)
HR	79.16 ± 13.87	75.59 ± 12.66	75.48 ± 13.71	80.25 ± 14.83	0.94	0.43(NS)
RR	21.26 ± 3.98	19.11 ± 3.04	18.82 ±3.23	18.75 ± 3.28	4.11	0.01(S)

KEY:

Values are expressed as mean ± standard deviation
SBP = Systolic Blood Pressure (mmHg)
DBP = Diastolic Blood Pressure (mmHg)
HR = Heart Rate (beats/sec)
RR = Respiratory Rate (cycles/sec)
NS = Not Significant
S = Significant

Table 8: Changes in cardiorespiratory parameters of participants in the Control Group at baseline and over a 12-week period

Parameters	Wk 0	Wk 4	Wk 8	Wk 12	F-value	p-value
	n=48	n=42	n=35	n=31		
SBP	144.56 ± 24.92	131.90 ± 22.66	133.43 ± 22.09	135.86 ± 26.93	2.48	0.06(NS)
DBP	78.96 ± 13.25	70.00 ± 12.30	72.00± 12.56	71.03± 12.35	4.57	0.00(S)
HR	76.58 ± 11.32	78.19 ± 12.64	73.86 ± 14.20	72.14 ± 9.24	1.79	0.15(NS)
RR	21.71 ± 7.47	20.85± 3.19	20.57 ± 3.24	20.96 ± 4.02	0.4	0.76(NS)

KEY:

Values are expressed as mean ± standard deviation
SBP = Systolic Blood Pressure (mmHg)
DBP = Diastolic Blood Pressure (mmHg)
HR = Heart Rate (beats/sec)
RR = Respiratory Rate (cycles/sec)
NS = Not Significant
S = Significant

variables in the EG except the heart rate exhibited significant decrease over the 12 week study period. These were observed between the baseline and 4th week, baseline and 8th week, and baseline and 12th week. In the CG, only diastolic blood pressure (DBP) showed significantly lowered mean value at the end of the study. Post-hoc analysis revealed that the difference was between the baseline and 4th week, baseline and 8th week, and baseline and 12th week.

4.1.4. Changes in Time Up and Go Test (TUG) of Participants in the Exercise and Control groups at baseline and over 12-week period.

Table 9 shows within group comparison of both control and exercise group participants at baseline, 4th, 8th and 12th week. There were no significant differences across the study period in both EG and CG. In the EG, there was improvement (reduction in mean TUG scores from 10.92 ± 4.90 to 10.01 ± 2.81secs) at the end of the 12th week which was not significant (P>0.05). There was increase in mean TUG scores in CG from baseline to the 12th week (10.27 ± 4.94 vs 10.68 ± 4.09). However, this was not statistically significant at the end of the study (P>0.05).

4.1.5 Changes in Six-Minute walk Test (6MWT) of Participants in the Exercise and Control groups at baseline and over 12-week period.

The mean scores of 6MWT for the participants in EG and CG did not exhibit significant change across the time frame of study (P<0.05). There was a decline in cardio-respiratory fitness in EG at the end of the 12wk study from 308.87 ± 73.30m to 308.41 ± 61.86m. Same pattern was observed in CG as there was a fall in mean value of 6MWT at the end of 12wk of the study when compared with the baseline (333.72 ± 68.05m to 322.04 ± 78.63m). During this period, no significant change (P>0.05) was observed across the time frame (Table 10).

Table 9: Changes in Time Up and Go Test of participants in the Exercise and Control Groups at baseline and over a 12-week period

Variables	Wk 0	Wk 4	Wk 8	Wk 12	F-value	p-value
TUG (EG)	10.92 ± 4.90	8.79 ± 2.35	9.63 ± 2.55	10.01 ± 2.83	2.28	0.08(NS)
TUG (CG)	10.27 ± 4.94	9.76 ± 4.89	10.65 ± 5.07	10.68 ± 4.09	0.30	0.83(NS)

KEY:

Values are expressed as mean ± standard deviation in secs

TUG = Time Up and Go Test (secs)

EG = Exercise Group

CG = Control Group

NS = Not Significant

Table 10: Changes in 6-Minutes Walk Test of Participants in the Exercise and Control Group at baseline and over a 12-week period

Variables	Wk 0	Wk 4	Wk 8	Wk 12	F-value	p-value
6MWT (EG)	308.87 ± 73.30	309.92 ± 53.17	317.49 ± 54.51	308.41 ± 61.86	0.61	0.61(NS)
6MWT (CG)	333.72 ± 68.05	329.85 ± 72.58	326.00 ± 74.05	322.04 ± 78.63	0.18	0.91(NS)

KEY:
Values are expressed as mean ± standard deviation
6MWT= 6 Minutes Walk Test (metres)
EG = Exercise Group
CG = Control Group
NS = Not Significant

4.1.6 Changes in Community Screening Instrument in Dementia (CSID) of Participants in the Exercise and Control Groups at baseline and over 12-week period.

The changes in the mean rank scores of domains in the SCID – Language, Attention/ Calculation, Orientation, Language-comprehension, Memory, Fluency, Praxis in the EG and CG over 12-week study period are presented in Table 11. In the EG, there was no significant difference across the time frame in all the domains of CSID (P>0.05) except in language comprehension and cognition which were significantly higher. The significantly different pairs in language comprehension were between baseline and 12th week, 4th and 12th week while the cognitive scores were between baseline and 4th week, baseline and 8th week, and baseline and 12th week. However, attention/calculation, praxis, fluency and memory were the domains which increased in mean rank scores but was not significant at the end of the study (P>0.05).

Also in the CG, similar observation was made where no significant change was found in all the domains except in memory, and cognition scores which increased significantly over the same study period. This statistically significant increase in cognitive scores was noted between baseline and 8th week, and 4th and 8th week. Moreover, there were increases in mean rank scores of language, attention/calculation, orientation, language comprehension, praxis and fluency which were not significant at the end of the study (P>0.05).

Table 11: Changes in Community Screening Instrument in Dementia (CSID) of Participants in the Exercise and Control Groups at baseline and over a 12-week period

Variables	Wk 0	Wk 4	Wk 8	Wk 12	F-value	p-value
Language(EG)	63.75	63.01	67.16	56.77	1.31	0.73(NS)
Language(CG)	68.47	78.46	85.56	81.33	3.78	0.29(NS)
Attention/ Calculation(EG)	55.22	65.04	63.88	71.35	4.49	0.21(NS)
Attention/ Calculation(CG)	72.64	81.96	75.34	81.69	2.72	0.44(NS)
Orientation(EG)	54.53	69.66	68.72	60.06	4.42	0.22(NS)
Orientation(CG)	74.61	77.75	79.57	79.41	0.36	0.95(NS)
Lang. Comp(EG)	45.38	58.71	69.66	88.94	26.64	0.00(S)
Lang. Comp(CG)	72.98	75.00	83.96	80.81	1.89	0.60(NS)
Praxis(EG)	54.79	69.19	66.83	62.65	3.45	0.32(NS)
Praxis(CG)	66.51	77.35	80.59	92.19	6.56	0.09(NS)
Fluency(EG)	56.96	68.13	63.55	64.63	1.80	0.61(NS)
Fluency(CG)	70.70	76.12	83.99	82.93	2.35	0.50(NS)
Memory(EG)	55.39	61.91	69.95	68.19	3.28	0.35(NS)
Memory(CG)	63.52	74.90	90.79	88.36	9.74	0.02(S)
Cognition(EG)	40.64	65.80	69.52	68.40	7.70	0.05(S)
Cognition(CG)	44.82	76.12	89.86	89.41	10.25	0.02(S)

KEY: Values are expressed as mean rank EG = Exercise Group
CG = Control Group NS = Not Significant S = Significant

4.1.7 Changes in Dementia Quality of Life of Participants in the Exercise and Control groups across the study period.

Table 12 presents changes in the mean rank scores of all the five domains of DQoL in both EG and CG. In the EG, the entire domains – Self- esteem ($DQol_1$), Positive Affect ($DQol_2$), Negative Affect ($DQol_3$), Feelings of belonging ($DQol_4$), Sense of Aesthetic ($DQol_5$) and the Dementia Qualify of Life (DQoL) revealed progressive improvement across the twelve week study and were found to be statistically significant at the end of the study ($P<0.05$). The significant changes in DQoL scores were noted between baseline and 4^{th} week, 4^{th} and 12^{th} week, and baseline and 12^{th} week. In the CG only one domain [Self-esteem ($DQol_1$)], in the (DQoL)-showed significant increase over the twelve weeks study period at baseline and 4^{th} week, baseline and 8^{th} week, baseline and 12^{th} week.

Table 12: Changes in Dementia Quality of Life of Participants with mild to moderate Exercise and Control Group at baseline and over a 12-week period

Variables	Wk 0	Wk 4	Wk 8	Wk 12	F-value	p-value
Esteem(EG)	32.30	67.85	70.60	82.15	23.26	0.00(S)
Esteem(CG)	52.36	82.07	79.00	94.09	10.39	0.01(S)
Positive Affect (EG)	31.81	69.94	68.91	81.77	23.69	0.00(S)
Positive Affect (CG)	68.27	75.15	89.56	81.62	5.25	0.16(NS)
Feeling of belonging(EG)	32.49	73.87	67.14	73.38	16.93	0.00(S)
Feeling of belonging(CG)	75.36	70.00	83.27	84.93	3.16	0.37(NS)
Negative Affect(EG)	35.47	71.56	63.90	85.75	26.57	0.00(S)
Negative Affect (CG)	69.96	78.95	88.40	74.72	3.67	0.30(NS)
Aesthetic(EG)	34.75	66.41	66.95	96.42	48.76	0.00(S)
Aesthetic(CG)	73.45	73.31	78.36	89.24	3.2	0.36(NS)
DQoL(EG)	28.06	70.89	67.19	86.27	40.31	0.00(S)
DQoL(CG)	55.33	75.69	86.30	87.00	5.46	0.14(NS)

KEY: Values are expressed as mean rank

EG = Exercise Group CG = Control Group DQoL = Dementia Quality of Life

NS = Not Significant S = Significant

4.1.8 Hypothesis Testing.

Hypothesis 1: An endurance exercise program would have no significance on Memory of participants.

Memory: Critical F at df of 3, 119 = 7.82

Observed F = 3.28

Since the observed F-value is less than the critical F-value, the hypothesis was **ACCEPTED.**

Hypothesis 2: An endurance exercise program would have no significance on Attention/Calculation of participants.

Attention/Calculation: Critical F at df of 3, 119 = 7.82

Observed F = 4.49

Since the observed F-value is less than the critical F-value, the hypothesis was **ACCEPTED.**

Hypothesis 3: An endurance exercise program would have no significance on Language of participants.

Language: Critical F at df of 3, 119 = 7.82

Observed F = 1.31

Since the observed F-value is less than the critical F-value, the hypothesis was **ACCEPTED.**

Hypothesis 4: An endurance exercise program would have no significance on Language-comprehension of participants.

Language Comprehension: Critical F at df of 3, 119 = 7.82

Observed F = 26.64

Since the observed F-value is greater than the critical F-value, the hypothesis was **REJECTED.**

Hypothesis 5: An endurance exercise program would have no significance on Fluency of participants.

Fluency: Critical F at df of 3, 119 = 7.82

Observed F = 1.80

Since the observed F-value is less than the critical F-value, the hypothesis was **ACCEPTED.**

Hypothesis 6: An endurance exercise program would have no significance on Orientation of participants.

Orientation: Critical F at df of 3, 119 = 7.82

Observed F = 4.42

Since the observed F-value is less than the critical F-value, the hypothesis was **ACCEPTED.**

Hypothesis 7: There would be no significant difference in post-intervention Cognitive scores of exercise participants with mild to moderate dementia compared with control participants.

Cognition (CSID): Critical Z = 1.96

Observed Z = 0.54

Since the observed Z-value is less than the critical Z-value, the hypothesis was **ACCEPTED.**

Hypothesis 8: An endurance exercise program would have no significance on Mobility of participants.

Time Up and Go (TUG): Critical F at df of 3, 119 = 2.68

Observed F = 2.28

Since the observed F-value is less than the critical F-value, the hypothesis was **ACCEPTED.**

Hypothesis 9: There would be no significant difference in post-intervention mobility scores of exercise participants with mild to moderate dementia compared with control participants.

Time Up and Go (TUG): Critical t at df of 53 = 1.98

Observed t = 0.68

Since the observed t-value is less than the critical t-value, the hypothesis was **ACCEPTED.**

Hypothesis 10: An endurance exercise program would have no significance on Self-Esteem of participants.

Self-Esteem ($DQol_1$): Critical F at df of 3, 119 = 7.82

Observed F = 23.26

Since the observed F-value is greater than the critical F-value, the hypothesis was **REJECTED**

Hypothesis 11: An endurance exercise program would have no significance on Positive -Affect of participants.

Positive Affect (DQoL2): Critical F at df of 3, 119 = 7.82

Observed F = 23.69

Since the observed F-value is greater than the critical F-value, the hypothesis was **REJECTED.**

Hypothesis 12: An endurance exercise program would have no significance on Feeling of Belonging of participants.

Feeling of Belonging ($DQol_3$): Critical F at df of 3, 119 = 7.82

Observed F =16.93

Since the observed F-value is greater than the critical F -value, the hypothesis was **REJECTED.**

Hypothesis 13: There would be no significant difference in post-intervention Dementia Quality of Life (DQoL) scores of exercise participants with mild to moderate dementia compared with control participants.

Quality of Life (DQoL): Critical Z = 1.96

Observed Z = 1.12

Since the observed Z-value is less than the critical Z-value, the hypothesis was **ACCEPTED.**

4.2. DISCUSSION

4.2.1 Biodata of Participants

The study which involved 85 consenting participants investigated the effect of endurance exercise on cognitive function, mobility and quality of life in participants who were diagnosed with mild to moderate dementia. Out of 85 participants, 48 were in control group while the remaining 37 were in exercise group. The mean age of the participants was 78.64 ± 6.86 years and ranged between 65 and 90years. The mean age of the participants was above the age of 65 years which were classified to be affected by dementia (Hendrie et. al., 2001).

4.2.2 Changes in executive dysfunction/language comprehension of Mild to Moderate Dementia Exercise and Control Group across the Study Period

The EG in this study showed improvement in language comprehension (executive function) as observed in other studies of Smiley-Oyen et. al., 2008 and Rand et. al., 2010 that find significant improvement in language comprehension. Rand et. al., (2010) found out that a combined exercise and recreation programme for 6 months could improve executive functioning of individuals with chronic stroke. They observed that improvement was sustained even post 6-month study. This similarity may be attributed to the same mode of exercise (aerobic) during which their participants were trained. The exercises included stretching, balance, and task-specific exercises (steppers, fast walking, repetitive sit to- stand). Contrary to these findings Quaney and associates 2009 reported that 8wks of aerobic training did not improve executive functioning of individuals with chronic stroke. This observation may be attributed to difference in duration of exercise

programme as 8 weeks of aerobic training might not be adequate to stimulate response. American College of Sports Medicine ACSM (1998) position stand suggested that adults should exercise at duration of fifteen to twenty weeks in order to evaluate efficacy of aerobic exercise. This is short of the expectation of the ACSM. Colcombe and Kramer (2003) in a meta-analysis indicated that the magnitude of executive function change is associated with the aerobic exercise duration, exercise modality and level of fitness of the participants. In this study, it is noted that twelve weeks of endurance exercise programme enhances better performance in language comprehension.

4.2.3 Changes in Memory of Mild to Moderate Dementia Exercise and Control Group across the Study Period

There was improvement in the memory scores in both EG and CG. Nevertheless, the improvement in EG was not statistically significant. Several studies had investigated if a combined exercise and recreation programme could improve the memory of individual with stroke (Lautenschlanger, 2008; Erickson and Kramer, 2009; Rand et. al., 2010). Rand and associates (2010) investigated if a combined exercise and recreation programe could improve the memory of eleven individual with chronic stroke. It was found that memory improved by 61% at the end of 12th wk of their study. This suggests that greater improvement (though not significant) observed in EG in this present study may be profound if the exercise programme had extended more than 12 wks. This implies that sustained aerobic exercise over 12 wks may also be beneficial for memory enhancement. It has been reported that this aerobic based programme had potential for inducing neuroplasticity.

4.2.4 Changes in Cognition of Mild to Moderate Dementia Exercise and Control Group across the Study Period

In this study, EG recorded significant gain in cognition, though an improvement of 168% was observed in EG, compared with 199% recorded in the CG at the end of the study. The EG and CG showed significant improvement at 4th and 8th week respectively. This early change observed in EG may be attributed to additional effect of endurance exercise and music played during the endurance exercise programme as documented in a randomized controlled trial conducted by Van de Winckel et. al.,(2004) to evaluate the effect of a musical exercise programme on cognitive function in patients with moderate to severe demented woman. The daily physical exercises engaged were supported by music for 30 min/session for three months; they found that there was significant improvement in cognition in the exercise group compared with control patients who received an equal amount of attention through daily conversation. Miu et. al., (2008) recorded same observation in demented elderly subject who were in aerobic exercise training (1hr twice/wkly for 12wks) and control group who received conventional medical treatment. The result of this study correlates with the observation by Miu et. al., (2008) and this might not be unconnected with the frequency and total period of the exercise programme. It was hypothesized by Van de Winckel et. al.,(2004) that music enhances arousal, and combined with exercise, motivates to patient to be even more active and alert to the present. In addition, Bastone and Filho (2004) found that there was significant improvement in cognition through exercise programme. The findings by Shay and Roth (1992) suggest that participation in aerobic exercise selectively preserve some

cognitive function such as memory, attention/calculation, fluency, language, language comprehension that normally decline with age. Radak et. al.,(2010) concluded that exercise improves the healthy vascularization and energy metabolism of different brain regions which could be an important means to ameliorate cognitive dysfunction in patients with dementia. The positive effect of exercise training on cognition in this study reveals that exercise has a role to play in the management of dementia.

4.2.5. Changes in Time Up Go Test of Participants with Mild to Moderate Dementia in Exercise and Control Group across the Study Period.

The mean values of Time Up and Go Test (TUG) at the baseline for both groups were within range value from the study conducted among the Caucasian by Steffen et.al (2002). They reported that it takes an average healthy individual age 80 – 89 years between 9 to 14 secs to complete the test which was comparable with the mean values observed in both groups in this study. However the mean TUG scores recorded in both groups (EG=10.92±4.90; CG=10.27±4.94) in this study tend towards the minimum value (9 secs) for performance of TUG in their study. This may be as a result of lower mean age value in this study compared with their study.

In another vein, the TUG scores recorded for exercise group at baseline was less than 20 seconds. This aligns with the submission of Podsiadlo and Richardson (1991) that individuals with age 79.5 years could independently engage in basic transfer such as climbing stairs. The experience in this present study is that participants in the EG could climb stair at designated station for stair climbing without assistance. The values for

Time Up and Go Test (TUG) across the study period in EG were observed to be lower after 12th week of aerobic exercise, indicating improvement in the ability of the patients to walk and carry out a task of walking after rising from sitting position. Conversely, there was no significant improvement over time in TUG scores in the CG on completion of the study.

The improvement observed in the EG is supported by the findings of Podsiadlo and Richadson (1991) who proposed that Time Up and Go Test correlates well on log transformed score of gait speed. Effects of aerobic training on speed (gait velocity) have been studied by several authors (Harada et. al., 1995; Lord et.al., 1996; Silver et. al., 2000). A related study was carried out by Silver et. al., (2000) who reported improvement of 21% in walking speed by their ischemic stroke subjects following 12wks of low intensity treadmill aerobic exercise. This was in consonance with the findings in this study as there was 8% improvement after 12wks study period.

Recently, Hardy and colleagues (2007) proposed that such improvement in habitual gait speed after one year has been found to reduce mortality rate by 41.2% over the next 8 years compared with elderly who showed no improvement, 49.3%, in habitual gait speed. The trend of improvement on mobility (TUG) is consistent with previous studies suggesting positive effect of exercise on physical functioning in patients with dementia (Teri et. al., 2003; Thomas et. al., 2003; Heyn et. al., 2004, Roland et. al., 2007). It shows that twelve weeks of endurance exercise programme is beneficial to patients with mild to moderate dementia.

4.2.6 Changes in Self- Esteem of Mild to Moderate Dementia Exercise and Control Group across the Study Period

The result from the present study indicates that the EG yielded better gain over time in self–esteem (SE) than the CG. The EG had 254% improvement compared with 179% as obtained in CG though both group exhibited significant improvement in the SE. The difference in change of improvement at the end of the study could be attributed to participation in endurance exercise programme. This is in agreement with the study of Li and associates in 2002, in which they conducted a randomized controlled trial to enhance self-esteem through Tai-chi (a form of traditional dance-like oriental exercise) for 6 months, they found out that individual who participated in twice weekly exercise programme which include balance, postural alignment and concentration showed increase in level of SE at the end of the study compared with CG who were instructed to maintain their routine activities. This study supported the inclusion of endurance exercise programme in the total management of patients with dementia.

4.2.7 Changes in Positive Affect of Mild to Moderate Dementia Exercise and Control Group across the Study Period

The findings in this study reveal that there was significant improvement at the end of the study period in positive affect (PA) of the participants who engaged in aerobic exercise compared with the EG. Positive affect has been posited to be improved through engaging in motor or verbal behaviours in response to activity which can ultimately reduce agitation in patients with dementia (Buettner, 1999; Cohen-Mansfield & Werner, 1997).

Zeisel et al. (2003) in a correlation study found that fewer psychological problems were observed in patients with dementia in ambient environment that residents can understand. This observation was noted in the countenance of the EG during the study period as they were familiar to the research centre. This study therefore corroborate that participation in endurance exercise improved the positive affect of patients with dementia.

4.2.8 Changes in Negative Affect of Mild to Moderate Dementia Exercise and Control Group across the Study Period

The findings in this study reveal that there was significant improvement in negative affect in the EG post intervention in contrast to the CG. This is in line with the submission of Cohen-Mansfield and Parpura-Gill (2007) who studied predictors of loneliness among 161 residents of low-income older adults. They observed that negative affect was linked to loneliness. Also, negative affect has been conceptualized as resulting from lack of social activities, impaired indoor and outdoor mobility, dependence in activities of daily living (ADL) and living in institutions (von Heideken Wagert et al., 2005). Cohen-Mansfield and Parpura-Gill (2007) concluded that new contacts and mobility could be important for providing socialization. Moreover, this study offered the participants in the EG the opportunity to engage in endurance exercise and thereby encouraged social interactions which decreased boredom and loneliness. Cohen-Mansfield (2005) added that negative affect which is highly correlated with loneliness could be improved through social interaction and contact interventions. This study showed that negative affect of patients with mild to moderate dementia could be improved through endurance exercise programme.

4.2.9 Changes in Feelings of belonging of Mild to Moderate Dementia Exercise and Control Group across the Study Period

This study showed significant improvement in feelings of belonging in EG at the end of the study in contrast to the CG. This is in variance with a randomized controlled trial study of Cooke and associates (2010) who explored the effect of music on quality of life in older people with dementia in two groups. The music and reading/control groups ran for 40 minutes thrice weekly for eight weeks. They found that the control group reported higher mid-point feelings of belonging than the music group. This variance in the two studies might not be unconnected with the exclusion of endurance exercise programme in their study. Also, the duration of their programme is rather short compared with the researcher's study and is noteworthy. By implication this suggests that endurance exercise programme has a role to play in the management of patients with dementia.

4.2.10 Changes in Sense of Aesthetics of Mild to Moderate Dementia Exercise and Control Group across the Study Period

There was significant improvement in sense of aesthetics across the study period in the EG. Only one article published by Cooke et. al (2010) who explored the effect of music on quality of life in older people with dementia in two groups (music and reading/control) could be cited. Each group ran for forty- minutes thrice weekly for eight weeks they also found, like other domains in Dementia Quality of life DQoL, that the control group reported higher mid-point sense of aesthetics than the music group. The rational for this inconsistency might be due to the short duration (8 weeks) and exclusion of endurance

exercise under which their study was conducted. This study proved that endurance exercise programme is important in enhancing sense of aesthetics in patients with mild to moderate dementia.

4.2.11 Changes in Affect of Mild to Moderate Dementia Exercise and Control Group across the Study Period

The findings in this study reveal that there was significant improvement in both positive affect (PA) and negative affect (NA) of the participants who engaged in aerobic exercise compared with control. Very few studies (MacRae et.al., 1996; Schreiner et. al., 2005; Williams and Tappen, 2007) investigated the effect of exercise on affect in individuals with mild to moderate dementia. The result is in line with the randomized study conducted by William and Tappen (2007) who examined the effect of three behavioral intervention on affect mood in nursing home residence with Alzheimer's disease i.e. supervised walking group, comprehensive exercise group (walking plus strength training, balance and flexibility) and social conversation group for 5days/wk and progressed up to 30 min/session over 16wks.

William and Tappen (2007) noted that significant improvement occurred in PA and NA in comprehensive exercise group compared with social (casual) conversation group. The social (casual) conversation group may be likened to the CG group of this study where no aerobic activity was encouraged. The outcome might likely be as a result of related frequency, time and period for establishing aerobic exercise as recommended by American College of Sports Medicine, ACSM (1998) minimum of thrice/wkly, twenty-minutes per session and period of 12 wks. Also, the exercise regime in researcher's work

included physical activities other than walking alone and this contributed to the characteristics of aerobic exercise. Equally, Lawton (1994) posited that positive affective state which is a reflection of a better QoL are related to an increase in participation of planned social activities. However, twelfth week of EEP afford the opportunity for participants in EG to engage in social interaction during the duration of exercise programme. In conclusion, twelve weeks of endurance exercise programme is beneficial in enhancing affect in patients with mild to moderate dementia.

4.2.12 Changes in Quality of Life of Mild to Moderate Dementia Exercise and Control Group across the Study Period

Observation on the effect of exercise on the quality of life of participants with dementia in this study was not in line with the study of Schneider et. al., (2008) and Steinberg et. al.,(2009). Both studies reported lower quality of life (QoL) of their participants following exercise. Schneider and colleagues (2008) studied to determine the feasibility and efficacy of a home base exercise intervention program to improve the functional performance of patients with AD. They reported worse lower QoL of their participants. The difference in the studies might be attributed to flexibility of exercise program as their AD participants were permitted to substitute one day a week with comparable moderate-intensity activities (2). Strength training and balance and flexibility training were incorporated in the exercises of their experimental groups. The effectiveness of the exercise program could not be substantiated as such exercise was carried on in home setting under a supervision of a caregiver.

Chin and associates (2004) and Schneider et. al., (2008) conducted work in older adults to examine the effect of exercise on quality of life. In the study by Schneider and colleagues (2008), exercise training was initiated for 12 months in three groups of older adults aged 71.8 $\pm$ 5.1 years namely cognitive behavioural therapy, attention control and health promotion education and a control group. However, the therapy group and educational group reported lower general health compared with control group. This inconsistency may be attributed to the frequency and time of exercise at different phases of their study vis-a-vis Phase 1 –3 times/week for 2 wks, Phase 2 –once/weekly for 8 wks and Phase 3 – self monitored. Also the mode of exercise training employed in their study was strength training as opposed to aerobic method in this present study.

There was observed improvement in all the five domains (self esteem, positive affect/humour, negative affect, feeling of belonging and sense of aesthetic) in the Dementia Quality of Life (DQoL) in both control and exercise group at the end of the study. Notwithstanding, the EG exhibited significant improvement in all the five domains in the DQoL (self-esteem, positive affect, negative affect, feeling of belonging and sense of aesthetic). The EG demonstrated improvement between baseline and at the end of 12th week compared to CG in all the five domains in DQoL – self esteem, positive affect/humour, negative affect, feeling of belonging, sense of aesthetic and Quality of life respectively.

The observed response to exercise was similar to a randomized controlled study conducted by Dechamps et. al., (2010) whose objective was to assess the effects of targeted exercise programme on health related quality of life in 160 institutionalised elderly persons aged 65years older. The intervention spanned over 6 months where

subjects were either in an adapted tai-chi program (4 times 30mins/wk) or cognition action program (2 times 30-45mins/wk) or control group. They found that the control group experienced a decline in health related quality of life over the 12 months period.

Santana-sosa et. al (2008) also observed positive influence of exercise training which included resistance, flexibility, joint mobility and balance/co-ordination exercises for Alzheimer's patients for 12 weeks. They noted that the exercise group had ability to perform activity of daily living independently in Katz and Barthel scores while no changes were found in the control group over the 12-week period. This study shows that twelve weeks of endurance exercise programme could be of help to improve significantly the quality of life of patients with dementia.

4.2.13 Changes in Six Minute Walk Test of Mild to Moderate Dementia Exercise and Control Group across the Study Period

There were no significant change in cardiorespiratory endurance at the end of the study period in both EG and CG though the CG exhibited lower 6MWT mean value compared with EG (333.72±68.05 vs. 322.04±78.63; 308.87±73.30 vs. 308.41±61.86). This observation was different from the studies in sedentary adults (Govindasamy et. al., 1992; Warren et. al., 1993, MacRae, 1996; Nalbant et. al., 2009), and in Alzheimer's disease (Santana sosa et. al., 2008).

Warren and associates in 1993 observed cardiorespiratory response to a 12 week moderate exercise training programme in thirty sedentary elderly women- mean age 73.5 ± 0.7yrs, 30-40 mins/session daily. They found that older women who involved in

aerobic exercise demonstrated significant improvement in cardiorespiratory fitness at the end of 12 weeks.

A study by Nalbant et. al., (2009) investigated the effect of aerobic exercise-walking thrice weekly at intensity of 70% of heart rate on performance on the 6MWT in older adult aged 71.5 ± 7.5yrs. They concluded that their subjects likewise improved after six months of supervised aerobic training.

A recent study by Santana sosa et. al., (2008) to determine the effect of 12 week training programme (including resistance, flexibility, joint mobility and balance/co-ordination exercise) for sixteen Spanish patients aged 76 ± 4 years with Alzheimer's disease on their overall functional capacity, a significant improvement after training in endurance fitness was observed compared with the control group. This variant may be attributed to the extended frequency (daily) and period (six months) under which these studies were conducted. Current American College of Sports Medicine ACSM (1998) guidelines recommend that adults should exercise at frequency of 3-5d/wk. Wenger and Bell (1986) submitted that improvement in VO_{2max} increases with frequency and such added improvement in VO_{2max} occurs with training even up to 5d/wk compared with 3d/wk employ in this present study.

A related study by Murtagh et. al., (2005) to determine the effects of 60 minutes of brisk walking per week, accumulated in two different patterns on cardiovascular risk on women aged 45.7 ± 9.4 year who were randomly assigned to either one 20-min walk (single bout), two 10-min walks (accumulated bouts) 3 d/wk for 12-week, or no training

(control) was in line with present study. They observed that there were no differences between groups for changes in VO_{2max} or RPE from pre to post-intervention. Same observation was recorded in this study as there was no statistical difference between the EG and CG over 12weeks. It is likely that the energy costs in both studies are practically the same- the time, frequency and period which the studies were conducted. Also observed in the EG was a significant reduction in all the cardiorespiratory parameters except heart-rate at the end of the study. Authors (Steffen et. al., 2002; McNamara et. al., 2003) opined that the self-paced 6MWT assesses the submaximal level of functional capacity and that most patients do not achieve maximal exercise capacity during the 6MWT; instead, they choose their own intensity of exercise. However, because most activities of daily living are performed at submaximal levels of exertion, the 6MWT may better reflect the functional exercise level for daily physical activities. Reybrouck (2003) submitted that the 6MWT gives only a rough estimate of the general functional status of the patients. However, twelve weeks of endurance exercise programme has no effect on cardiorespiratory fitness in patients with mild to moderate dementia in this study.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

Alzheimer disease and other dementing disorders are major sources of morbidity and mortality in ageing society (Larson et. al., 2004). Dementia causes irreversible decline in global intellectual, social and physical function. It is one of the major sources of morbidity and mortality in ageing society. The impact of Alzheimer disease has not been studied as much in developing countries in which the growth of the proportion of the elderly population is even greater in the developed countries. Despite therapeutic advances, current treatment modalities for dementia have limited success. Regular exercise has been portrayed as a mainstay and preventive health care for individual of all ages that reduce risk of chronic illness, maintain mobility, enhance mood and even improve function. Since no cure for dementia has been reported and with dearth of literature on effect of endurance exercise on the dysfunction associated with dementia, this study therefore investigated the effect of an endurance exercise programme on cognitive function, mobility and quality of life of patients with mild to moderate dementia.

Literature reviewed included Causes of Dementia, Risk Factors, Symptoms, Management, Dementia Quality of Life (DQoL), Time Up and Go Test (TUG), Community Screening Instrument in Dementia (CSID), Mobility/Physical Function,

Physical Fitness, Epidemiology, Impact of Dementia on Caregiver, Economic Implication and Diagnosis. Management of dementia focuses on exercise as a promising entity that centers on aerobic exercise as the main stream. The health benefits of endurance exercise training which includes reducing risk of chronic illness, maintaining mobility, enhancing mood and function which are usually associated with dementia were discussed.

A quasi-experimental design was used for the study. Consecutive sampling technique was used to recruit eighty-five participants at Dementia Research Project Clinic, University College Hospital, Ibadan. Participants were systematically assigned into exercise and control group following ethical approval from U.I/U.C.H Joint Ethical Committee and securing their informed consent. Exercise session in form of circuit training was conducted thrice weekly on alternate days for twelve weeks which was purely aerobic for participants in exercise group. Outcome measures CSID, TUG, 6MWT, DQoL were assessed at baseline, 4^{th}, 8^{th} and 12^{th} week of the programme in both groups. Other measurements include body weight, waist hip ratio (WHR), resting heart rate, pre and post-exercise systolic and diastolic blood pressure at same period interval. Data was analysed using descriptive statistics of mean, standard deviation and inferential statistics. Alpha level was set at 0.05.

Results showed improvement in the mean scores of TUG over the study period in exercise group though it was not significant compared to the baseline scores while in the control group, no improvement was observed in TUG scores. Twelfth week comparison showed no significant difference between the exercise group and control group. In the same vein, 6MWT scores did not change significantly in both groups. The CSID and

DQoL scores however recorded significant increase at the completion of the study. Only language comprehension (a domain in CSID questionnaire) showed improvement which was found to be statistically significant. In the DQoL of the exercise group, the results showed that there was significant improvement in all the domains- Self-esteem, Positive Affect, Negative Affect, Feelings of belonging and Sense of Aesthetics. The 12th week comparison showed no significant difference in the CSID, TUG, 6MWT and DQoL scores between the two groups. The discussion focused on the fact that the result of this study as regards mobility and cardiorespiratory fitness, cognition and some attributes in dementia quality of life are in consonance with some previous studies.

5.2 Conclusion

This study revealed pertinent findings of the effect of endurance exercise programme on cognitive function, mobility and quality of life of patients with dementia. It is noted that patients with mild to moderate dementia benefited from endurance exercise programme and pharmacological treatment which resulted in improvement in their cognitive function, mobility and quality of life at the end of the twelve week study programme.

5.3 Recommendation

The following recommendations were made;

5.3.1 For patients with dementia

1. Individual with mild to moderate dementia should be encouraged to be involved in aerobic exercise to enhance selected cognitive function (language comprehension).
2. To improve overall quality of life, individuals with mild to moderate dementia should engage in aerobic exercise.
3. Aerobic exercise is beneficial for people living with mild to moderate dementia.

5.3.3 For Clinicians

1. Physiotherapy clinicians should encourage people living with mild to moderate dementia to engage in regular aerobic exercise.
2. The importance of aerobic exercise in this population should be stressed to both the clients and relations.
3. Exercise training should be included in the overall medical/nursing care protocol for patients with mild to moderate dementia.

5.3.4 Policy Makers

1. Appropriate authority should embark on provision of recreation centre/gymnasium very close to the elderly to promote their physical and mental well-being.

2. There should be national policy towards the welfare patients with mild to moderate dementia.

5.2.4 Further Studies

1. Further studies could extend the period of aerobic exercise training on clinical symptoms and quality of life in patients with mild to moderate dementia to be able to see if a longer duration of aerobic exercise programme will bring significant improvement in all domains of cognitive functions.
2. The effect of other forms of exercise training such as strength, balance training, Yoga, Tai Chi, cognition-action programme on clinical symptoms and quality of life in patients with mild to moderate dementia should be investigated.

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APPENDIX I

INFORMED CONSENT FORM

TITLE: Effect of a 12-week endurance exercise programme on cognitive function, mobility and quality of life of patients with mild to moderate dementia.

NAMES OF THOSE INVOLVED IN THE STUDY: AJAYI, BABATUNDE FOLUSO

PURPOSE OF STUDY: Find out the effect of an endurance exercise programme on cognitive function, mobility and quality of life of patients with dementia.

PROCEDURE OF RESEARCH: Severity of cognitive loss, mobility, quality of life, cardiorespiratory fitness, cardiorespiratory parameters and anthropometric variables will be measured. You will be assigned to exercise/pharmacological group or pharmacological group for twelve weeks. You will be required to come for exercise three days in a week on alternate days for twelve weeks. The information gathered from you before and after study will be used to find the effect of an endurance exercise programme in patients with dementia. In total we expect to recruit one hundred participants.

EXPECTED DURATION: We expect you to be involved in this study for twelve weeks and not more than 1 hour at Ile-Adebisi, Idi-Ikan Ibadan at each clinic visit.

RISKS: There is no major risk involved in this study and all data collected will be used exclusively for research purpose. However any injury such as musculoskeletal injuries that may be sustained during the course of the research will be treated at no cost to you.

BENEFITS: It is hope that at the end of this study your health status (cognition, mobility, quality of life, mobility and cardiorespiratory fitness) will improve.

CONFIDENTIALITY: For the purpose of this study, patients will be assigned study numbers instead of using names during collection of data. This is to ensure that the

participant's name will not be used in connection with any information gather for the study. All information gathered will be held under strict confidence and will be used solely for the purpose of this study.

VOLUNTARINESS: Your participation in this study is entirely voluntary. If you choose not to participate, this will not affect your treatment in the hospital in anyway. You are free to refuse to take part in the study and even after consent has been given, you have the right to withdraw consent at any time. Your refusal or withdrawal would not result in denial of any sort of necessary benefits.

RESEARCHER'S STATEMENT: I have fully explained this study to…….. and have given sufficient information, including risks and benefits to make an informed decision.

PARTICIPANT'S STATEMENT: Now that the study has been explained to me and I fully understand the purpose, methods, risks and benefits of this study, I am willing to participate in it. I understand my participation is voluntary and I may withdraw consent at any time. I have received a copy of the informed consent form.

Name……

Date……..Signature/Thumbprint…….

CONTACT INFORMATION: Department of Physiotherapy, University of Ibadan, Ibadan.

This study has been approved by the Health Research Ethics Committee of the University of Ibadan and the Chairman of the committee can be contacted at Biode Building Room T10, 2nd Floor, Institute for Advanced Medical Research and Training (IMRAT), College of Medicine, University College Hospital, Ibadan

E-MAIL; uiuchrc@yahoo.com in addition, if you have any question about your participation in this research, you can contact the principal investigator, Department of Physiotherapy, University of Ibadan, Ibadan. You can also contact the Head, Department of Physiotherapy, University of Ibadan, Ibadan.

INFORMED CONSENT FORM

I am AJAYI, BABATUNDE from Physiotherapy Department University of Ibadan, Ibadan who is carrying out a study to investigate the effect of twelve week endurance exercise training on cognitive function, mobility and quality of life of patients with dementia on one hundred participants. You will be required to come for exercise three days in a week on alternate days for twelve weeks.

Your full cooperation and participation in the exercise programme may help to know the effectiveness of treatment that may be given to you and other people affected by dementia. All information given shall be used for research purpose only and shall be treated with utmost confidentiality.

Participation in this study is completely voluntary and you are also free to withdraw your participation at any time.

I will appreciate your help in participating in this study.

CONSENT: Now that the study has been explained to me and I understand the content of the study process I am willing to take part in the study.

I am keeping a copy of the informed consent.

…….....…….....

Signature/Thumbprint of Participant | Signature/Thumbprint of Witness | Signature of Researcher

IWE IFIOHUN SI

Emi ni AJAYI BABATUNDE lati Ile Eko Giga Fasiti Ibadan, Ibadan ti o se ise iwadi ijinle lati se awari ipa ti idaraya olose mejo ni lori awon asanyan ami ailera ati igbesi aye ti o pegede awon alailera ati awon ti o tete ma ngbagbe nkan fun ogun alailera. E o ma wa fun idaraya ni emeta lose fun ose mejo bi a o sela sile fun yin.

Ifowosowopo lekunrere ati ilowosi ninu eto idaraya yi yo ran yin lowo lati mo bi itoju ti a n fun yin ti munadoko to ati awon miran ti ma n tete gbagbe nkan. Gbogbo ifito ni leti yin ni a o lo fun ise iwadi ijinle yi nikan eti keta ko si ni gbo o.

Ilowosi ninu ise iwadi ki ise dandan, e si le ko lati tesiwaju nigbakugba ninu ise iwadi yi.

Inu mi yio dun ti e bale kopa ninu ise iwadi ijinle yi.

IFIOHUNSI: Bayi ti a ti se alaye ise iwadi yi fun mi ti osi ye mi yekeyeke.Mo nife si ati kopa ninu re.

Mo ni eda iwe yi lowo.

.....	.....	.....
Ifowosi/ Itekasi Olukopa	Ifowosi/ Itekasi Ajeri	Itekasi Oluwadi

APPENDIX II

COMMUNITY SCREENING INSTRUMENT FOR DEMENTIA (CSID)

QUESTIONNAIRE

I WILL BE ASKING YOU ABOUT THINGS YOURSELF IN THE PAST AND HOW YOU ARE NOW. SOME OF THE QUESTIONS MAY NOT BE RELEVANT TO YOU, BUT IT WOULD BE HELPFUL IF YOU WOULD ANSWER THEM ALL. YOUR ANSWERS WILL BE KEPT CONFIDENTIAL.

Start time: _____

NITORINA, EMI O BERE LOWO NYIN NIPA AWON NKAN TI O TI SELE SEHIN ATI BI ARA NYIN TI RI NISISIYI. SI YIN O LE DABI PE AWON MIRAN NINU IBERE NA KO SE PATAKI ABI KO BA OJU MU, SUGBON YIO JE NKAN IRANLOWO FUN WA TI E BA LE FUN WA NI IDAHUN SI GBOGBO AWON IBERE NA. GBOGBO IDAHUN TI E BA FUN WA NI YIO WA NI IPAMO, KO SI NI JE MIMO FUN ENIKENI.

1. I would like for you to remember my name. My last name is

   _____. Can you repeat this please?
   (last name)
   (Interviewer may repeat name 3 times if necessary.)

   Ma fe ki e ranti oruko mi. Oruko mi ni _____
   E jowo mo fe ki e pe oruko na tele mi?
   0……..... **Nwon ko le tun so** (Cannot repeat name)
   1... **Won tun oruko mi so daradara** (Successfully repeats name)

   I want you to remember it because I will ask you my name a little later.
   Mo fe ki e ranti oruko mi nitoripe ma beere laipe.

<u>Language Expression - Naming</u>

We will begin with naming things. I will point to something and I would like for you to tell me the name of the object. For example.....

Ao bere pelu siso oruko awon orisirisi nkan. Ti mo ba ti na owo si nkan na, emi yio fe ki e so oruko re fun mi. Apejuwe: (Mo fi owo kan eti) _____ kini yi?

Show your pencil.

2. What is this called? 0.....Incorrect
   Ki ni anpe eleyi? 1.....Correct

Point to your watch.

3. What is this? 0.....Incorrect
Kini yi? 1.....Correct

Pat your chair.

4. What about this..... 0.....Incorrect
Eleyi nko? 1.....Correct

Point to shoes

5. And these..... 0.....Incorrect
Ati awon eyi? 1.....Correct

Show your knuckles.

6. What do we call these? 0.....Incorrect
Kini a npe eleyi? 1.....Correct

Point to the elbow.

7. What do we call this? 0.....Incorrect
Kini a npe eyi? 1.....Correct

Point to the shoulder.

8. And this, what do we call this part of our body? 0.....Incorrect
Kini a se npe eya ara ti mo fi owo kan yi? 1.....Correct

<u>Language Expression - Definition</u>

I was just showing you things and you told me what we call them. Now I will tell you the name of something and I want you to describe what it is. For example.....
Mo ti nfi awon nkan han yin, e si ti so oruko ti a npe won fun mi. Nisisiyi emi o so oruko nkankan fun nyin. Emi o si fe ki e juwe nkan ti awon nkan na je. Gegebi apejuwe... Oko: A nfi ko ebe.

9. What is a bridge?
Kini afara je?
(Examples of correct answer: Something that goes across a river, canyon, road; something the dentist puts in your mouth.)
(Lati da omi koja) 0.....Incorrect
_____ 1.....Correct

10. What do you do with a hammer?
Kini a nfi hammer se?

(Examples of correct answer: Drive nails, build things, bang things.)
(lati fi kan iso, lati fi kan ile.)
0....Incorrect
_____ 1.....Correct

11. What do people do in a church?
(Examples of correct answer: Pray, sing, praise God, read, meditate, etc.)

Kini awon enia ma nse ni Sosi tabi Mosalasi.
Lati gbadura - To pray
Lati sin olorun - To worship God
Lati Korin - To sing
Lati Kewu - To read Quran 0....Incorrect
Lati gbeyawo – To wed 1.....Correct
Awon miran (Others) _____

12. Where do we buy medicine?
(Examples of correct answer: Drug store, pharmacy, hospital, market, chemist, special section of supermarket…)

Nibo ni a ti le ra oogun? 0....Incorrect
1.....Correct

Language Expression - Repetition

[Note to Interviewer: Only one presentation is allowed.]
13. Now I would like for you to repeat what I say,
"no ifs, ands, or buts".

Mo fe ki e so oro ti mo ba so yi, gege bi mo ba ti so gan, laiyi pada. 0....Incorrect
"Oke gb'oke g'ope." 1.....Correct

Memory - Recall
14. Do you remember my name? What is it? 0....Incorrect
Nje e ranti oruko mi? Kini? 1.....Correct
(Accept 1st or last name)

If Incorrect: Well, I'll ask you again very soon. Remember my last name is _____.
Ma tun bi yin ni oruko mi laipe yi. E ranti pe oruko mi nje_____.
(Repeat 3 times if necessary, rough approximation of name is acceptable.)

Language Expression - Naming, Fluency
15. Now we are going to do something a little different, I am going to give you a category and I want you to name, as fast as you can, all of the things that belong in that category. For example, if I say `articles of clothing,' you could say shirt, tie or hat. Can you think of other articles of clothing?

Nisisiyi, a o se awon nkan miran ti o yato die si eleyi ti a ti nse bo. Emi a fun yin ni oruko ti a nfi juwe awon nkankan. Emi a si fe ki e daruko bi e ba ti le yara so gbogbo awon nkan ti e ba mo ti o 'jemo oruko naa. Fun apejuwe, ti mo ba so wipe "Aso ti a nwo", eyin le so pe "Buba, iro, sokoto, fila, dansiki," Kini awon aso miran ti a tun nwo, ti e tun mo?" (gbariye, agbada, dandogo, singlet, ibante, gele).

That's fine. I want you to name things that belong to another category 'animals'. I want you to think about all the many different kinds of animals you know. Think of any kind of animal in the air, on land, in the water, in the forest, all the different animals. Now I would like for you to tell the names for as many different animals as you can. You will have a minute to do this. [Interviewer - look at your watch.] Are you ready? Let's begin.....

Iyen dara. Mo fe ki e daruko awon nkan ti a le so pe o je elemi, yato si enia ati igi. E le da oruko orisirisi: awon eranko ile tabi ti igbo, awon eiye oju orun ati ti ile, awon eja inu omi (ati osa, ati okun). Mo fe ki a bere nisisiyi lati ma daruko nwon. Iseju kan ni a fun yin lati daruko awon orisirisi eranko, eiye, eja ti e ba mo. O se pataki ki e yara daruko gbogbo eranko ti e ba mo ni iseju kan yi, nitori iye ti e ba le daruko ni mo fe ka. O ya o'

Record number of animals _____

Registration

Now I am going to tell you three words and I would like for you to repeat them after me.
Nisisiyi emi a so oro meta fun yin ti emi a fe ki e pe tele mi.

16. Repeat after me these words:
(E pe awon oro wonyi tele mi: Oko, Ile, Eja).

Oko (Boat) 0…...Incorrect
1……..Correct
Ile (House) 0…...Incorrect
1.....Correct
Eja (Fish) 0…...Incorrect
1.....Correct

[Repeat, up to 5 attempts, until subject has successfully said the three words.]

Record number of attempts _____

Very good, now try to remember these words because I will be asking you later.
O dara pupo. Mo fe ki e fi awon oro meta ti a sese so yi s'okan, nitori emi a tun bi yin lere nipa won laipe yi.

Attention and Calculation

Now we're going to do some things with numbers. This is sometimes hard for people, just try to do the best you can.
Nisisiyi a fe se isiro die. Isiro ma nnira nigbamiran fun awon enia. Sugbon mo fe ki e sa ipa yin ki e si se iwon ti e le se.

17. If I have 20 Naira and give you 2 Naira, how many naira would I have left? N18.00

Ti mo ba ni ogun Naira, ti mo si fun yin ni naira meji, eelo lo ku si owo mi?
0…....Incorrect
1...…....Correct

Recall

18. Do you remember the three words I told you a few minutes ago?
Nje e ranti awon oro meta ti mo so fun yin ni iwon iseju die sehin?

Oko (Boat) 0……..Incorrect 1……..Correct

Ile (House) 0…..Incorrect 1.....Correct

Eja (Fish) 0…..Incorrect 1.....Correct

Attention and Calculation

19. If one pound of lard costs 10 Naira, how much would 2 pounds of lard cost? How much would 3 pounds of lard cost? What about 4 pounds of lard?

(N20) 0.....Incorrect 1.....Correct

(N30) 0.....Incorrect 1……..Correct

Ti eko agidi kan ba je Naira mewa, elo ni meji yio je? Meta nko? Merin nko?

(N40) 0.….Incorrect 1……..Correct

Orientation to Place

Now I would like to ask some questions about your home, this area.
Nisinsinyi, ma fe bere nipa ile yin ati agbegbe yi.

20. What is the name of this city?
Kini oruko ilu ti a wa yi?
_____
0.....Incorrect 1.....Correct

21 Who is the mayor of this city?
Kini oruko oba ilu yi?
_____
0.....Incorrect 1.....Correct

22. What are two major streets near your home?
Kini oruko titi nla meji ti o wa nitosi ile yin?
_____
0....Incorrect 1.....Correct

23. Where is the city market?
Nibo ni oja nla wa?
_____
0....Incorrect 1.....Correct

24. What is your address?
Kini oruko agbo-ile yin?
0....Incorrect 1.....Correct

_____

Orientation to Time

Now I would like to ask some questions about time.
Nisisinyi ma fe bere nipa igba ati akoko ti a wa yi.

25. What day of the week is it?

Kini ojo oni je ninu ose?

0.....Incorrect
1.....Correct

26. What month is it?

Osu kelo ni a wa yi?

0.....Incorrect
1.....Correct

27. What year is this?

Nje e le so fun mi odun wo ni a wa yi?

0.....Incorrect
1.....Correct

28. What season is it?

Kini igba ti a wa yi? Igba ojo, erun, tabi oye?

0....Incorrect
1.....Correct

29. Did it rain yesterday?

Nje ojo ro lana?

0.....Incorrect
1.....Correct

Language Comprehension - Motor Response

I am going to ask you to carry out some actions so please listen carefully because I will only tell you one time. *[Interviewer - give complete instructions at one time, do not give them step by step.]*

Emi yio ni ki e se awon nkankan. Nitori pe ekan soso ni emi yio so nkan ti mo fe ki e se yi, o se pataki ki e f'eti sile dada.

30. Please nod your head.
E jowo e fi ori yin se apejuwe beni.

0....Incorrect
1.....Correct

31. Please point first to the window and then to the door.
Mo fe ki e koko na owo si ferese, ki e to na owo si ilekun.

0....Incorrect
1.....Correct

[Should the subject not complete the full sequence, then the whole instruction may be repeated to ensure it has been heard and understood.]

32. I'm going to give you a piece of paper. When I do, take the paper in your right hand, fold the paper

in half with both hands, and put the paper down on your lap.

Right Hand 0……..Incorrect
1……....Correct

Folds 0……..Incorrect
1……....Correct

Emi yio fun nyin ni paper (takada) yi. Ti mbati fun yin ni paper na, e fi owo otun yin gba, ki e ka si meji pelu owo yin mejeji, ki e si fi si ori itan yin.

In lap 0……..Incorrect
1…….Correct

Memory - Recall

33. Do you remember my name? *(Close approximation acceptable as correct.)*

0.....Incorrect

Nje e ranti oruko mi? 1.....Correct

Memory

34. Now I will read a short story. I will then ask you to repeat as much of the story as you can remember. I want you to listen very carefully because I want you to try to tell me the whole story with as many details as you can remember.

Nisinsinyi emi yio ka itan kukuru kan fun yin. Emi o si fe ki e so lehin ti emi ba ka tan, gbogbo eyiti e ba ranti ninu itan na. Mo fe ki e f'eti sile daradara, nitori mo fe ki e gbiyanju lati so gbogbo itan na finifini lai fi nkankan sile.

Three children were alone at home and the house caught on fire. A brave man managed to climb in a back window and carry them to safety. Aside from minor cuts and bruises all were well.

Awon omo kekeke meta kan da wa ninu ile. Ile na si gbina. Okunrin akinkanju kan gun ferese ti o wa lehin ile wole, o si ko awon omo meta na kuro ninu ewu. Yato si ibi ti nwon fi pa die, tabi ti nwon fi bo, gbogbo won wa ni ilera.

Now I would like for you to tell me the story in as much detail as possible.

Nisisiyi emi a fe ki e so itan na fun mi, ni ekun rere lai fi apa kankan sile.

1…….....…….....Awon omo meta (3 children)
1…….....…….....Ile gbina (house on fire)
1…...…….....…...Okunrin akinkanju kan (brave man climbed)
1.....O ko awon omo kuro ninu ewu (children rescued)
1……...Yato si ibi ti won fi pa die tabi fi bo (minor injuries)
1…….…….....Gbogbo nwon wa nilera (everyone well)

Total....._____

Stick Design

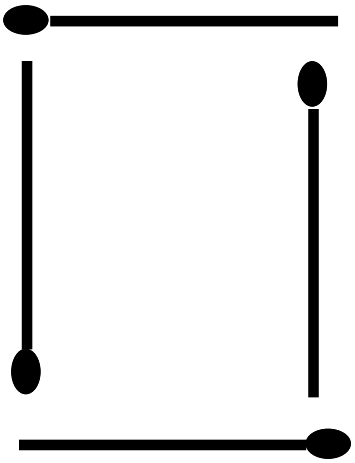
Now I would like you to arrange these match sticks to make this design. Be sure to align the match heads as they appear in the picture. [Demonstrate how to do the Square design. Gesture between your design and the design on the sheet of paper emphasizing how the real match heads are in correct orientation relative to the stimulus. Pick up the matches and have the subject attempt the Square design. Provide no further assistance. Allow approximate 45 seconds for each design].

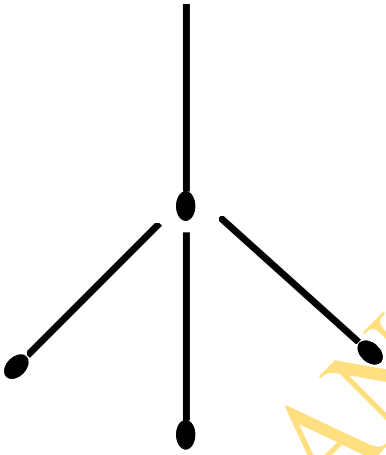
Nisinsiyi mo fe ki e to igi isana wonyi ki e fi se aworan yi. E ri daju pe e to awon ori igi isana yi ki o ba ti aworan yi mu. Ma se apere kan fun yin.

35.	Square	**correct**	**error**
	a. a four sided figure	1	0
	b. rests on a side	1	0
	c. match heads oriented correctly	1	0

36.	Rake	**correct**	**error**
	a. two middle sticks aligned head to toe	1	0
	b. side sticks angle outward from top match head	1	0
	c. match heads oriented correctly	1	0

35. 36.





37. Tremor: Record presence or absence

0…..Absent
1…..Present

38. Remember the story I told you awhile ago. Now I would like for you to tell me as much as you can about it.

Nisisiyi emi a fe ki e tun so itan ti mo so fun yin laipe yi fun mi, ni ekun rere lai fi apa kankan sile.

1…….....…….....Awon omo meta (3 children)
1…….....…….....Ile gbina (house on fire)
1…….....Okunrin akinkanju kan (brave man climbed)
1.....O ko awon omo kuro ninu ewu (children rescued)
1……..Yato si ibi ti won fi pa die tabi fi bo (minor injuries)
1……. .....Gbogbo nwon wa nilera (everyone well)

Total....._____

39. When was the Second World War fought, when salt became very scarce?

Nigbawo ni won ja ogun ajakaye keji, ti iyo won pupo?

0.....Incorrect
1.....Correct

_____

40. Who was the military leader of the Ibos during the Nigerian Civil War fought from 1967 - 1970?

Tani oga ologun ti o je olori awon Ibo nigba ogun abele Nigeria ati Biafra ti nwon ja ni odun mejilelogoji sehin?

0.....Incorrect
1.....Correct

_____

41. Who is the current President of Nigeria?

Kini oruko aare orileede Nigeria nisisiyi? 0.....Incorrect
1.....Correct

_____

42. Who is the current Governor of Oyo State?

Kini oruko gomina ipinle Oyo? 0.....Incorrect
1.....Correct

_____

APPENDIX III

QUALITY OF LIFE MEASURE FOR DEMENTIA PATIENTS USING DEMENTIA QUALITY OF LIFE (DQoL) BY **BRODS ET- AL (1999).**

INSTRUCTIONS: PLEASE ANSWER ALL QUESTIONS BY CHOOSING THE ONE THAT APPLY TO YOU.

NEVER	SELDOM	SOMETIMES	OFTEN	VERY OFTEN
1	2	3	4	5

1 SELF ESTEEM:

Thought and feelings about themselves

A. Feels confident

B. Satisfied with self

C. Accomplished something

D. Makes own decision

NEVER	SELDOM	SOMETIMES	OFTEN	VERY OFTEN
1	2	3	4	5

2. POSITIVE AFFECT/HUMOURS

A. Felt Happy

B. Cheerful

C. Content

D. Hopeful

E. Found something that made you laugh

F. Jokes and laugh with others

NEVER	SELDOM	SOMETIMES	OFTEN	VERY OFTEN
1	2	3	4	5

3. NEGATIVE AFFECT

A. Afraid

B. Lonely

C. Frustrated

D. Embarrased

E. Angry

F. Worried

G. Depressed

H. Nervous

I. Sad

G. Irritated

K. Anxious

NEVER	SELDOM	SOMETIMES	OFTEN	VERY OFTEN
1	2	3	4	5

4. FEELINGS OF BELONGING

A. Felt useful

B. Felt people like you

C. Felt lovable

5. SENSE OF AESTHETICS:

NOT AT ALL	A LITTLE	SOMEWHAT	MOSTLY	VERY
1	2	3	4	5

Extent to which you obtained pleasure

from sensory awareness, appreciation of beauty

(Extent of enjoyment

A. Listening to music

B. Listening to sound of nature

C. Watching animals or birds

D. Looking at colourful things

E. Watching clouds or sky

IGBELEWON IGBE AYE AWON AIPENIYE

Aifaramorara	***Mo faramodie***	***Leekookan***	***Nigbakugba***	***Nilemolemo***
1	***2***	***3***	***4***	***5***

I. IBUYI FUN ARA ENI:

Ero ati imo nipa ara won

A. Nini igboya

B. Nini itelorun nipa ara eni

D. Gbigbe ohun kan se

E. Sise ipinnu eni fun ara eni

2. NINI IMORIYA / INUDIDUN:

A. Ni inudidun

B. Ni oyaya

D Nini itelorun

E. Ni ireti

E. Riri ohun kan ti yoo derin-in pani

F. Da apara ki o si rerin-in pelu awon eniyan

3. NINI IMOSILARA TI KO BANI LARA MU:

Aifaramorara	*Mo faramodie*	*Leekookan*	*Nigbakugba*	*Nilemolemo*
1	*2*	*3*	*4*	*5*

A.Eru
B. Dida wa

C. Sisu ni

D. Idojuti

E. Ibinu

F. Idamu

G. Irewesi okan

H. Egbonriri

I. Banuje

J. Irira

K. Igbokan soke/Saniyan

4. NINI IMOLARA NIPA BIBA EGBE PE TO:

Nini imosilara nipa biba egbe pe to

A. Wiwulo

B. Nini imosilara pe awon eniyan feran re

C. Nini ife si awon eniyan/tabi nife si ni

5.IMOSILARA EWA:

Ai fara mo rara	**Mo fara mo die**	**Mo fara mo bee bee**	**Mo fara mo pupo**	**Mo fara gan-an ni**
1	**2**	**3**	**4**	**5**

Bi o se gbadun itaniji nipa imolara

ati imoriri ewa to ni pa

A. Itetisi didun ati iro iseda

B. Wiwo awon eranko ati eye

D. Wiwo awon ohun alarambara olorisirisi awo

E. Wiwo ofurufu ati iwoye ojo

INSTITUTE FOR ADVANCED MEDICAL RESEARCH AND TRAINING (IMRAT)
COLLEGE OF MEDICINE, UNIVERSITY OF IBADAN. IBADAN, NIGERIA.
Telefax: 234-2-2412170; 234-2-2410088 / 3310, 3120, 3114, 3594 Fax: 234-2-2413545
DIRECTOR: Professor Adeyinka G. Falusi, B.Sc. (Hons.), M.Phil., Ph.D.

UI/UCH EC Registration Number: **NIHREC/05/01/2008a**

NOTICE OF FULL APPROVAL AFTER FULL COMMITTEE REVIEW

Re: Effects of Endurance Exercise Programme on Selected Clinical Symptoms and Quality of Life of Patients with Dementia

UI/UCH Ethics Committee assigned number: UI/EC/09/0073

Name of Principal Investigator: Ajayi Babatunde F.

Address of Principal Investigator: Department of Physiotherapy, College of Medicine, University of Ibadan

Date of receipt of valid application: 28/05/2009

Date of meeting when final determination of research was made: **N/A**

This is to inform you that the research described in the submitted protocol, the consent forms, and other participant information materials have been reviewed and *given full approval by the UI/UCH Ethics Committee.*

This approval dates from 23/10/2009 to 22/10/2010. If there is delay in starting the research, please inform the UI/UCH Ethics Committee so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. *All informed consent forms used in this study must carry the* UI/UCH EC *assigned number and duration of* UI/UCH EC *approval of the study.* In multiyear research, endeavour to submit your annual report to the UI/UCH EC early in order to obtain renewal of your approval and avoid disruption of your research.

The National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the UI/UCH EC. *No changes are permitted in the research without prior approval by the* UI/UCH EC *except in circumstances outlined in the Code. The* UI/UCH EC *reserves the right to conduct compliance visit to your research site without previous notification.*

UI/UCH EC
APPROVED
COLLEGE OF MEDICINE

Dr. A. A. Adenipekun,
Chairman, Medical Advisory Committee,
University College Hospital, Ibadan, Nigeria
Vice- Chairman, UI/UCH Ethics Committee
E-mail:uiuchirc@Yahoo.com

sn	GENDER	group	AGE	BP1	BP2	P.R	R.R	WEIGHT	HEIGHT	HIP	WAIST	6MWT	TUG	COG	QOL
1	F	1	80	150	90	66	20	58	1.59	91	87	355.9	9.28	54	124
1	F	2	80	100	60	64	20	58	1.59	90	86	330.9	7.82	51	110
1	F	3	80	110	60	66	22	58	1.59	87	81	311.9	12.13	56	122
1	F	4	80	110	60	66	22	58	1.59	87	81	311.9	12.13	39	86
2	F	1	90	170	100	104	24	52	1.66	100	77	132.9	31	55	129
2	F	2	90	160	90	100	22	60	1.66	103	76	115.1	30.12	55	129
2	F	3	90	150	90	90	22	57	1.66	102	74	120.1	30	63	127
2	F	4	90	160	90	82	26	57	1.66	90	71	108	23.84	60	133
3	F	1	78	130	80	90	20	55	1.51	97	93	330.6	8.35	57	115
3	F	2	78	140	90	94	24	55	1.51	96	90	360	10	54	113
3	F	3	78	130	70	80	18	55	1.51	90	84	342	8.58	63	130
4	F	1	83	160	90	76	16	57	1.58	92	92	343	8.12	58	108
4	F	2	83	160	70	90	18	57	1.58	96	88	391.8	7.12	64	132
4	F	3	83	160	70	90	18	57	1.58	96	88	391.8	7.12	61	135
4	F	4	83	130	70	72	18	60	1.58	92	85	362.4	9.68	62	135
5	F	1	80	150	90	66	20	58	1.59	91	87	355.9	9.28	54	124
5	F	2	80	100	60	64	20	58	1.59	90	86	330.9	7.82	51	110
5	F	3	80	110	60	66	22	58	1.59	87	81	311.9	12.13	56	122
5	F	4	80	110	60	66	22	58	1.59	87	81	311.9	12.13	39	86
6	F	1	90	170	100	104	24	52	1.66	100	77	132.9	31	55	129
6	F	2	90	160	90	100	22	60	1.66	103	76	115.1	30.12	55	129
6	F	3	90	150	90	90	22	57	1.66	102	74	120.1	30	63	127
6	F	4	90	160	90	82	26	57	1.66	90	71	108	23.84	60	133
7	F	1	85	120	80	80	24	68	1.53	106	103	309.2	8.94	65	114
7	F	2	85	120	70	70	24	70	1.53	108	102	324	8.18	68	130
7	F	3	85	120	70	72	24	70	1.53	104	101	297	11.3	68	125
7	F	4	85	120	70	72	24	70	1.53	104	101	297	11.3	63	118

8	F	1	86	120	70	80	18	48	1.5	90	84	324	9.12	58	109
8	F	2	86	100	50	82	18	50	1.5	89	85	281.8	8.33	62	93
8	F	3	86	110	60	72	18	53	1.5	88	81	306	9.48	61	123
8	F	4	86	110	60	72	18	51	1.5	90	78	332	9.61	58	126
9	F	1	83	170	80	84	22	63	1.55	96	94	336.2	8.2	73	116
9	F	2	83	140	70	82	24	64	1.55	97	98	324	8.21	76	135
9	F	3	83	150	70	78	22	67	1.55	101	101	318.2	9.12	75	139
9	F	4	83	180	70	86	22	67	1.55	98	96	350	7.73	75	135
10	F	1	75	130	90	76	16	71	1.57	99	99	412.5	8.15	50	111
10	F	2	75	140	80	68	16	70	1.57	106	90	410	8.2	46	122
10	F	3	75	140	90	60	18	70	1.57	98	91	364.1	8.97	58	121
10	F	4	75	140	70	58	16	71	1.57	98	82	342	8.65	56	126
11	F	1	78	160	90	78	24	72	1.59	114	104	243.9	17.01	52	100
11	F	2	78	170	90	68	24	74	1.59	104	95	208	12.06	53	128
11	F	3	78	170	90	68	24	74	1.59	104	95	208	13	50	128
11	F	4	78	170	90	72	24	75	1.59	108	93	243.5	15.58	56	86
12	F	1	85	120	80	80	24	68	1.53	106	103	309.2	8.94	65	114
12	F	2	85	120	70	70	24	70	1.53	108	102	324	8.18	68	130
12	F	3	85	120	70	72	24	70	1.53	104	101	297	11.3	68	125
12	F	4	85	120	70	72	24	70	1.53	104	101	297	11.3	63	118
13	F	1	86	120	70	80	18	48	1.5	90	84	324	9.12	58	109
13	F	2	86	100	50	82	18	50	1.5	89	85	281.8	8.33	62	93
13	F	3	86	110	60	72	18	53	1.5	88	81	306	9.48	61	123
13	F	4	86	110	60	72	18	51	1.5	90	78	332	9.61	58	126
14	M	1	86	180	100	76	18	55	1.69	93	95	450	7.79	52	110
14	M	2	86	130	70	64	16	59	1.69	92	88	300	8	63	121
14	M	3	86	150	70	80	18	62	1.69	90	92	387.1	7.96	63	125
14	M	4	86	170	90	70	18	60	1.69	90	94	378	8.81	66	133

15	F	1	78	140	80	76	24	51	1.6	89	85	335.1	8.22	66	106
15	F	2	78	120	70	78	24	52	1.6	90	86	342	8.13	59	123
16	F	1	70	150	70	76	26	59	1.58	94	87	333.3	9.64	58	142
17	M	1	68	140	60	60	22	44	1.67	70	68	396	8.4	50	111
17	M	2	68	130	60	80	24	44	1.67	78	67	407.8	8.03	58	127
17	M	3	68	120	60	74	26	44	1.67	75	70	432	10.34	63	119
17	M	4	68	120	60	74	26	44	1.67	75	70	432	10.34	63	119
18	F	1	78	170	80	66	24	73	1.61	102	99	360	7.02	63	127
19	F	1	70	110	60	62	18	60	1.59	89	83	324	11.13	57	104
19	F	2	70	100	50	64	20	62	1.59	97	86	324	9.95	61	127
19	F	3	70	100	50	62	18	61	1.59	98	89	320.8	11.16	64	127
19	F	4	70	90	50	60	18	61	1.59	95	82	310.7	10.39	64	127
20	F	1	67	120	70	76	18	52	1.5	82	79	416.4	7.5	61	115
20	F	2	67	100	60	74	16	48	1.5	84	73	308.7	7.51	63	127
20	F	3	67	100	60	62	14	49	1.5	89	75	221.7	7.1	74	124
20	F	4	67	100	60	62	14	49	1.5	86	151	220	7.1	70	128
21	F	1	75	150	80	70	26	48.5	1.51	89	85	389.5	10	60	117
21	F	2	75	130	70	74	24	47	1.51	89	82	385.8	9.48	64	116
21	F	3	75	130	70	66	26	49	1.51	89	85	414	9.13	64	127
21	F	4	75	140	80	66	26	47	1.51	86	82	402.2	9.32	61	99
sn	GENDER	group	AGE	BP1	BP2	P.R	R.R	WEIGHT	HEIGHT	HIP	WAIST	6MWT	TUG	COG	QOL
22	F	1	80	120	50	72	18	49	1.7	80	76	325.8	10.51	62	122
22		2	80	100	50	78	18	47	1.7	77	72	348.3	10.01	66	126
22	M	3	80	100	50	72	16	46	1.7	79	73	396	10.53	77	77
22	M	4	80	100	50	64	16	47	1.7	80	70	324	10.81	73	98
23	F	1	70	140	70	72	18	58	1.57	95	85	381.3	8.86	68	116
23	F	2	70	130	60	82	22	60	1.57	95	95	368.5	8.43	71	127
23	F	3	70	140	70	76	20	56	1.57	97	93	381.5	9.57	75	110

23	F	4	70	140	70	76	20	56	1.57	97	93	381.5	9.57	74	110
24	M	1	76	140	90	80	18	84	1.72	102	102	403.7	7.05	63	123
24	M	2	76	130	80	84	20	82	1.72	104	106	459.2	7.49	72	114
24	M	3	76	130	80	80	16	83	1.72	106	104	380	7.54	67	127
24	M	4	76	130	80	80	16	83	1.72	106	104	380	7.54	67	127
25	F	1	75	200	100	100	20	34	1.44	79	69	335	8.03	37	90
25	F	2	75	160	70	98	24	34	1.44	75	68	280	9.29	41	78
25	F	3	75	170	90	126	26	34	1.44	80	65	291.2	9.92	41	111
26	F	1	67	160	90	84	16	49	1.61	84	76	373.7	7.1	60	123
26	F	2	67	140	80	100	16	49	1.61	85	82	406.5	7.47	55	120
27	F	1	78	110	60	74	20	45	1.47	86	70	335.1	8.4	50	119
27	F	2	78	100	60	74	20	45	1.47	85	75	389.1	8.81	50	112
27	F	3	78	170	90	55	24	58	1.65	83	79	382.2	8.33	44	99
28	F	1	65	160	90	80	22	77	1.52	114	105	324	8.87	79	104
28	F	2	65	140	80	74	20	80	1.52	116	107	306	7.11	74	108
29	M	1	87	170	80	74	24	56	1.72	85	77	361	8.74	50	121
29	M	2	87	170	80	64	20	56	1.72	89	79	320.5	7	49	117
29	M	3	87	140	70	62	20	58	1.72	86	79	352.5	7.79	62	128
29	M	4	87	140	70	80	20	56	1.72	84	74	360	7.8	63	141
30	F	1	83	170	80	84	22	63	1.55	96	94	336.2	8.2	73	116
30	F	2	83	140	70	82	24	64	1.55	97	98	324	8.21	76	135
30	F	3	83	150	70	78	22	67	1.55	101	101	318.2	9.12	75	139
30	F	4	83	180	70	86	22	67	1.55	98	96	350	7.73	75	135
31	F	1	75	130	90	76	16	71	1.57	99	99	412.5	8.15	50	111
31	F	2	75	140	80	68	16	70	1.57	106	90	410	8.2	46	122
31	F	3	75	140	90	60	18	70	1.57	98	91	364.1	8.97	58	121
31	F	4	75	140	70	58	16	71	1.57	98	82	342	8.65	56	126
32	F	1	75	130	80	72	22	44	1.61	77	67	354.5	7.28	47	110

32	F	2	75	130	80	100	28	45	1.61	82	72	324	9.82	47	110
33	F	1	78	160	90	78	24	72	1.59	114	104	243.9	17.01	52	100
34	F	1	80	170	90	68	24	74	1.59	104	95	208	12.06	53	128
35	F	1	78	170	90	68	24	74	1.59	104	95	208	15	50	128
35	F	2	78	170	90	72	24	75	1.59	108	93	243.5	15.58	56	86
36	F	1	79	150	80	78	22	56	1.54	91	86	350.4	9.7	73	130
36	F	2	79	160	80	74	18	53	1.54	89	85	369.5	7.15	65	137
36	F	3	79	160	80	74	18	53	1.54	89	85	369.5	7.15	65	137
36	F	4	79	180	80	58	20	56	1.54	91	87	342	8.89	73	145
37	F	1	83	140	70	88	20	37	1.6	78	62	436.6	8.01	54	133
37	F	2	83	140	60	90	20	37	1.6	79	61	387	8.01	68	131
37	F	3	83	140	70	80	20	39	1.6	75	60	396	8.02	68	127
37	F	4	83	160	60	82	22	37	1.6	73	60	409	8.85	73	141
38	F	1	80	110	60	70	22	51	1.49	89	90	333.9	7.8	70	116
38	F	2	80	130	50	62	22	52	1.49	89	89	282.8	8	68	110
39	M	1	87	110	70	58	20	52	1.69	76	73	400.5	9.15	79	137
39	M	2	87	110	70	68	22	56	1.69	80	78	378	10.64	69	122
39	M	3	87	110	70	62	22	54	1.69	82	77	327	8.04	71	139
39	M	4	87	110	70	68	22	56	1.69	80	78	378	10.64	70	121
40	M	1	67	100	50	70	20	46	1.65	73	68	336.2	8.56	65	120
40	M	2	67	100	60	76	16	45	1.65	82	70	305	9.68	74	113
40	M	3	67	110	60	68	18	47	1.65	81	76	315.2	10.83	74	129
41	F	1	67	160	70	90	26	45	1.62	78	71	371.3	7.88	59	98
41	F	2	67	150	70	92	28	46	1.62	76	71	411.6	7.36	63	124
41	F	3	67	150	70	96	22	45	1.62	80	70	379.6	9.24	60	110
41	F	4	67	150	70	92	28	46	1.62	76	71	411.6	7.36	60	121
42	F	1	75	90	70	106	68	50	1.46	88	88	212.8	15.01	56	114
42	F	2	75	130	60	108	22	50	1.46	91	90	234	12.56	66	127

42	F	3	75	110	70	96	26	50	1.46	90	90	225.4	11.14	65	126
42	F	4	75	110	70	80	28	48	1.46	91	90	224.8	12.35	63	114
43	F	1	67	170	90	64	18	69	1.69	95	88	325.7	8.15	54	117
43	F	2	67	170	90	60	18	69	1.69	97	85	317	8.37	64	98
43	F	3	67	170	100	56	20	69	1.69	98	87	294.2	10.47	69	103
43	F	4	67	160	100	64	16	68	1.69	99	82	297.8	8.31	66	121
44	M	1	86	170	90	70	18	60	1.66	90	94	378	8.81	65	133
45	F	1	85	110	50	84	14	55	1.51	92	85	296.4	10.53	54	127
46	F	1	80	180	80	70	22	43	1.46	87	83	347.4	10.53	45	127
46	F	2	80	140	70	64	20	44	1.46	87	83	432.9	9.93	42	127
46	F	3	80	130	60	64	22	43	1.46	88	75	389.65	10.25	42	91
47	F	1	70	140	80	60	20	51	1.54	86	83	348	9.51	61	127
47	F	2	70	120	70	72	20	62	1.58	95	93	337.9	7.3	67	110
48	F	1	67	149	70	60	18	73	1.54	110	102	364	7.81	49	108
48	F	2	67	120	60	74	20	72	1.54	106	97	352.8	8.07	45	119
48	F	3	67	120	70	60	16	71	1.54	102	96	378	7.62	60	102

sn	EXERCISE GENDER	Group	AGE	BP1	BP2	P.R	R.R	WEIGHT	HEIGHT	HIP	WAIST	6MWT	TUG	COG	QOL
1	F	1	65	170	100	78	20	36	1.66	80	71	324	7.3	54	102
1	F	2	65	110	70	68	16	39	1.66	81	65	334.3	7.96	59	120
1	F	3	65	140	80	66	18	40	1.66	72	67	351.8	7.97	58	114
1	F	4	65	140	80	70	18	40	1.66	77	68	324	7.45	59	125
2	F	1	70	190	110	62	18	77	1.56	105	100	381.9	8.03	60	111
2	F	2	70	150	90	62	18	75	1.56	101	94	324	8.06	64	128
2	F	3	70	150	90	54	14	75	1.56	100	96	375.6	8.06	63	129
2	F	4	70	130	70	66	14	75	1.56	100	97	325.5	7.77	65	131
3	F	1	78	140	90	78	20	61	1.57	97	92	310	7.31	64	100
3	F	2	78	140	90	70	16	60	1.57	96	99	400.2	7.1	64	126

4	F	1	85	160	100	78	26	43	1.56	83	80	290.1	10.2	47	97
5	M	1	77	120	60	62	12	46	1.63	79	71	321.9	10.08	67	121
5	M	2	77	120	60	60	12	46	1.63	81	71	325.5	8.43	74	142
5	M	3	77	130	60	56	12	46	1.63	77	68	380	8.96	80	127
6	F	1	80	140	90	86	28	35	1.53	79	80	329	10.85	59	100
6	F	2	80	120	60	86	16	36	1.53	79	66	301	8.25	58	114
6	F	3	80	120	60	84	16	37	1.53	73	66	317.5	10.05	69	119
6	F	4	80	150	80	80	16	37	1.53	80	67	321.5	8.44	68	134
7	F	1	79	110	70	64	14	35	1.56	76	69	378	8.31	58	104
7	F	2	79	90	60	62	16	35	1.56	77	66	295	8.2	70	124
7	F	3	79	90	50	64	16	37	1.56	71	67	350.1	7.33	68	117
7	F	4	79	100	60	68	14	37	1.56	72	67	340.2	7.79	69	126
8	F	1	89	150	80	64	18	47	1.51	87	84	310.3	10.85	51	96
8	F	2	89	160	80	58	18	50	1.51	88	80	315	9.99	61	107
8	F	3	89	160	70	58	20	51	1.51	85	81	310	9	44	110
8	F	4	89	160	80	60	22	51	1.51	85	80	369.5	9.64	49	109
9	F	1	83	160	80	64	20	46	1.56	87	73	402	6.6	55	102
9	F	2	83	150	80	66	16	48	1.56	87	74	353	7.46	64	129
9	F	3	83	130	80	68	18	50	1.56	88	74	400	8.33	67	129
10	F	1	80	130	80	74	24	45	1.5	93	98	108	20.8	42	101
11	F	1	77	180	90	80	20	65	1.59	105	106	360	7.53	47	101
11	F	2	77	140	80	76	16	67	1.59	103	89	334.5	7.4	45	107
11	F	3	77	110	70	70	18	68	1.59	91	84	350.2	8.05	59	104
12	F	1	65	150	80	74	20	85	1.74	114	106	432	11.47	71	113
12	F	2	65	110	60	84	20	84	1.74	113	105	352.2	8.78	72	95
12	F	3	65	110	70	72	20	84	1.74	110	106	342	9.71	78	120
12	F	4	65	90	60	80	20	86	1.74	112	101	298.5	8.3	78	118
13	F	1	73	130	80	98	18	86	1.56	121	91	342	8.48	41	103

13	F	2	73	130	80	84	20	85	1.56	112	96	325.3	8.27	46	114
14	F	1	81	180	70	72	28	60	1.58	93	90	327	10.2	57	84
14	F	2	81	150	70	62	24	60	1.58	101	87	328.6	8.25	65	103
14	F	3	81	150	70	62	24	60	1.58	101	87	328.6	10.2	73	110
14	F	4	81	150	80	60	22	60	1.58	97	82	348.4	9.35	69	90
15	F	1	82	140	80	82	16	65	1.62	95	82	360	8.51	59	95
15	F	2	82	110	70	78	18	65	1.62	93	87	330.3	8.51	59	122
16	F	1	85	140	90	90	28	59	1.64	98	88	282.6	6.9	57	102
16	F	2	85	120	80	78	18	61	1.64	95	92	301.8	8.33	60	125
16	F	3	85	120	70	84	20	63	1.64	97	91	306	10.35	66	125
16	F	4	85	120	80	86	18	61	1.64	92	84	283.1	10.64	60	133
17	F	1	75	150	90	76	24	47	1.54	81	83	280.5	9.43	62	93
17	F	2	75	120	70	72	18	45	1.54	80	85	329.2	7.47	65	136
17	F	3	75	120	80	76	16	45	1.54	81	78	325.2	8.41	68	136
17	F	4	75	110	60	80	18	46	1.54	79	77	313.8	8.7	63	144
18	F	1	89	150	90	104	22	42	1.56	86	83	139.7	28.36	54	86
18	F	2	89	160	100	100	22	44	1.56	84	76	171.6	14.33	45	123
18	F	3	89	130	80	106	22	45	1.56	82	74	211.7	13.99	49	123
18	F	4	89	170	100	98	16	45	1.56	80	75	190.1	15.96	40	123
19	F	1	85	160	90	90	22	55	1.5	88	98	294.2	13.68	62	101
19	F	2	85	180	90	84	22	53	1.5	96	98	292.3	9.39	65	126
19	F	3	85	160	70	74	20	52	1.5	93	89	319	9.94	62	117
19	F	4	85	120	80	76	16	55	1.5	96	96	234	11.38	66	131
20	M	1	91	170	110	78	24	50	1.72	85	80	123.4	21.8	39	113
20	M	2	91	130	80	88	26	50	1.72	85	81	180	13.49	45	99
20	M	3	91	140	80	76	26	55	1.72	81	80	188.6	16.74	44	121
20	M	4	91	130	70	84	26	55	1.72	82	81	167.6	15	50	114
21	F	1	89	130	90	84	20	43	1.69	85	69	137	22.56	31	109

21	F	2	89	110	70	78	20	45	1.69	85	70	144	17.29	40	102
21	F	3	89	140	80	84	20	45	1.69	79	69	180	17.93	31	104
21	F	4	89	120	80	78	18	45	1.69	77	64	126	18.55	29	102
22	F	1	87	170	110	100	24	49	1.59	91	89	294	10.34	51	100
22	F	2	87	140	90	98	22	50	1.59	93	88	282.5	7	64	126
22	F	3	87	160	90	98	24	51	1.59	93	87	265.4	8.22	61	122
22	F	4	87	160	100	100	22	51	1.59	90	82	306	8.48	60	145
23	F	1	75	160	90	66	18	57	1.52	91	84	342	8.85	51	125
23	F	2	75	160	80	66	18	58	1.52	91	84	380	8.53	49	133
23	F	3	75	140	80	78	18	56	1.52	97	93	378	7.84	50	119
24	F	1	79	110	70	64	14	35	1.56	76	69	378	8.31	58	104
24	F	2	79	90	60	62	16	35	1.56	77	66	295	8.2	70	124
sn	GENDER	group	AGE	BP1	BP2	P.R	R.R	WEIGHT	HEIGHT	HIP	WAIST	6MWT	TUG	COG	QOL
24	F	3	79	90	50	64	16	37	1.56	71	67	350.1	7.33	68	117
24	F	4	79	100	60	68	14	37	1.56	72	67	340.2	7.79	69	126
25	F	1	81	180	70	72	28	60	1.58	93	90	327	10.2	57	84
25	F	2	81	150	70	62	24	60	1.58	101	87	328.6	8.25	65	103
25	F	3	81	150	80	60	22	60	1.58	97	82	348.4	9.35	69	90
25	F	4	81	150	70	70	26	62	1.58	101	98	378	8.54	72	115
26	F	1	85	140	90	90	28	59	1.64	98	88	282.6	6.9	57	102
26	F	2	85	120	80	78	18	61	1.64	95	92	301.8	8.33	60	125
26	F	3	85	120	70	84	20	63	1.64	97	91	306	10.35	66	125
26	F	4	85	120	80	86	18	61	1.64	92	84	283.1	10.64	60	133
27	F	1	75	150	90	76	24	47	1.54	81	83	280.5	9.43	62	93
27	F	2	75	120	70	72	18	45	1.54	80	85	329.2	7.47	65	136
27	F	3	75	120	80	76	16	45	1.54	81	78	325.2	8.41	68	136
27	F	4	75	110	60	80	18	46	1.54	79	77	313.8	8.7	63	144
28	F	1	84	150	80	80	20	48	1.53	86	84	321.5	11.95	74	111

28	F	2	84	130	70	76	18	47	1.53	85	82	309.5	7.53	65	119
28	F	3	84	130	70	78	18	48	1.53	82	80	331.4	8.54	68	120
28	F	4	84	130	60	78	20	47	1.53	84	81	327.5	8.48	71	134
29	F	1	87	170	110	100	24	49	1.59	91	89	294	10.34	51	100
29	F	2	87	140	90	98	22	50	1.59	93	88	282.5	7	64	126
29	F	3	87	160	90	98	24	51	1.59	93	87	265.4	8.22	61	122
29	F	4	87	160	100	100	22	51	1.59	90	82	306	8.48	60	145
30	F	1	85	160	90	90	22	55	1.5	88	98	294.2	13.68	62	101
30	F	2	85	180	90	84	22	53	1.5	96	98	292.3	9.39	65	126
30	F	3	85	160	70	74	20	52	1.5	93	89	319	9.94	62	117
30	F	4	85	120	80	76	16	55	1.5	96	96	234	11.38	66	131
31	F	1	84	150	80	80	20	48	1.53	86	84	321.5	11.95	74	111
31	F	2	84	130	70	76	18	47	1.53	85	82	309.5	7.53	65	119
31	F	3	84	130	70	78	18	48	1.53	82	80	331.4	8.54	68	120
31	F	4	84	130	60	78	20	47	1.53	84	81	327.5	8.48	71	134
32	F	1	83	120	60	68	22	46	1.44	90	92	298.2	8.83	70	120
32	F	2	83	120	60	68	24	45	1.44	95	87	330.2	9.06	51	103
33	F	1	83	140	70	80	20	48	1.5	92	83	302	11.57	51	102
33	F	2	83	140	70	80	20	48	1.5	92	83	302	11.57	51	102
33	F	3	83	140	70	69	16	52	1.5	83	77	252	11.43	50	118
33	F	4	83	120	60	76	16	50	1.5	85	76	263.7	11.3	47	116
34	F	1	75	150	90	76	18	46	1.52	87	77	342	7	68	140
34	F	2	75	140	80	70	18	46	1.52	86	93	346.5	6	69	140
34	F	3	75	120	70	72	16	47	1.52	88	84	356.7	7.7	60	123
35	F	1	72	160	90	64	20	45	1.5	86	82	369.8	8.1	58	108
36	F	1	69	160	60	62	22	47	1.5	81	80	342	6	72	131
36	F	2	69	140	60	58	22	47	1.5	80	79	372.7	6	74	123

37	F	1	73	180	90	126	20	43	1.49	83	74	318	12	42	123
37	F	2	73	150	80	106	18	44	1.49	83	70	337.3	10.4	40	125
37	F	3	73	170	80	106	18	45	1.49	79	69	342	8.47	39	127
37	F	4	73	190	90	128	20	43	1.49	76	67	348	9.08	44	143