

CHAPTER ONE

INTRODUCTION

Background to the study

Exercise describes movement of the body produced by skeletal muscles that results in energy expenditure through contractions of the muscles targeted for health benefits, competition, pleasure or leisure and to achieve physical fitness. Exercise is a subset of physical activity that is used to determine the health and performance physical fitness of not only an individual but also all categories of people and special population including stroke patients. Physical fitness is the attributes for determining capacity of the body to function efficiently well in work and relaxation activities in order to be healthy and to resist diseases (Shehu, Onasanya, Onigbinde, Ogunsakin & Baba, 2013; Sanderson, Hayes, Johnson, Kramer, Carter, Jarvis, Brazzelli & Mead, 2020),

Thompson, Buchner, Pina, Balady and Williams (2003) defined exercise as a subsection of physical activity that is planned, organized, repetitive and purposeful so as to achieve enhancement or preservation of physical fitness of an individual. Richard and Melisa (2015) described exercise as any form of physical activity that is planned, structured and repetitive for the purpose of preparing any part of the body either for health or performance. Regular participation in physical activity and exercise as habit or lifestyle attitude is a major way to prevent metabolic syndrome that leads to several diseases including stroke (Jonathan, 2003).

Studies have proven that exercise is one of the most important means to improve the quality of life generally in achieving health and wellness (Danilo, Leonardo & Andrey, 2008; Dominic, 2005) while non participation predisposes an individual to risk of hypokinetic diseases such as stroke and other cardiovascular challenges. The long term beneficial effects of exercise are found to improve health, maintain fitness and central aspect of medical rehabilitation (Hamzat & Ekechukwu, 2015).

Engagement in aerobic exercise according to Richard and Malissa (2015) which is any moderate-intensity physical activity that can last long for several minutes helps in improving cardiorespiratory fitness and general well-being of an individual. However, Bumgarner (2018) explained that exercise prescription guidelines on the amount of physical activities recommended to maintain and promote good health should be 30 minutes of moderate-intensity aerobic exercise/physical activity in a day for five days a week or a total of two hours and 30 minutes per week, if the benefits must be derived. This therefore implies that it is impossible to achieve good health and wellness without participating actively in physical exercise. Talabi (2016) corroborated that for anyone to enjoy good health status, consistent engagement in adequate physical exercise must be maintained.

Wellness defines multidimensional wellbeing of an individual not limiting it to physical, social and mental wellbeing alone but cross cutting into and individual socio economic and environmental interrelationships. Corbin, Pangrady and Robert (2011) defined wellness as a state of health in which an individual progresses towards a higher level of functioning thereby achieving an optimum balance between the internal and external environment. However, physical health is central to wellness components and a significant factor that contributes to quality of life in stroke survivors.

Quality of life (QoL) of an individual is a closely-held conviction or how individual see life position with regards to his/her way of life and worth frameworks of job which has a relationship with the individual objectives, assumptions, principles and worries of such individual (Madden, Hopman, Bagg, Verner & O'Callaghan, 2006) within the community of residence. In other words, Quality of Life is the degree of satisfaction that an individual enjoys and experiences in everyday life as opposed to financial or material well-being. Costanza and his colleagues summarized QOL as the contentment an individual enjoys everyday, measurable by socio-economic, pain perception,

activity of daily living, work ability, mobility/motor, self-esteem and psycho-emotional stability (Costanza, Fisher, Ali, Beer, Bond, Boumans,...Snapp, (2008); Ventegelt, Merrick & Anderson, 2003).

A healthy individual is one that has a balance among physical health, social health as well as mental/psychological health. World Health Organization (WHO, 2016) expressed health as a state of complete physical, mental, and social well-being not merely the absence of disease or infirmity. By implication, healthy individual is not determined by long time without sickness but might have inherent risks which later manifest as in stroke and other cardiovascular diseases like cardiac arrest among others. WHO's definition of health implies that dimension of health and its effects on body indicate the estimation of wellbeing not usually the absence of diseases and it can be assessed by measuring the improvement in the quality of life in relation to health care (World Health Organization, 2004).

Quality of life is usually one of the indices that are often affected in stroke survivors due to the adjoining disabilities and functional incapacities. Zygfryd (2006) referred to quality of life as a current issue accepted to have two principal aspects. These include: internal aspect (certain personal traits and skills that enable the human being to take individual, autonomous actions) and the external factor (the environmental conditions of the individual's life). WHO dichomised Quality of life generally as six domains which evolves around physical condition, mental condition, self-reliance, social relationships, environment, psychological and religion beliefs (World Health Organization Quality of Life (WHOQOL) 2012). This definition takes into consideration Patient's perspective on QOL as central which encompasses personal assessment of physical health status based on physical functional ability, psychological, social functions, mood, companionship, and recreational activities.

Therefore, consideration of the concept of wellness puts individual's perception at the core of the conceptualization of QOL and consequently making it subject-bound or entirely personal.

Stroke is a systemic disease which directly impairs QoL of the victim or patient. Stroke is a condition caused by an interruption of blood flow to the brain that leads to the death of brain cells. This results to loss of function and it is always on the contralateral side of the affected hemisphere, resulting in range of focal neurological deficits that last longer than 24 hours (Fawcus, 2000). Stroke, otherwise called 'cerebrovascular accident (Adedoyin & Adesoye, 2005) is a condition that creates remarkable circumstances, affects the survivors Health-Related Quality Of Life (HRQOL) including changes in physical and emotional functioning, memory and thinking, socialization, and communication. Suitable evaluation of post-stroke HRQOL is important in order to understand the complete impact of the stroke (Moon, Kim, Kim, Won, & Kim, 2004).

Cerebrovascular accident is predominantly central to the world of the elderly and cuts across diverse occupation or professions (Adedoyin & Adesoye, 2005), even class or creed whether literate or non literate. Research has established that stroke is a global health problem and the third largest killer in industrialized or developed countries after heart disease (Amman, Ruud, Knols, Pierrette, Rgtob, de Bie & Eling, 2014) as well a major challenge of other nations like Africa. Amman, et al., (2014) added that also in developing nations, stroke is also becoming prevalent and conformed to be a major cause of physical disability in people over 60 years of age. Ovbiagele, Goldstein, Hidashida, Howard, Johnston and Khaviou, (2013) as well as Feigin, Lawes and Bennett, (2003) reported stroke as one of the most common chronic conditions seen in older adults the incidence approximately doubling each decade after the age of 55 years. The incidence of stroke in the world population is becoming more alarming with a yearly 15 million of the world population of victim of stroke with five million of death recorded due to the gravity of the conditions; and five million of the

yearly victims having permanent disability (World Health Organisation, 2002; DiCarlo, 2009). Mackay and Mensah (2004) reported also that Ischemic heart disease and stroke ranked first and second among the twenty-five leading causes of death in 1990. Stroke/cerebrovascular disease as a major challenging diseases, might likely maintain the ranks in 2020 or further (Dominic, Ojo & Adedoyin, 2017) with the current situations of sedentariness (Dominic, Seidina, Williams, Oyerinde, Olaitan, & Onifade, 2017), dependence on technology labour devices to replace physical activity and work, long hours of sitting, computer usage (Dominic, Seidina, Williams, Oyerinde, Olaitan & Onifade, 2018), inactivity after retirement (Ojo, & mohammed, 2013) and television viewing (Cuthbertson, et al., 2019) among others if lifestyle behaviours are not modified to reduce the above and increase positive active lifestyle.

The presence of CVD risk factors and rapid industrialization in Sub-Sahara Africa (SSA) makes non-communicable diseases such as cancer, diabetes mellitus, asthma and CVD an emerging problem. Sub-Sahara Africa carries double burden of infectious and chronic disease (Yusuf, Reddy, Ounpun & Anand, 2001; Mudie, Tan, Kendall, Juliet, dos-Santo-Silva, Quint, Smeeth, Cook,...& Perel. 2019). However, according to Yusuf et al., (2001) the incidence of CVD in Sub-Sahara Africa is likely to become higher than that of the developed nations by 2020. The issue of COVID-19 pandemic has further reduced activity lifestyle, decreased human relationships, increase sedentary activity and lifestyle compounding the CVD and stroke challenges even today. Yuyun, Sliwa, Kengne, Mocumbi and Bukhmann (2020) reported that though age –adjusted CVD mortality rate in Sub-Saharah Africa are low compared with some high income countries but there is about 50% increase in CVD death and even among younger ages with high number of disability adjusted lifestyle, due to stroke, hypertensive heart disease with Ischemic heart disease (Owolabi, et al., 2018; Yuyum, et al., 2020).

Majority of stroke survivors usually live with residual physical impairment which may lead to a sedentary lifestyle and resultant secondary complication (Calmel, Degache, Courbon, Roche, Ramas, Fayolle-Minon & Devillard, 2011). World Health Organization (2010) projected stroke and heart disease to be the major cause of death and disability by 2020 and even beyond based on current worldwide challenges and burden of diseases (Yuyum, et al., 2020). In spite of the fact that approximately 14% of stroke survivors attain a full recovery in physical function but 25% to 50% will need at least some assistance with daily living activities as a result of severe long term of partial paralysis and about 5% who eventually die of the condition (Mackay & Mensah, 2004). Consequently, disability to carry out activities is general to stroke survivors mostly among the elderly (Roth, Elliot, Harvey, & Semik, 2001; Anwer & Alghadir, 2020). The majority of recurring happenings to survivors of stroke are recurrent episodes of strokes, at least for the first several years (Vickrey, Rector, Wickstrom, 2002). Recurrent stroke and cardiac disease are the leading causes of mortality in stroke survivors (Gordon, Contractor & Leighton, 2001). This calls for intervention studies to curb recurrence, disability and loss of functions as well as promote quality of life and functional ability of stroke survivors.

In Nigeria, Stroke is also a major concern with its prevalence even found among people at their lower fifties from observations as a therapist. The present prevalence of stroke in Nigeria is 1.14 per 1000 Nigerian although the 30-day case death rate is as high as 40% which means 40% of stroke victims die within 30 days (Wahab, 2008; Adeloye, D., Ezejimofor, Y., Auta, A., Mpazanje, R, G., Ezeigwe, N... & Adewole, I. (2019)). Therefore stroke is a condition that needs greater attention for prevention and management. A study done in Ile- Ife, Nigeria by Ojo and Mohammed (2013) found that sedentary older adults from age 55 are at higher risk of CVD especially stroke as well as higher incidence among retirees who do not engage in regular physical activity after

retirement but indulge in sedentary lifestyle. Quality of life improvement and regular physical activity and exercise have been found to be pivotal to preventing stroke. Intervention by improving quality of life of persons who ones had a stroke and are at a risk for a repeated episode due to leading risk factor for stroke (hypertension, that is, blood pressure higher than 140/90mmHg) might save the individul from disaability an even death . Additional risk factors include smoking of tobacco, obesity, high blood pressure, bad cholesterol, diabetes mellitus, earlier Transient Ischemic Attack (TIA) and atrial fibrillation (Donnan, Fisher, Macleod & Davis, 2008). An ischemic stroke is usually caused by obstruction of a blood vessel which is usually blocked by arterial plaque or clot (hematoma) while hemorrhagic stroke is caused by bleeding either directly into the brain (arachnoids) or into the space surrounding the brain (sub-arachnoid) (Feigin, Rinkel, Lawes, Algra, Bennett, van Gijn & Anderson, 2005). Prevention of stroke contains reducing risk factors along with use of aspirin, surgical procedure to open up the arteries to the brain in persons with difficult narrowing and warfarin in those with atrial fibrillation (Donnan, Fisher, Macleod & Davis, 2008). A stroke most often needs emergency care and if identified within three to four and half hours, maybe curable with a medicine that can break down the clot such strokes are possibly preventable such type is known as transient ischemic attack (TIA) (Gomez, 2018).

Recent epidemiological data suggest a significant leveling off of prior declines in stroke mortality rates and a likely rise in stroke occurrence (Gordon, Contractor & Leighton, 2001). Ischemic strokes account for 88% of all strokes while hemorrhagic stroke accounts for only 12%. Majority of stroke victims live with one form of residual deformity or the other with about 2% of them dying during the crises (Goldstein, Adams, Becker, Curt, Philip, Hademenos, Martha, Howard, Howard, Jacobs, Steven, Levine, Mosca, Ralph, Sacco, Sherman, Wolf, Gregory & Members, 2001).

Risk factors for ischemic stroke may be classified into three major risk factors for stroke is non-modifiable risk factors which include age, race, gender, and family history (Ojo & Mohammed, 2013). Furthermore well-documented modifiable risk factors (including previous transient ischemic attack, coronary artery disease, atrial fibrillation, Coronary Artery Disease (CAD); other types of diseases include cardiac arrest, hypertension, cigarette smoking, hyperlipidemia, diabetes mellitus, and sickle cell disease) The less well-documented, potentially modifiable risk factors include physical inactivity, obesity, alcohol abuse, hyperhomocysteinemia, drug abuse, hypercoagulability, hormone replacement therapy, oral contraceptive use, and inflammatory processes (Goldstein, Adams, Becker, Curti, Philip et al, 2001). Since atherosclerosis is the most common underlying cause of ischemic stroke, it is not surprising that all of the major potentially modifiable risk factors for Coronary artery disease (CAD) are included in the above list of stroke risk factors.

A key to stroke prevention is the control of multiple stroke risk factors through comprehensive lifestyle modification and the appropriate use of pharmacological therapy (and carotid endarterectomy) as indicated by Goldstein, Adams, Becker, Curti, Philip et al, (2001) and Becherma, (2019). Current evidence provides a strong rationale for the long-term intensive control of multiple risk factors as an essential strategy to reduce the risk both for recurrent stroke and acute cardiac events in stroke survivors. There is the need to take advantage of these interventions to reduce disability and death associated with stroke and its recurrence.

Physical activity and exercise training have been confirmed to be very effective and is now recommended for cardiovascular diseases for stroke survivors and researches proven it as (Hou, Du, Chen, Li, Yan, Zhou & Zhu, 2018) one important component of a comprehensive stroke risk-reduction program (Pearson, Blair, Daniels, Eckel, Fair & Fortmann, 2002; Hamzat & Ekechukwu, 2015; Becherma, 2019). The effects and benefits of exercise on the cardiovascular system are well

documented which establishes the direct relationship between physical inactivity and cardiovascular mortality. Also, physical inactivity is independent risk factors for developing stroke (Swardfager, 2012). Exercise benefits should be taken advantage of and developing different exercise regimen are necessary to reduce stroke risk factors and improve survivors' quality of life appreciably; hence this study.

Statement of the Problem

Yearly, 15million of the world population fall victim of stroke out of which 5 million of such die due to the conditions and another 5 million are permanently disabled (World Health Organisation, 2002). In Nigeria 1.14 per 1000 Nigerian fall victim of stroke yearly 40% of these victims die within 30 days (Wahab, 2008), Adeloye, Ezejimotor, Auta, Mpazanje, Ezeigwe....& Adewole (2019) reported new cases of stroke are more than stroke survivors relatively in their comparative studies. Many of the previous researches on exercise and health including quality of life dwell more on apparently healthy individuals. Consequently, there is the need to explore the type of exercise that can benefit not so healthy individuals like stroke survivors with a view to improving their quality of life. The researcher observed through interaction with stroke survivors that many of them are dissatisfied with their state of health and general well-being mostly due to low functional ability and poor physical conditioning. This condition predisposed them to a sedentary lifestyle that limits their performance of Activities of Daily Living (ADL), increases the risk for falls, and may contribute to a heightened risk for recurrent stroke and cardiovascular disease which could be effectively minimized if they were exposed to adequate rehabilitative exercises.

Systematic reviews and meta-analysis provide evidence that aerobic exercise and resistive strength training are beneficial to improve aerobic capacity, walking distance, muscle strength and physical function in stroke survivors without necessarily increasing pain and increasing muscle tone in

the affected limbs (Stoller, Velasquez, de Bruin, Knols & Hunt, 2012 ; Veerbeek, Koolstra, Ket, Van-Wegen & Kwakkel, 2011). However, the therapeutic benefit of exercise needs to be explored the more on CVA victims such as stroke survivors.

Since most of the previous studies cited in this introduction concerning physical activity and stroke survivors were not conducted in Nigeria or Africa, there is lack of enough knowledge on the effects of exercise on stroke survivors' QOL particularly as it might be influenced by physiological and environmental differences commonly seen in Nigeria. This study was therefore conducted to investigate how exercise might improve the quality of life with regards to ameliorating pain and increase in functional capability of stroke survivors such that the research outcome may practically help in the formulations of guidelines on exercise programs for stroke survivors in Nigeria.

Objectives of the Study

Main objective:

The main objective of the study was to determine the effect of exercise on quality of life of Stroke patients in Osun State, Nigeria.

The specific objectives of the study were to:

1. investigate the effects of physical exercise on healthy well-being of stroke survivors in Osogbo, Osun-state Nigeria.
2. determine the effects of exercise on the functional capability of stroke survivors in Osogbo, Osun-state Nigeria.
3. determine the effects of exercise on cardiorespiratory endurance (VO_2^{max}) of stroke survivors in Osogbo, Osun-state Nigeria.
4. ascertain the effects of exercise on cardiovascular parameters (Blood pressure and heart rate) of stroke survivors in Osogbo, Osun state Nigeria.

Research Questions

This study tried to address the accompanying research questions.

1. What are the impacts of actual exercise on Quality of Life of stroke survivors in Osogbo, Osun state, Nigeria?
2. Does exercise improve healthy well-being of stroke survivors in Osogbo, Osun-state Nigeria?
3. What are the effects of exercise on functional capability and activities of daily living of stroke survivors in Osogbo, Osun-state Nigeria?
4. What are the effects of exercise on lower and upper limb muscles strength in Osogbo, Osun-state Nigeria?
5. Will exercise reduce pain perception of stroke survivors in Osogbo, Osun-state Nigeria?
6. Will exercise improve cardiovascular variables (Systolic blood pressure, diastolic blood pressure and heart rate) of stroke survivors in Osogbo, Osun-state Nigeria?
7. Will exercise improve cardio-respiratory endurance (VO_2^{max}) of stroke survivors in Osogbo, Osun-state Nigeria?
8. Would physical exercise improve functional ability of stroke survivors in Osogbo, Osun state to relate well with their immediate physical environment?
9. Will Stroke affect the body symmetry of stroke survivors in Osogbo Osun state Nigeria?

Hypotheses

To establish the effect of exercise on quality of life of stroke survivors, hypotheses were formulated and tested.

Main Hypothesis

There is no significant difference in the quality of life of stroke survivors in Osogbo Osun state Nigeria before and after exercise intervention?

Sub-Hypotheses

1. There is no significant difference in healthy well-being of stroke survivors in Osogbo, Osun state Nigeria before and after exercise intervention.
2. There is no significant difference in the functional ability to perform activities of daily living (ADL such as work capacity, performing daily living activities, ability to get around with ease and sufficient energy for everyday life) by stroke survivors in Osogbo, Osun state Nigeria before and after exercise intervention.
3. There is no significant difference in stroke survivors' functional ability before and after exercise intervention in Osogbo, Osun state Nigeria.
4. There is no significant difference in stroke survivors' hamstring (knee flexors) muscle strength before and after exercise interventions in Osogbo, Osun state Nigeria.
5. There is no significant difference in stroke survivors' pain perception before and after exercise intervention in Osogbo, Osun state Nigeria.
6. There is no significant difference in the systolic blood pressure (SBP) of stroke survivors before and after exercise intervention in Osogbo, Osun state Nigeria.
7. There is no significant difference in the diastolic blood pressure (DBP) of stroke survivors before and after exercise intervention Osogbo Osun state Nigeria.
8. There is no significant difference in the diastolic Heart Rate (HR) of stroke survivors before and after exercise intervention Osogbo Osun state Nigeria.

9. There is no significant difference in cardio-respiratory endurance of stroke survivors before and after exercise intervention in Osogbo Osun state Nigeria.
10. There is no significant difference in the stroke survivors' ability to relate well with the environment before and after exercise intervention in Osogbo Osun state Nigeria.

Significance of the Study

This study is significant in the following ways; it will add to the body of existing knowledge in exercise and medical sciences especially in the management of stroke survivors. It will also provide exercise professionals/experts (exercise physiologist and physiotherapist) evidence based fact on the effect of exercise on quality of life of stroke survivors. Furthermore, it will also serve as reference evidence to be used in counseling stroke survivors. This study establishes the exercise protocols that can be used for exercise prescription and in the management of stroke victims especially the experimental group.

Delimitation of the Study

This study was delimited to adult male and female stroke survivors who are already ambulant with or without walking aids, stroke survivors with controlled systolic and diastolic blood pressures, The research design was one group repeated measure pre-test and post-test experimental design. The population was delimited to 21 out-patient stroke survivors in two major hospitals in Osogbo town Osun state; Purposive sampling technique was adopted to select all the 21 participants, aerobic and anaerobic exercises. The standardized instrument was adapted for data collection. The statistical analysis was delimited to descriptive statistics of mean, standard deviation and percentage and inferential statistic of one-way repeated measures ANOVA with alpha level of 0.05 for hypotheses testing.

Limitation of the Study

Due to limited stroke survivors available the number could not be increased. The study captured registered stroke survivors from two main tertiary health institutions in Osogbo, Osun State, Nigeria. Therefore, the finding of this study can only provide insight into exercise recommendations for stroke survivors but not generalizable on the totality of Nigeria.

Operational definition of terms

The following terms used in the study are defined below;

Effects: The word effect means consequences or outcome of something, it also means a thing that is caused or produced by something else. It is also a change which is a result or consequences of an action or other cause.

Exercise: this is any bodily activity that enhances or maintains physical fitness and overall health and wellness.

Stroke: Stroke also known as cerebrovascular accident (CVA), cerebrovascular insult (CVI); a stroke is a brain attack. It can happen to anyone at any time. It occurs when blood flow to an area of brain is cut off or blocked. When this happens, brain cells are deprived of oxygen and begin to die. When brain cells die during a stroke, abilities controlled by that area of the brain such as memory and muscle control are lost.

Quality Of Life: Quality of life simply means contentment with everyday life; the degree of enjoyment and satisfaction experienced in everyday life as opposed to financial or material well-being. It is a highly subjective measure of happiness which is an important component of many life decisions.

Blood pressure: This is the measurement of the pressure, tension or force which the blood uses to flow in the blood vessels (arteries and vein). The first sound heard is called systolic which reflect the

tension in the contraction of the heart; while the second sound is diastolic reflect the tension in relaxation of the heart.

Cardio-respiratory endurance (VO² max): is a measurement of how well your heart, lungs and muscles work together to keep your body active over an extended period of time. Cardio-respiratory endurance is measured by scientist and exercise experts. It is done by testing the air that is breathed out during vigorous exercise. It can also be estimated through different formulas, in this study VO₂max was measured by applying the Uth-Sorensen-Overguard–Pedersen estimation formula which is $VO_2^{max} = 15.3 \times (HR_{max})/HR_{min}$ ml/kg/min (Uth-Sorensen Kristain & Preben, 2004).

Maximum Heart Rate (HR max): Maximum Heart Rate, HR_{max}, typically alluded to the most note worthy number of heart beats each minute (bpm) an individual can accomplish in a hard and fast exertion. It is according to the age of an individual, heredity, and wellness level. HR_{max} is a helpful apparatus in deciding preparing powers, which are generally communicated as rates of HR_{max}

Minimum heart rate (HR min): It is the heart rate at rest with no physical exertion (best when measured in the morning before any stress, caffeine, or much movement).

Goniometry: Goniometry is the measurement of joint range of motion it is usually between 0⁰ and 360⁰ every joint has a standard goniometry measurement value.

Modifiable Risk factors: These are preventable or adjustable risk factors which are usually correctible through adjustment of lifestyle and habits.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The focus of this study was to investigate the effects of physical exercise on quality of life of stroke survivors in Osogbo Osun state Nigeria. Therefore this chapter contains both conceptual and theoretical frameworks to the study and review of related literature pertinent to the conduct of the study under the following sub-topics:

- Theoretical framework of the study
- Conceptual Framework of the study
- Concept of Physical Activity and Exercise
- Concept and Domains of Quality of Life
- Physical Health Related/Well-Being QOL Domains
- Effects of exercise on Quality of Life Domains
- Effect of Exercise on Hearing and Speech Ability
- Effect of Exercise on Activities of Daily Living (ADL)
- Effect of Exercise on Functional Ability
- Concept of Cardiovascular Endurance
- Effect of Exercise on Cardiovascular Health of Stroke Survivors
- Effect of Exercise on Blood Pressure Regulations
- Effects of Stroke on Quality of Life of Patients
- Influence of Exercise on Quality of Life of Stroke Survivors
- Exercise Prescription in Improving QOL of Stroke Survivors
- Appraisal of relevant literatures

Theoretical Framework

Theory according to Camp (2001) is defined as a set of interrelated constructs, definitions and propositions that present a rational view of phenomena by explaining or predicting relationships among those elements. A theory should lead to practice and practice also should lead to theory and also teaching is supposed to shape both research and practice (Kristian, 2017). The most important theories as related to this study are that of quality of life and cerebrovascular accidents also known as stroke.

Quality of life (QOL) Theory

Quality of life (QOL) is the general well-being of individuals and societies, outlining negative and positive features of life. It notices life fulfillment, including everything from actual wellbeing, family, schooling, business, abundance, strict convictions, account and the climate (Barcaccia, Espositob, Mataresoc, Bertolasoc, Elvirad and De Marinisc, 2013). QOL implies a decent life and a decent everyday routine is exactly the same thing as experiencing an existence with high quality (Ventegedt, Merrick & Andersen, 2003).

It has a wide range of contexts, including the fields of health/wellness, physical development, social, environmental, psychological, spiritual and emotional (Bottomley, 2002). An assessment of HRQOL is an effective evaluation of QOL and its relationship with health. The notion of a good life can be observed from subjective to the objective, where this spectrum incorporates a number of existing quality of life theories. This spectrum is regarded as the integrative quality-of-life (IQOL) theory which has the following factors namely; well-being, satisfaction with life, happiness, meaning in life, the biological information system, realizing life potential, fulfilment of needs, and objective factors (Ventegedt, Merrick & Andersen, 2003).

Theories of stroke

Theories of stroke according to Gomez (2018) consists of the basics of stroke pathology, that is how stroke is formed or developed, stroke is basically a disease of the brain that is caused by the interruption of blood supply to the brain. It can either be ischemic when it is caused by a blood clot which blocks the supply of blood to the other part of the brain due to the blockage of the blood vessels at capillary level by the clot. The clot sometimes get dissolves within 24 hours the victims/patients get relief of most of the stroke symptoms, when this happens it is referred to as Transient Ischemic Attack (TIA). Otherwise when it lasted beyond 24hours it developed into a full blown stroke with all or most of its symptoms which majorly is weakness of one side of the body otherwise called hemiplegia. However, interruption of blood flow to the brain cells can also be caused by a burst of the cerebral vessels and the bleeding of blood to the half part or hemisphere of the brain when this happens it is called ‘Hemorrhagic Stroke’ unlike Ischemic stroke hemorrhagic stroke is not likely to be resolved within 24 hours.

The implication of the theory: Gough’s (2005) theory of well-being confirmed that happiness provides motivating device for healthy well-being while Kahneman (1999) states that well-being factors are what make experiences and life pleasant or unpleasant which is different from momentary feelings; positive or negative which cannot be quantified as well-being while satisfaction over a period of time entails some cognitive process for a stroke survivor undergoing physical exercise over a period of time, this theory is very relevant. This is the basis for adopting eight weeks period of intervention, so that their level of quality of life can be determined.

Stroke Recovery Theory

The theory of stroke recovery revolves around process of stroke recovery management and rehabilitation, the primary goals of stroke management/rehabilitation are to reduce brain injury and promote maximum patient recovery, which is necessary for early detection and appropriate emergency medical care for optimizing health outcome (Jauch, Cucchi'ara, Adeoya, Meurer, Brice, Chan, Gentile,...& Hazinsk, 2010). The implication of this theory is that stroke survivors have high chance of recovery if treatment commences early and the prognosis is better in the first three months fair after six months but poor if presented later.

Theory of Exercise and Exercise Motivation

Several authors have postulated exercise theory; the ancient Chinese healing exercise theory stated that where our mind goes our energies follow (Sanoviv, 2011). The philosophy of exercise today embraces this age-long wisdom as fitness is no longer focused on going for the burn, or on the -no pain, no gain- concept of exercise but rather on a holistic approach practice necessary for maintaining a healthy body, mind and spirit (Sanoviv, 2011; Landry & Solmon, 2004). Exercise theory also emphasizes that when one engages in physical activity or exercise it must bring a sense of harmony and not stress the person's life. Therefore, incorporating an exercise program into one's lifestyle is something people should do voluntarily. It does not necessarily have to be in a gym but in anywhere one is and the goal does not have to be developing a perfect six-pack but achieving and maintaining a healthy life. Sanoviv (2011) stated that exercise does not have to be scary considering the danger of inactivity it should be lifestyle and that sedentary behaviour has negative effects on every aspect of physical and mental health including the quality of life of all individuals.

Moderate exercise protects the body against a number of diseases such as Coronary heart disease, hypertension, type2 insulin-dependent diabetes, osteoporosis, colon cancer, anxiety,

depression, obesity, stroke, and back pain. Also exercise releases endorphins (feel-good hormones in the brain). This is why exercise is often prescribed as an antidote for depression (Sanoviv, 2011; Lutz, Karoly & Okun, 2008). The implication of this study is that exercise's benefits for healthy living and for recovery from sickness cannot be over emphasized it should be approached not with the aim of achieving good body shape alone but for health reasons.

Theory of Environmental Health

According to Bill (2010), theory of environmental health has to do with that aspect of human health including quality of life that is mostly determined by physical, chemical, biological, social and psychosocial factors. Also the theory revolves around the theory and practice of assessing correcting; controlling and preventing any adverse effect of environment might have to human health. In Puciato, Rozpara and Borysiuk (2015)'s theory of environmental health exercises informed of physical activities acclimatized people generally to their environment through the principle systemic adaptation. An individual becomes a stranger to their environment by inactivity and sedentary living and hence deterioration in environmental health. The implication of this theory is that environmental health is achievable simply by conscious efforts of awareness of its importance and participatory efforts to make healthy living.

Theory of Health and Wellness

The definition of health is not just the absence of illness and disease or living a healthy lifestyle and being in a good state of mind. The World Health Organization is shaped by the individuals from the United Nations and they accept that "Health is a condition of complete physical, mental and social prosperity and not simply the shortfall of sickness or illness (and a socially and monetarily gainful life)' (WHO). Health believe model by Shaheen, (2006) stated that one will take

health interrelated steps based on six types of factors and beliefs which were; (i) Perceived susceptibility that is the condition that affects an individual on the area of bio psychosocial model, (ii) Perceived severity; condition that is severe enough give ones negative consequences, (iii) Perceived benefit; the advice and actions that may stop, lower or lessen the effect, risk the consequences of the condition respectively, (iv) Perceived barrier/cost; the corrective or preventive benefits which have more advantages than the psychological and physical harms for the individuals, (v) Cues to action; this is the internal or external cue or both that brought about the individual to final act, (vi) Perceived behavioral control; the extent which an individual could perform a behavior (Shaheed, 2006).

Theory of Mind and Executive Functioning Following Stroke

According to Jackie, Moris and Philip (2017) factors that may influence the psychological and social competence of stroke survivors is the impairment in Theory of Mind (ToM). ToM is the capacity vital for understanding mental states, (for example, considerations, sentiments, goals) of other individuals, and is seen as basic for fruitful social correspondence (Weed, McGregor, Nielson, Roepstorff & Frith, 2010), as it frames the reason for anticipating the activities of others. All the more explicitly, ToM is viewed as having subjective and emotional parts. Intellectually ToM is a capacity to recognize the learning of self and others and to comprehend the musings, convictions and aims of someone else, though full of feeling ToM is worried about understanding another's sentiments (information about feelings) (Shur, Shamay-Tsoory & Levkovitz, 2008).

Different explores on hypothesis of psyche (ToM) in connection to stroke has its fixation chiefly on central one-sided cerebrum sore. It is archived that there might be cover in the unpredictable cerebrum systems associated with both the social intellectual procedures engaged

with Tom and the subjective guideline procedures key to official capacity. Individual contextual investigations show that a system of cerebrum districts gives off an impression of being associated with ToM. Specifically, harm to some particular districts of prefrontal cortex (Shamay-Tsoory, Tomer, Berger & Aharon-Peretz, 2003; Stuss, Gallup & Alexander, 2001) and areas of the worldly projections, for example, the predominant transient sulcus (Apperley, Samson, Chiavarino & Humphreys, 2004) can upset ToM execution.

The Implication of the Theory: Meanwhile theory of mind (ToM) postulated by Jackie, Moris and Philip (2019) enhanced the necessity of mental comprehension which transforms into development of intention and readiness to get well. Weed, McGregor, Nielson, Roepstorff and Futt, (2010) shed more light on how ToM forms basis of prediction which gives hope and improves prognosis of the stroke victim undergoing treatment. Achieving healthy life is a universal need WHO defines health as a state of complete physical, mental and social well-being not merely absence of disease or infirmity.

Theory of Wellbeing

Theory of wellbeing according to Gough, (2005) who defined wellness as living and faring well, flourishing, these all are filled with the ideas about what constitutes human happiness, the sort of life that is good to lead these relates the quality of life of individuals. Wellbeing is of three parts which are subjective, objective and Eudaimonic wellbeing. Richard Layard lessons of new science stated that the state of happiness is vital to human's wellbeing. Happiness provides an overall motivating device, well-being factors according to Adler & Seligman, (2016) Gough (2005) are what make experiences and life pleasant or unpleasant it distinguishes between momentary feeling-positive and negative it also evaluates states of satisfaction over a period of time it entails some cognitive processing.

Implications of the theory

The above theories show different views and theory about stroke recovery emphasized on useful principles helpful to achieving healthy life, it is good to note here that to achieve healthy life it starts from the mind. There are so much of mental contributions to recovery and living healthy well-being.

Gough (2005) theory of well-being confirmed that happiness provides motivating device for healthy well-being while Kahneman (1999) states that well-being factors as what make experiences and life pleasant or unpleasant which is different from momentary feelings – positive or negative which cannot be quantified as well-being while satisfaction over a period of time entails some cognitive process for a stroke survivor undergoing exercise over a period of time entails some cognitive process. Cognitive process for a stroke survivor undergoing exercises over a time is to determine satisfaction or otherwise the quality of life. The basis for adopting eight weeks period of intervention level of quality of life can be determined.

Meanwhile, theory of mind (ToM) postulated by (Jackie, Moris, & Philip, 2019) enhanced the necessity of mental comprehension which transforms into development of intention and readiness to get well. Weed, McGregor, Nielson, Roepstorff and Futt (2010) shed more light on how ToM forms basis of prediction which gives hope and improves prognosis of the stroke victim undergoing treatment. Achieving healthy life is a universal need WHO defines health as a state of complete physical, mental and social well-being not merely absence of disease or infirmity.

Exercise theory by Sanovre (2011) stressed the importance of making it less stressful to the individual by making it a lifestyle as one way to achieving wellness and healthy life. Achieving stroke recovery is the primary goal of stroke caregiver, according to Jauch, cucchiene Adeoya,

Meurer, Brice, Chan, Gentile and Hazinski (2010) emphasize the need for rapid detection and appropriate care is essential for optimal health outcome for stroke survivors.

Conceptual Framework of the Study

The concept of this study is on three major words which are Exercise, Quality of life and Stroke which formed the main variables of this study, Other variables are as follows;The Independent variables are the different types of exercise procedures that will be used as treatment which are Aerobic exercise, Anaerobic/ strengthening exercise and flexibility (passive) exercise. Also, the physical variables such as age, sex, height, weight and Body Mass Index (BMI) are as well included in this study.

The dependent variables are: (i) Quality of life, which has the following domains; physical (such as identifying with discomfort or inconvenience, energy or exhaustion, sleep, rest, mobility, every day exercises, medication/drug and job execution), psychological (such as identifying with emotions, learning, memory and consideration, confidence, aspect, spirituality, religiousness, and positive or negative thinking), social (such as personal relationships, social support and sexuality) and environmental (which deals with physical security); (ii) cardiorespiratory endurance ($VO_2\text{max}$); (iii) cardiovascular variables/parameters (such as systolic, diastolic blood pressures and heart rate); (iv) muscle strength (such as knee flexors, shoulders flexors and range of motion); and (v) functional capacity.

CONCEPTUAL FRAMEWORK

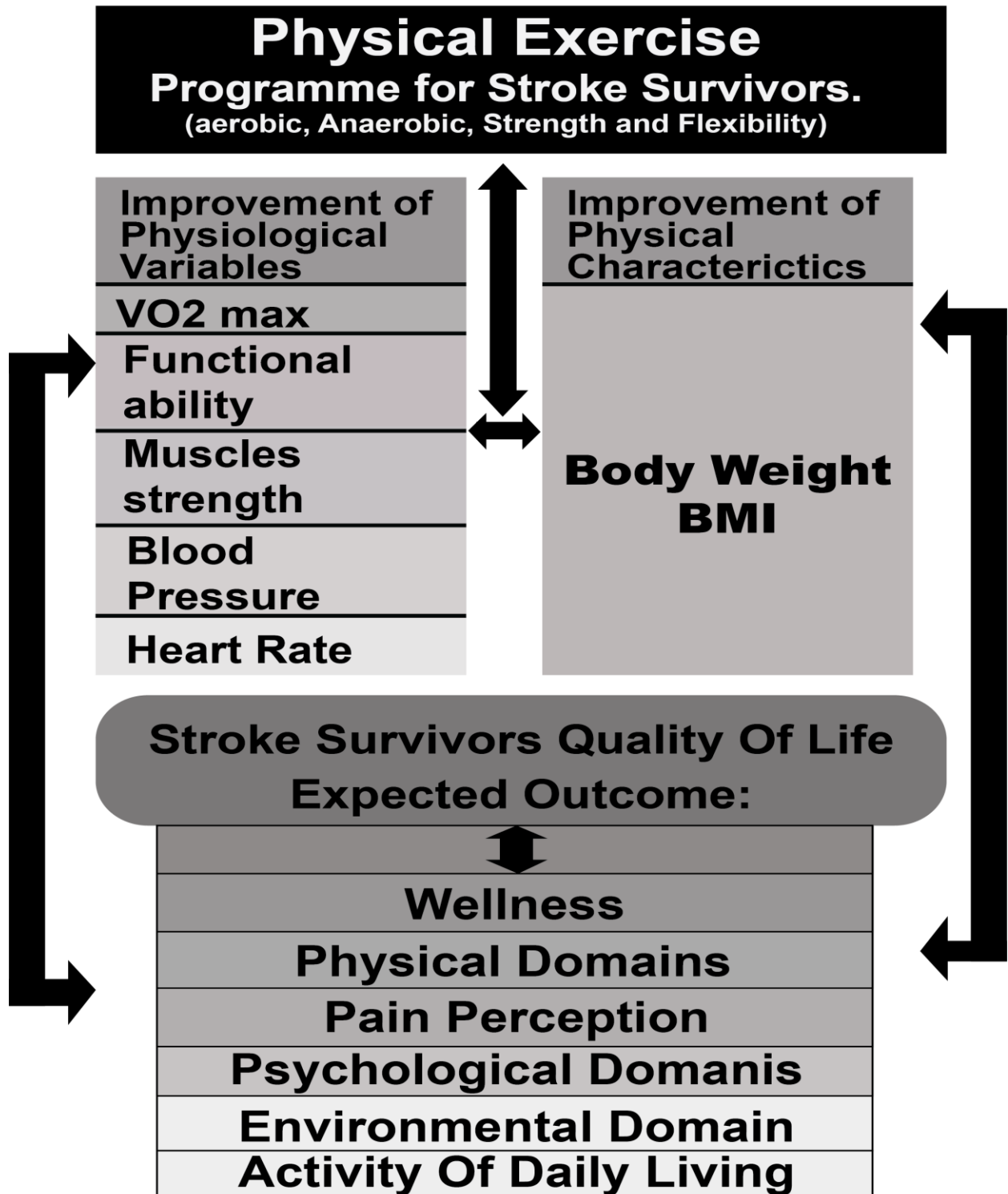


Figure1: Conceptual Framework of the Study.

Source: Researcher-developed (2018).

The conceptual framework is a pictorial depiction of the model for the study. Physical exercise programme designed included aerobic, anaerobic and flexibility. The model expected that the exercise regimens will lead to improvement of physiological variables leading to efficiency of the cardiorespiratory fitness ($VO_2\text{max}$), functional ability, muscular strength, blood pressure and heart rate. The exercise programme is also expected to improve physical characteristics of weight and BMI. Expected outcome are improved quality of life in areas of physical domain, pain perception, psychological and environmental QoL as well as activity of daily living.

Concept of Physical Activity and Exercise

Exercise has been characterized as any action that results in contraction of skeletal muscles (Myers, 2009). This term is normally utilized in reference to any action that advances physical health and wellness. Despite the fact that muscle contraction and elongation is the basic component of all types of exercise (Talabi, Ajayi-Vincent, Adesina, & Aribamikan, 2010), numerous different organs and frameworks are influenced, for instance, the heart and lungs. Numerous individuals additionally agree that ordinary exercise improves their feeling of mental prosperity alongside their general physical wellbeing (Myers, 2009). Stampfer, Hu, Manson, Rimm, Willett, Hu, Manson, Rimm & Willett (2000) defined exercise as any bodily activity that enhances or maintains physical fitness and overall health and wellness. It is performed for various reasons; including strengthening muscles the cardiovascular system. Athletic skills, weight loss, maintenance or merely enjoyment, Frequent and regular physical exercise boosts the immune system and helps prevent the "diseases of affluence" such as heart disease, cardiovascular disease, Type 2 diabetes, and obesity. Exercise has been found to improve stroke survivors' health-related quality of life (Chen & Rimmer, 2011). In the study of Dominic, (2005) among female undergraduate students of University Ilorin it was discovered that

exercise and physical activities improve abdominal muscle flexibility and cardio-respiratory endurance among women.

Physical Activity and Exercise

Physical Exercise can be described as any bodily movement produced by the skeletal muscles which result into energy expenditure through contractions of these muscles that are aimed for health benefit, competition, and pleasure to achieve physical fitness (Talabi, Ajayi-Vincent, Adesina & Aribamikan, 2010). While exercise constitute the physical activities that are planned and programmed for a particular goal in mind which may be for health/ therapeutic benefits, leisure, physical fitness or enjoyment(Richard & Melissa, 2015).Some organizations often use physical activity and exercise interchangeably though they both have similar attributes (WHO, 2005). Physical activity differs from exercise in the sense that physical activity refers to body movement that is produced by the contraction of skeletal muscles and that increases energy expenditure (Wojtek, David, Maria, Christopher, Claudio, George & James, 2009).

Physical activity is defined as a movement that involves contraction of muscle. These are part of the activities we do throughout the day that involves movement such as housework, gardening, walking and climbing stairs. Stanley (2001) stated the example of physical activities as slow stroll, fast pace run, a dock worker's heavy physical labour and heavy lifters to mention a few. Exercise is a particular type of physical movement which is planned, deliberate physical action performed with the expectation of gaining wellness or other medical advantages, working out at a physical fitness centre, swimming, cycling, running and sports, similar to golf and tennis, are altogether types of activity (Robb & Jones, 2009). Carl, Kenneth and Gregory, (2009) portrays exercise as arranged, organized, tedious and purposive as it is planned for improving or keeping up at least one segments of physical wellness. There are various sorts of activities which are: oxygen consuming/aerobic

activities, anaerobic activities, adaptability works out, fortifying activities. In a perfect world, an exercise planned ought to incorporate components intended to improve every one of these segments: Cardio-respiratory perseverance activities: improve one's respiratory continuance capacity to participate in aerobic activity through exercises, for example, energetic strolling, running, running, cycling, swimming, hopping rope, paddling, or cross-country skiing.

Muscular ability: An individual can promote muscle quality most successfully by lifting heavy loads, utilizing either freeloads like hand weights and free weights or weight machines (Goerge, 2009). Muscular perseverance improves one's continuance through workout (molding works out), weight preparing, and exercises, for example, running or swimming.

Flexibility: this is a work of body movement to expand the degree of adaptability through extending practices that are done as a component of exercise or through an order like yoga or karate. While it is conceivable to address these wellness segments with a physically dynamic way of life, this kind of activity programme can enable one to accomplish considerably more noteworthy advantages that exercise procures (Robb & Jones, 2009).

Exercise and Health Promotion

Exercise is one of the key demands for good health to maintain sound health and wellness regular exercises are required. (Dominic, Talabi, & Niyi-Odumosu, 2016). Regular physical activity is one of the most important things that can be done for good health, it has many benefits some of which are; controls of weight/ weight reduction, reduces the risk of cardiovascular diseases, reduces the risk for type 2 diabetes and metabolic syndrome, reduces risk of some cancers, strengthen your bones and muscles, improve your mental health and mood, improve the ability to do daily activities and prevent falls, for an older adult and finally it increases the chances of living longer (Centers For Disease Control And Prevention (CDC), 2015) .

Generally, Moderate-Intensity aerobic exercises like brisk walking is safe for most people but it is important to take the following precautions which are; Start slowly, cardiac events, such as a heart attack are rare during physical exercises but the risk increases when the individual suddenly become much active than usual that is why it is important to start slowly and gradually increase your level of activity.(CDC 2015), Furthermore Mayo Clinic, (2014) reported health benefits of regular exercise and physical activities regardless of the age, sex or physical ability exercise improve life and give these additional benefits; Exercise combats health conditions and diseases,It improves mood, boosts energy, exercise promotes better sleep, it puts the spark back to sex life and it is fun way to spend some time because it gives a chance to unwind, enjoy the outdoors or simply make one happy which is good for health.(Talabi, 2016; Mayo Clinic, 2014).

Exercise and physical activity are a great way to feel better, gain health benefits and have fun. As a general goal, aim for at least 30 minutes of physical activity every day,If an individual wants to lose weight or meet specific fitness goals, he/she may need to exercise more. It is necessary to remember to check with one's doctor before starting a new exercise program, especially if the individual has not exercised for a long time, have chronic health problems, such as heart disease, diabetes or arthritis, or anyother concerns (Mayo Clinic, 2014).

Concept of Quality of Life

The concept of QOL was first mentioned in medical science in the 70s due to the changing paradigm of health and health care and not only to economic reasons but also the changing nature of illness from acute to chronic whose causes were increasingly linked to individual's lifestyle with the influence of their material, cultural and natural environment. QOL is a subjective cognitive and emotional actuality reflected in the feeling of satisfaction or dissatisfaction with life (Krzepota, Biernat & Florkiewicz, 2015). According to WHOQOL (2004) the concept of QOL is the perception

by an individual of their position in life in the context of value and culture systems they live in, relating it with the culture's expectations standards and interests. It includes the following elements; Physical condition, mental condition, Self-reliance, social relationships, environment, religion, beliefs, convictions and views. Generally, the assessment of health-related QOL takes into consideration the following three elements;

- The functional capability of an individual that is, the ability to satisfy individuals everyday needs, in order to take up or continue in their social roles; intellectually and emotionally.
- The way they perceive their situation in life, the level of satisfaction and contentment with life.
- Symptoms of illness and the general level of fitness following the illness and age.
- Functional state of the patient together with general and specific symptoms.
- Psychological dimension. Social aspects such as family social support, economic status and soon.
- Later measurements now include the spiritual dimension (Walden-Galuszko, 2017). However, for a terminal disease, it comprises four areas.
- Physical efficiency is affecting the ability to function unaided.
- Somatic state reflecting the efficiency of basic physiological functions and the somatic setions that a patient experiences.
- Psological condition, especially the assessment of fear depression and possible disorders of psychological function.
- Social sphere reflected in kind and quality of human interaction. (Walden-Galuszko, 2017)

Quality of Life Domains



Figure 2: Quality of life and its domains.

Source: Bottomley (2002)

Measurement of Quality of Life

The process of measuring quality of life involves assessment of emotional well-being recently researchers have begun to distinguish two aspects of personal well-being which were:

emotional well-being, in which respondents are asked the quality of their life everyday emotional experiences, the frequency and intensity of their experiences for example, joy, stress, sadness, anger and affection-and life evaluation, in which respondents are asked to think about their life as a general rule and evaluate against a scale (Kahneman & Deaton, 2010). Quality of life domains are the different measurable variables of quality of life, which indicates the expected areas of life satisfaction. The domains include psychological/emotional well-being, activities of daily living, environmental interaction and health and wellness Quality of Life (QoL).

Psychological/Emotional Well-being Domain can also be described as psychological well-being of an individual, especially the assessment of fear, depression and possible disorders of the psychological functions. It can also be measured as the level of depression and anxiety an individual has (Radhakrishnan, 2012).

Activities of Daily Living QoL Domain is aimed to examine an individual's ability to carry out functions related to daily activities both domestic and outdoor activities. The domain focuses on components of well-being, which are affected by progressive changes in health status, functional ability, physical and work energy expenditure (Zubritsky et al., 2013).

The Environmental Interaction domain of quality of life refers to how individuals relate with their immediate environments such as housing, air quality and other components of the environment. It is an important feature of QoL that affects health and health-related QoL (Albert & Logsdon, 2000). On the other hand, Lawton (1991) stated that the two are sometimes hard to separate as successful treatment by a physician may improve one's capacity to make friends and relate with the environment.

The health and wellness domain of Quality of life is defined as the general well-being of individuals and societies. It has broader contexts, including the fields of international development,

healthcare, politics and employment. There is a clear distinction between the concepts of QOL and the recently growing area of health-related QOL (HRQOL) (Bottomley, 2002). QOL is also different from the concept of standard of living, which is generally based on income and wealth. According to Juczynski and Oginska-Bulik (2003), health-related QOL should be approached holistically based on four dimensions; physical, psychological (mental and emotional), social and spiritual. Emphasising the frequently quoted WHO definition of health, “the physical, mental and social well-being of an individual not merely a lack of disease or ailment”, the newer definition supplements the concept of health with public and spiritual dimensions (WHOQOL, 2004). Most researches on health-related QOL concentrate on the following group of people; people suffering from chronic diseases (cancer, Aids, diabetes and epilepsy), disabled illness requiring constant medical and nursing care; living in stressful conditions (staying in hospitals, refugee camps or old people home); suffering from personality disorders and children (WHOQOL, 2004).

Health-Related Quality of Life

Health-Related Quality of life is defined as the general well-being of individuals and societies. It has broader contexts, including the fields of international development, healthcare, politics and employment. It is of great importance to avoid mixing up the concept of QOL with a more recent growing area of health-related QOL (HRQOL) (Bottomley, 2002).

However, according to Juczynski&Oginska-Bulik (2003), health-related QOL should be approached holistically which is based on five dimensions; Physical, psychological (mental and emotional), social and spiritual. Emphasizing the most frequent definition of health by WHO as physical, mental and social well-being of an individual not merely a lack of disease or ailment, the newer definition supplements the concept of health with public and spiritual dimensions (WHOQOL, 2004). Most research into health-related QOL concentrates on the following group of

people, People suffering from chronic diseases (cancer, Aids, diabetes, epilepsy and soon; Disabled illness requiring constant medical and nursing care; Living in stressful conditions (staying in hospices or refugee camps, old people home); Suffering from personality disorders and Children (WHOQOL, 2004). In the sense of having meaning of one's life but does not decide it. One may have excellent living conditions, enjoy good health and yet be dissatisfied with life.

Physical Domains of QOL

This domain is the most relevant domains in stroke rehabilitation since most of the symptoms experienced by this class of patients have to do with loss of physical and functional ability; so what is paramount in the mind of every stroke survivors is he or she will regain the physical functions. Physical functions are divided into various parts which includes functional ability (such as; Psychomotor speed, Touch Sensibility, Vision, Hearing; and Speech ability, Loss of skeletal muscle and strength; and reduction in joint range of motion); Pain perception and discomfort, Energy, Strength, Flexibility, Coordination, Stamina and Endurance, Sleep and rest. These domains correspond with the main components of health in the WHO's definition of health (physical health, mental health and social health).

The physical component of QOL is related to the whole of physical functions of the human body. It refers to the physical functioning of the patient as a consequence of his illness and treatment. Patients with a chronic condition like stroke are often confronted with the physicaleffects of the disease which include pain, spasticity, joint stiffness leading to restrictions in performing activities and threatening one's independence (Riemsma, Pattenden, Bridle, Sowden, Mather, Watt, & Walker, 2003). Elements of physical competency and development are associated with pain perception and discomfort, energy, strength, flexibility, stamina and endurance, sleep and rest and

are factors that make up physical health domains of quality of life (Adedoyin, Adeyanju, Balogun, Adebayo, Akintomide & Akinwusi, 2010).

Pain and Discomfort

Pain could be described as a feeling of discomfort, an acute unpleasant physical discomfort experienced by somebody who is violently struck, injured, or ill. It can also be emotional distress; somebody or something troublesome: somebody or something that is extremely annoying (WHO 2016). Pain, unpleasant sensory and emotional experience caused by real or potential injury or damage to the body or described in terms of such damage.

It is commonly an undesirable physical sensation experienced by an individual and, the degree to which these sensations are troubling and meddle with life. Inquiries inside this idea incorporate the control the individual has over the torment and the straightforwardness with which help from pain can be accomplished. The supposition that is made that the simpler the relief from discomfort, the less the dread of torment and its subsequent impact on personal satisfaction. Also changes in levels of torment might be more upsetting than torment itself. Notwithstanding when an individual isn't quite tormented, either through consuming medications or on the grounds that the torment is by its very nature on and off, (for example, headache), his/her quality of life might be influenced by the steady risk of torment. It is recognized that individuals react to pain in a different way, and contrasting resistance and acknowledgement of pain is probably going to influence its effect on personal satisfaction. Disagreeable physical sensations, for example, firmness, aches, long haul or momentary agony, or tingles are incorporated. Agony is made a decision to be available if the individual reports it to be in this way, regardless of whether there are no therapeutic means to represent it (WHO, 2016).

Effects of Exercise on Pain and Perception

In Adedoyin, Adeyanju, Balogun, Adebayo, Akintomide and Akinwusi (2010)'s study on effect of aerobic physical exercises on pain disability and psychological condition with stroke shows that there were lower perception of pain and psychological symptoms after exercise was administered. Also, According to Hoffman (2007) physical and aerobic exercise will result moral /mood upgrade at the same time reduces pain in stroke victims.

Regular exercise training also might offer some defense from depression (Richard & Melisa,2021) and is clinically useful in treating certain psychiatric and chronic pain conditions and may allow for aprogress of the acute improvements in mood from a single exercise session (Hoffman, 2007).

Energy and Fatigue of Stroke Survivors

Energy can be described as enthusiasm and endurance that a person has in order to perform the necessary tasks of daily living, as well as other chosen activities such as recreation. This may aggravate from reports of handicapping tiredness to sufficient degrees of energy, to feel truly invigorated. Tiredness may result from any of various causes, for instance disease, issues, for example, wretchedness, or over-effort. The effect of exhaustion on social connections, the expanded reliance on others because of constant weariness and the purpose behind any weakness are past the extent of addressing, despite the fact that they are understood to the inquiries in this feature and aspects concerned explicitly with day by day exercises and relational connections (WHO, 2016).

Effect of Exercise on Energy and Fatigue

Regular exercise involvements by stroke survivors have been documented to beneficial to recovery. In Studenski, Duncan, Perera, Reker, Min Lai and Richards's study (2005) on daily functioning and quality of life in a randomized controlled trial of therapeutic exercise for sub-acute

stroke survivors, it was found that exercise improved the strength and energy of a stroke survivor as well as reduced the fatigue experienced by the patients. Usually exercise is an energy booster that also causes fatigue especially anaerobic exercises but has long term benefit on reduction of fatigue especially among stroke survivors. However, the rate and frequency of exercise is directly proportional to amount energy build-up to optimize daily functional improvement through adherence to exercise regimen.

Psychological domain of QoL and Stroke Survivors

The word ‘Psychology’ simply means the scientific study of the human mind and its functions, especially those affecting behaviour in a given context. It also refers to the mental characteristics or attitude of a person or group of people (Stam, 2000). Psychology of an individual has a lot to do with his or her health and wellbeing and stroke survivors not exempted. The mind, emotion, mood, ability to sleep and rest is strictly attached to the psychological health of the individual. Every healing starts from the mind stroke inclusive (Robinson, Segal & Smith, 2019). The attitude of mind of stroke survivors will determine the speed of recovery or the reoccurrence of stroke, making multidimensional treatment essential for stroke treatment.

Effect of Exercise on Psychological Domain

Exercise is a natural and effective anti-anxiety treatment. Generally as well as specifically, exercise is beneficial to all population and special groups, whether healthy, diseased or athletic. Physical activity and exercise are integrated into body of knowledge to relieve tension and stress, boost physical and mental energy and enhance well-being through the release of endorphins which helps the brain to concentrate, mentally sharp for task at hand (Hassan, Rancourt, Austin & Ploughman, 2016). Exercise improves physical health and physique, reduce waist/body weight, improve sex life, and even aid longevity. Furthermore, exercise will improve

physical condition faster as well as reduce worries, anxiety and aid sleep and rest even among stroke survivors (Robinson, Segal & Smith, 2019). Robinson and colleagues added that exercise also stimulates the growth of new brain cells, helps prevent age-related decline and improve self-esteem.

Sleep, Rest and Stroke Survivors

Sleep and rest are essential components of lifestyle practice for quality of life and wellbeing of any individual and imperative for stroke survivors. The amount and duration of sleep are vital to healthy life and recovery from disease. The amount of sleep and rest of stroke survivors are a major concern because daily amount and/or problems in this area will definitely affect quality of life. Rest issues may incorporate trouble sleeping, awakening during the night, getting up promptly toward the beginning of the day and being unable to return to sleep as well as absence of refreshment from rest. Ability of stroke survivors to enjoy good sleep and have adequate rest hastens healing and recovery as well as promote good mood (WHO 2016). There is the need to encourage stroke survivors and family members or caregivers to monitor them to ensure adequate rest and sleep.

Effect of Exercise on the Sleep of Stroke Survivors

It has been well documented that exercise improves sleep. In the study of Loprinzi, (2016) it was discovered that physical activity generally improves sleep especially in the individuals that have problem with sleep. According to Gamaldo (2019) moderate aerobic exercises increases the quantity of slow-wave sleep one gets that is ability to experience deep sleep that gives the brain and body the chance to rejuvenate. Exercise stabilizes mood and decompress the mind, raises body temperature that after about 30 to 90 minutes the temperature starts falling down. This decline in the body temperature helps to facilitate sleep (Gamaldo 2019).

Psychomotor Speed Exercise and Stroke Survivor

Psychomotor speed involves physical and mental activities which have to do with bodily movement triggered by mental activity especially voluntary muscle action. Psychomotor ability refers to a wide range of actions involving physical movement related to conscious cognitive processing which may be measured by accuracy or speed (reaction time). The speed at which coordination function and action are performed is being controlled by the cerebral hemisphere which has both the sensory and motor control of body movements. The voluntary muscular contraction which forms the foundation of movement all contribute to physiology of movement and body kinematics in all bodily movement in whatever condition, either healthy or diseased (Era, Berg & Schroll, 2013). Voelker-Rehage, Godde, and Staudinger (2010) established that there is a robust relationship among physical fitness, psychomotor speed and aging and this might be applied to stroke condition which ages the patient's physiologically. The physiological mechanisms of these variables work with brain's function, cerebral circulation, and the trophic influence of physical activity on the central nervous system (Yildiring, Ergun, Piteti & Beets, 2010). Era, Berg and Schroll (2013) study on psychomotor speed where auditory stimuli were used to test reaction and movement time corroborated that physical activities when it becomes a habit may improve psychomotor speed in elderly so also in stroke survivors speed based on the breakdown of the body neuromuscular mechanism.

Hearing, Speech Ability and Exercise

Cerebrovascular accident/stroke attack occasionally affects some areas in the brain that control sense of hearing and speech. When this happens, the victim may experience problem with hearing and speech. The speech and hearing impairment usually affects quality of life, not only stroke victims but also a child who experiences genetic and/or environmental factors. Carlson, Jacob,

Pollock, Brian, Neff and Nicole (2013)'s study based on the assumption that vision, hearing, and speech are a significant piece of a child's life; explaining that at the point when a baby is conceived, the visual perception is young and progressively builds the capacity until hearing is established through fetal improvement vital for legitimate movement of discourse and language soundness.

In the investigation of Cristell, Hutchinson and Alessio (1998) it was established that exercise improves bloodstream to the mind, helps in hearing with cardiovascular wellness exercise expanding the degree of oxygen in the blood thereby nourishing ones whole circulatory framework. Alessio and colleague added that exercise improves the exhibition of the ear which detects sound and the cerebrum which process the sound, making an interpretation of sound waves into importance and understanding (Alessio & Hutchinson, 2014).

Activities of Daily Living (ADL) and Effect of Exercise on ADL

Exercises of day by day living are customary exercises required day by day by everybody does in other to keep up life this reaches from household action to the required movement for other job performed day by day. Medical issues can meddle with even the most essential parts of day by day living (for instance, breathing easily, nature of rest, taking out squanders, encouraging oneself, dressing, and others), the medicinal services callings have classified the ideas of exercises of day by day living (ADLs) and instrumental exercises of day by day living (IADLs). Such examination and grouping serve to at any rate halfway externalize personal satisfaction. It can't kill all subjectivity, yet it can help improve estimation and correspondence by measuring and by lessening unspeak-able (Chou, 2011).

Exercise is helpful to build stride speed, improve balance, and improve execution in ADLs in the fragile more seasoned grown-ups (Chou, 2011). Kwakkel, Veerbeek, and van Wegen, (2010) found that enlarged exercise treatment has a little however good impact on ADL, especially if

treatment information is expanded in any event 16 hours inside the initial a half year after stroke. This meta-analysis also suggests that clinically relevant treatment effects may be achieved on instrumental ADL and gait speed.

Concept and Effect of Exercise on Functional Ability

Functional ability referred to ability of a particular part of the body to perform the function which is designed to perform in particular, it can also be referred to the ability of an individual, stroke survivors especially in this case to carry out all the functions his/her body system is designed or made to do normally (Douglas, Kristen, Kristina, Karen, Madeleine, Roberta & Newton, 2010). Physical exercises important tool that is very efficient as a therapeutic modality used to improve appreciately functional capacity in patients with cardiovascular diseases (Bocalini, dos Santos & Serra, 2008).

Concept and Effect of Exercise Cardiovascular Endurance (VO₂max)

It is a fitness component used to measure, determines fitness and endurance to physical activities. VO₂ max also referred to maximal oxygen consumption, maximal oxygen uptake, peak oxygen uptake or maximal aerobic capacity, it is the maximum rate of oxygen consumption as measured during incremental exercise VO₂max is also known as cardiovascular aerobic fitness it is the measurement of cardiorespiratory endurance of an individual; that is, how well your body can produce energy using oxygen. Aerobic power is determined by the maximal oxidation rate of hydrogen within the mitochondrial electron transport chain and is thus identical to maximal oxygen uptake (Heck, Schulz & Bartmus, 2003).

The study carried out by Quaney, Boyd, McDowd, Zahner, He, Mayo and Macko (2009), shows a significant improvement of stroke survivors' motor learning and VO₂max after subjecting them to the aerobic exercise of progressive resistance on a stationary bicycle ergometer and

stretching exercises. However, the study of Jørgensen et al. (2010) was a 12 weeks training on body weight supported treadmill and progressive resistance strength training and aerobic exercise for stroke survivors which recorded significant improvement in gait performance and cardiovascular health parameters such as Systolic Blood Pressure and Diastolic Blood Pressure.

Generally, exercise play the major role in improving VO_2 max, it can improve with exercise training and decrease with age, though the degree of exercise trainability also varies very widely: conditioning may double VO_2 max in some individuals, and will never improve it in others. In one study, 10% of participants showed no benefit after completing a 20-week conditioning program, although the other 90% of the test subjects all showed substantial improvements in fitness to varying degree (Kolata, 2002; Bouchard, Ping, Treva, James, Jack, Jacques, Louis, Arthus & Rao, 1999).

Health-Related Quality of Life (HRQL)

In health care, health-related quality of life (HRQoL) is an assessment of how the individual's well-being may be affected over time by a disease, disability, or disorder (Bottomley, 2002). Health-related quality of life (HRQL) is a person's fulfillment or joy with areas of life to the extent that they influence or are influenced by wellbeing as characterized previously. HRQL can be recognized from personal satisfaction as we characterized it before in that it concerns itself basically with those elements that fall under the domain of human services suppliers and social insurance frameworks (Bottomley, 2002). Generally, evaluation of HRQL speaks to an endeavor to decide how factors inside the component of wellbeing (for instance a malady or its treatment) identify with specific elements of life that have been resolved to be critical to individuals all in all (generic HRQL) or to individuals who have a particular illness (condition-explicit HRQL). Most conceptualizations of HRQL stress the impacts of illness on physical, social/job, mental/enthusiastic,

and intellectual working. Manifestations, wellbeing recognitions, and in general personal satisfaction are regularly incorporated into the idea area of HRQL (American Thoracic Society, 2007).

Effect of Exercise on Cardiovascular Health of Stroke Survivors

Expanding exercise limit with regards to a stroke survivor can help anticipate crumbling of the cardiovascular system (Sacco et al, 2013). The impacts of activity in the administration of CVA are significant given that cardiovascular illness is the main planned reason for death in people with stroke, combined with the way that cardiovascular wellness in people with stroke has been observed to be as low as 50–80% of the age and sex-coordinated qualities in latent people (Pang, Eng and Dawson, 2005). This suggests the oxygen-consuming wellness level of many stroke survivors does not arrive at the basic worth that is basic for autonomous living (Cress and Meyer, 2003). In this manner, expanding exercise limit in people with stroke which will improve their capacity to perform Activity of day by day living that is constrained by shortcoming and exhaustion optional to the stroke; it is an ideal procedure in stroke recovery.

Studies also established that Aerobic exercise training plays important role in improving cardiovascular fitness and other health outcomes among stroke patients by breaking the vicious cycle of physical inactivity and functional decline (Hamzat & Ekechukwu, 2015). However activity intolerance is common among elderly stroke survivors (Roth, Harvey, Elliot, Roth, Lovell, Richard, Harvey, Allen, Heinemann, Semik & Sylvia, 2001). Nevertheless ambulatory persons with a history of stroke may be able to perform at 50% of peak oxygen consumption and 70% of the peak power output which can be achieved also by age and gender-matched people without a background marked by stroke. Typically exercise prejudice is likely because of a few variables, including bed-rest–actuated deconditioning, inactive way of life, attendant left ventricular brokenness, the related seriousness of neurological inclusion (limpness or creating spasticity of the lower furthest point as

well as hindrance of the tactile capacity of the included side, debilitated trunk equalization, spasticity or shortcoming of the influenced upper or lower limit, responsive aphasia, and mental perplexity), and the expanded oxygen-consuming necessities of strolling (Gordon, Contractor & Leighton, 2001). Approximately 50-70% of persons with stroke regain functional independence, but 15-30% of the stroke survivors are left with permanent disability (Vickrey, Rector & Wickstrom, 2002). Disability manifested by impairment of body function or body structure, limitation and/or restriction in activities participation (Wolf, Clagett & Easton, 1999) which results in poor physical fitness, defined as the ability to carry out daily tasks with vigor and alertness also without excessive fatigue and a demand of a lot of energy to enjoy leisure-time pursuits and respond to emergencies.

Exercise as a therapy is a potent anti-stressor which prevents stress syndrome from building up and affecting the body systems when it is applied correctly. Exercise plays a vital role in reducing risk of stroke and it also improves the overall well-being of stroke survivors. Regular exercise can reduce the risk of stroke by a quarter, just 30 minutes of activity five days a week can reduce the risk of stroke (Edward, Jauch, Jeffrey, Saver, Harold, Adams, Bruno & Connors, 2013).

Various studies have established the efficacy of exercise on improving the quality of life of stroke survivors, Tang, Sibley, Thomas, Bayley, Richardson and McIlroy, (2009) and Yen et al., (2008) reported comparable improvement for stroke survivors after subjecting them to different kind of aerobic exercises their motor recovery and functional ability improved in 2 out of 7 groups in outcome measure in the studies. (Duncan, Richards & Wallace, 1998; Duncan, Studenski, Richards, Gollub, Min Lai, Reker, Perera, Yates, Koch, Rigler & Johnson, 2003). In another study conducted by Macko, Frederick, Ivey, Forrester, John, Leslie, Kenneth and Andrew (2005) where he used randomized trial on stroke survivors' it was revealed by the result of the study that treadmill aerobic training improves ambulatory function and cardiovascular fitness in chronic stroke patients, also in

the study of Macko, Frederick, Ivey, Forrester, John, Leslie, Kenneth and Andrew (2005) it was proved that treadmill increased the peak exercise capacity while it decreased the energy cost used for hemiparetic ambulation, therefore, improves the functional mobility in chronic stroke survivors by improving the capacity and ambulatory workload as well as enable patients for activities of daily living (ADL) at lower percentage of peak VO_2 .

It is interesting to know that in the studies of Potempa, Lopez and Braun (1995) and Quaney et al, (2009), bicycle ergometer has been showed to have improved various domains of quality of life in stroke victims, while the result of Potempa et al, (1995) study shows that there was appreciable improvement in aerobic capacity of chronically, moderately disabled, hemiparetic stroke survivors when subjected to adequate aerobic exercise training on a cycle-ergometer, participants also improved in functional workload and exercise time to a higher extent than expected for the increase in aerobic capacity. The study also involved aerobic exercise using cycle ergometry is feasible and improves fitness in chronic hemi paretic stroke patients but gives no clear evidence that cycle exercise could improve neuromuscular function. While in Quaney, Boyd, McDowd, Zahner, He, Mayo and Macko (2009)'s study the lower extremity bicycle exercise in chronic stroke patients significantly improved motor learning that is required for daily functions. It also shows that Aerobic exercises improved mobility and selected cognitive domains related to motor learning that increase sensorimotor control after stroke

Environmental Health Domain

Environmental health comprises the aspect of human health which is determined by physical, chemical, biological, social and psychosocial factors. Whereby all these factors contribute to how healthy an individual can be, the way and manner these potentially affect adversely the health of present and future generation are very important to the environmentalist (Bill, 2010 & Agius, 2010).

Environmental domain of quality of life is how the environment affects the QOL generally; some because of the nature of the environment get their quality of life badly affected and worsens their healthy well-being adversely (Agius, 2010).

Definition of stroke

Stroke is brain damage caused by a lack of blood flow to part of the brain. In order to perform its many functions and direct activities throughout the body from walking to seeing to reasoning the brain requires a constant supply of energy, provided by the oxygen and nutrients that are delivered by the flowing blood. If blood flow is restricted or cut off at any point between the heart and the brain, portions of the brain relying on blood from the obstructed blood vessel become deprived of oxygen. Brain cells are extremely sensitive to such deprivation, and if they are deprived of oxygen and nutrients for more than several minutes, they, in effect, starve to death. A stroke results in permanent damage to the brain tissue and in many cases, permanent disability for the patient. For example, a patient who has had a stroke may develop paralysis on one or both sides of the body; have difficulty with walking, eating, or other daily activities; or lose the ability to speak or understand speech (Adedoyin & Adesoye 2005).

Aetiology of Stroke

Stroke is generally a condition caused by a sudden blockage of blood and nutrient supply to the brain cells which leads to the death of those cells and loss of function of contralateral side of the body. So many things are responsible for this which ranges from burst of the cerebral capillary that supply blood to the brain or haemorrhage which results in the deprivation of blood some parts of the brain, another one is the blockages of the arterioles/ capillary in the brain by blood clot or plaque whereby preventing blood and nutrients getting to some brain cells. Every factor that results into these are the causes/etiology of stroke which is; Hypertension, haemorrhage, emboli, arterial plaque,

thrombus (Feigin, Rinkel, Lawes, Algra, Bennett, van Gijn, Anderson, 2005). Other causes of stroke are high cholesterol level, obesity, diabetes, smoking and excessive alcohol intake (Chobanian, et al 2003).

Stroke Risk Factors

Stroke, which is also known as the cerebrovascular accident (CVA) has most of the risk factors of cardiovascular diseases (CVD). CVD risk factors are traits and lifestyle habits that increase a person's chances of having coronary artery and vascular disease such CVA. Some risk factors such age, gender and heredity cannot be changed or controlled. Other risk factors such as high blood pressure, obesity, cigarette smoking, alcohol, high blood cholesterol, sedentary lifestyle or lack of regular exercise, diabetes mellitus and wrong diet are controllable. The most important risk factors are high blood pressure; high blood cholesterol and cigarette smoking (Torpy, 2003; Cardiovascular Rehabilitation Program [CRP], 2008).

According to, a risk factor is something that makes one more likely to have a disease, illness, or medical problem. Every parameter that will make an individual prone to CVD will also make the individual prone to stroke (CVA) (Craig, 2007, Daniel & Conor, 2006). In the study of Daniel and Conor (2006) and Craig (2007) male was proven to have a higher tendency of having CVA than female.

Hypertension; Hypertension is prominent among the causes of stroke; it is defined as a chronically elevated blood pressure greater than 140/90 mm Hg. If it is left untreated, hypertension can dramatically increase your risk for heart attacks, strokes and peripheral arterial disease. Exercise do not only improves the workings of the cardiovascular system, but can also lower blood pressure as well (Feigin, Rinkel, Lawes, Algra, Bennett, van Gijn, Anderson, 2005; Chobanian, Bakris, Black, Cushman, Green, Izzo, Jones, Materson, Oparil, Wright & Roccella, 2003).

Table 1. Blood Pressure Chart

Blood Pressure Category	Systolic mmHg (upper value)		Diastolic mmHg (lower value)
Normal	<120	And	< 80 (Athletics have lower value)
Pre hypertension	121 – 139	Or	80-89
High Blood Pressure (Hypertension)Stage 1	140 – 159	Or	90– 99
(Hypertension)Stage 2	≥160	Or	≥100
Hypertensive Crisis (Emergency care needed)	> 180	Or	> 110

Source: American Society of Hypertension and the International Society of Hypertension (2014).

Other causes of stroke include; **Thrombus**. A thrombus (blood clot) generally forms around atherosclerotic plaques, which causes blockage of blood flow in the brain. The blockage is usually gradual due to the onset of symptomatic thrombotic stroke (Elbadawi, et al., 2021). Symptomatic thrombotic stroke is slower than hemorrhagic stroke. Occasionally a thrombus or blood clot can lead to embolic stroke when it does not completely block the blood vessel. When the thrombus breaks off and moves around in the bloodstream, this is a condition that is called embolus (Shah et al., 2015).

Venous thrombosis: Cerebral venous sinus thrombosis prompts stroke due to privately expanded venous weight, which surpasses the weight produced by the veins. Infarcts are bound to experience hemorrhagic change (spilling of blood into the harmed zone) than different sorts of ischemic stroke (Stam, 2000).

Cerebral hypo-perfusion

Cerebral hypo-perfusion is the decrease of bloodstream to all pieces of the cerebrum in the brain. The reduction in blood flow could be due to a blockage caused by blood clot (thrombus) or a burst of the blood vessels in the brain. It is most normally because of heart disappointment from

heart failure or arrhythmias, or from decreased cardiovascular yield because of myocardial dead tissue, aspiratory embolism, pericardial emanation, or dying.

Hypoxemia (low blood oxygen content) may accelerate the hypo-perfusion because of decrease in bloodstream; all pieces of the cerebrum might be influenced, particularly defenseless -watershed regions - fringe zone districts provided by the major cerebral veins. A watershed stroke alludes to the condition when the blood supply to these territories is undermined. Bloodstream to these territories does not really stop however rather it might decrease to the point where brain harm can happen (Stam, 2000).

Intracerebral haemorrhage (ICH)

This type of haemorrhage usually happens in small arteries or arterioles and is ordinarily because of hypertension, intracranial vascular deformities (counting enormous angiomas or arteriovenous mutations), cerebral amyloid angiopathy, or infarcts into which auxiliary discharge has happened (Donnan, Fisher, Macleod and Davis, 2008). Other potential causes are injury, draining disarranges, amyloidangiopathy, illegal medication use (amphetamines or cocaine). The hematoma broadens until weight from encompassing tissue restrains its development, or until it decompresses by purging into the ventricular framework, CSF (cerebrospinal fluid) 33% of intracerebral drain is into the mind's ventricles. ICH has a death pace of 44 percent following 30 days, higher than ischemic stroke or subarachnoid discharge (which in fact may likewise be delegated a kind of stroke (Donnan, Fisher, Macleod and Davis, 2008).

Effect of Exercise on Blood Pressure Regulation

Exercise plays a very important role in blood pressure regulations (Hoffman & Hoffman, 2007). Exercise training induces systemic adaptation of the arterial wall in healthy individuals (Thijssen et al, 2013). This might translate to better arterial vessel compliance that may facilitate the

decrease in peripheral resistance after bouts of exercise. Studies have also shown that aerobic exercise has inverse relationship with blood pressure leading to reduction in both systolic and diastolic blood pressure (Pescatello et al., 2004). In the study of Carpio-Rivera, Moncada-Jiménez, Salazar-Rojas and Solera-Herrera (2016), it was discovered that jogging exercises elicit greater reduction in systolic and diastolic blood pressure while walking induced greater reduction in systolic blood pressure than diastolic blood pressure.

Silent Stroke

A quiet stroke is a stroke that does not have any outward notice, and the patients are normally ignorant that they have had a stroke. Regardless of not causing recognizable manifestations, a quiet stroke still harms the cerebrum and exposes the patient at increased risk of both transient ischemic assault and real stroke in future. Alternately, the individuals who have had a symptomatic stroke are in danger of having silent stroke. Silent strokes typically cause lesions, which are detected via the use of neuro-imaging such as Magnetic Resonance Imaging (MRI) (Miwa et al., 2010). Silent strokes are estimated to occur at five times the rate of symptomatic strokes (Saver et al., 2003). The risk of silent stroke increases with age but may also affect younger adults and children, especially those with acute anaemia (Vermeer et al., 2003).

Symptoms and Consequences of Stroke

A striking symptom of stroke is that they are often unexpected and develop suddenly, and may worsen over the next several hours or days. The symptoms often primarily affect only one side of the body because blood flow is cut off to only part of the brain during a stroke (Rigby, Smith & Watson, 2008). One of the most common symptoms is a sudden weakness or numbness of one side of the face, or upper and lower limb. Some stroke sufferers experience a sudden dimness or loss of vision, particularly in only one eye. They may also, suddenly become unable to speak or have trouble

understanding speech. Sudden, severe headaches with no known cause and sudden, unexplained dizziness, unsteadiness, or falls, can also be warning signs of a stroke. Eventually this symptoms gradually or most of the time instantly leads to weakness of the contralateral side of the body, in ability to walk or walk well at the same time affects body symmetry due to weakness of the affected side the study of Zverev, (2015) and Balasubramanian, Bowden, Neptune and Kautz (2007) confirmed that body asymmetry is part of the characteristics of stroke survivors. Anyone who experiences one or more of these earlier symptoms should seek medical attention immediately before it degenerates to gross paralysis (Rigby, Smith & Watson, 2008).

Effects of Stroke on Quality of Life of Patients

Various studies have proved that stroke just like some other health conditions affect the quality of life of patients critically. In the study of Williams, Weinberger, Harris, and Biller (1999) and Aprile, Stasio, Federica, Stefano and Pietro (2007) stroke is reported to reduce the quality of life of patients. Stroke also causes depression especially in patients whose functional ability has reduced markedly. Stroke also affects Health-related quality of life (HRQOL). This includes changes in physical and emotional functioning, memory and thinking, socialization, and communication. Suitable evaluation of post-stroke HRQOL is important in order to understand the complete impact of the stroke (Moon, Kim, Kim, Won & Kim, 2004). Inconsistency of conceptualization and operationalization of QOL in stroke research has been identified as a weakness in stroke QOL research (Bays, 2001).

To address this problem Duncan, Bode, Min Lai, and Perrera, (2003) developed a stroke-specific HRQOL measure, which is called the Stroke Impact Scale (SIS). The SIS is more comprehensive in evaluating stroke survivor HRQOL than the standard HRQOL measures, in that the SIS includes upper arm and hand function, commonly affected by stroke (Salter, Hellin, Foley &

Teasell, 2008) and has fewer floor effects than the Short Form-36 (SF-36) (Lai, Perera, Duncan, & Bode, 2003).

The majority of stroke patients are left with some form of permanent disability that interferes with normal daily activities and reduces the quality of life, such as walking, speech, vision, understanding, reasoning, and memory. The specific effects of a stroke vary greatly depending on what part of the brain was deprived of oxygen. For instance, if blood stream is cut off from a zone of the cerebrum that controls discourse, the stroke will bring about a discourse handicap, for example, slurring or aphasia which mean the failure to communicate through discourse or composing, or the powerlessness to get discourse (Holland, 2019).

In the event that the stroke harms the region of the mind that controls motor abilities, a patient may experience difficulty in motion or moving an arm. Various forms of paralysis especially hemiplegia (paralysis affecting one side of the body) are common after a stroke. In addition to its physical consequences, a stroke can also have psychological effects. People who have had a stroke often become depressed or feel angry and frustrated at their inability to perform tasks that, before the stroke, were easy or autonomus (Fawcus, 2000). Two vital and distinct characteristics that have been linked with lower HRQOL of post-stroke conditions include older age and female gender (Jonsson, Lindgren, Hallstrom, Norrving & Lindgren, 2005; Sturm et al., 2004).

Other specific factors negatively influencing stroke survivor HRQOL include: poor physical functioning (Hackett, Duncan, Anderson, Broad & Bonita, 2000), the presence of comorbid diseases (Nichols-Larsen et al., 2005; Suenkeler et al., 2002), post-stroke depression, paresis (mild weakness) of the arm that was dominant before stroke and institutionalization of the stroke survivor. External factors along with family functioning and social support have been found to influence stroke survivor HRQOL (Carod-Artal et al., 2000; King, Palmer & Glass, 2003).

Stroke victims commonly experience a lot of health challenges that incorporate a diminished ability limit, action narrow mindedness, muscle decay, fractional loss of motion, remaining walk deviations, related symptomatology, melancholy, nervousness, work/monetary pressure, and, for about, a mind-boggling feeling of vulnerability. A few factors may impact the greatness of these shortfalls. These incorporate age, sexual orientation, recuperating actuated deconditioning, hazard status, the related seriousness of neurological association, attending Coronary Artery Disease (CAD) and its spin-off, comorbid conditions (for instance, diabetes, aspiratory sickness, and osteoporosis), drugs, time from the intense cerebrovascular occasion, the level of social help, and patient consistency with a recommended recovery routine (Gordon et al., 2004).

Influence of Exercise on Quality of Life of Stroke Survivors

Exercise and physical movement have an expanding proof base in the essential and auxiliary aversion of stroke and in stroke restoration. The interface between physical action and cerebrovascular malady is mind-boggling and of expansive enthusiasm to clinicians, advisors, and disease transmission experts. The significance of the relationship is getting to be clearer: physical inertia has been involved by the Inter stroke study as one of the 5 key hazard factors which record for over 80% of the worldwide weight of stroke (Gallagher, Quinn, Alexander, and Walters, 2011). Physical wellness preparing is progressively being prescribed as a segment of stroke restoration programs because of the developing group of proof encompassing the advantages of improving the capacity after stroke. The job of long haul physical movement in patients who have had a stroke in the aversion of further stroke is less clear. Gallagher et al (2011)'s examination gives an accounting survey of the writing which tends to the interface between physical movement and cerebrovascular infection with explicit reference to counteractive action of stroke and post-stroke recovery.

Oxygen consuming activity can cause an intense perking up just as a decrease in the view of torment from an agonizing boost. Standard exercise preparing additionally may offer some insurance from the gloom, is clinically valuable in treating certain mental and constant agony conditions, and may take into consideration an upgrade of the intense enhancements in state of mind from a solitary exercise session. The utility of vigorous exercise preparing for improving state of mind unsettling influences and torment observation among patients with ceaseless torment requires further examination (Hoffman & Hoffman, 2007).

Physical exercises specific benefit to stroke survivors

Exercise has been found to improve different domains of quality of life (Hamzat & Ekechukwu, 2015; Hoffman & Hoffman, 2007 and Fawcus, 2000) especially different index of physical domains. Exercise have been found to improve activities of daily living in stroke victims such that it increases gait speed, improve balance, and improve performance in ADLs. In researches carried out by Chou, (2011) and Kwakkel, et al (2010) it was found to have reduces pain perception (Nichols & Glenn 1994; Hoffman, 2007), improves sleep (Loprinzi, 2016), increase touch sensibility (Ceccato, 2011); helps to improve cardiovascular endurance of stroke survivors (Quaney, Boyd, McDowd, Zahner, He, Mayo and Macko, 2009) and improves their health-related quality of life (American Thoracic Society, 2007). Exercise increases energy and ability to work but reduces fatigue felt during physical activities according to the study carried out by Studenski, Duncan, Perera, Reker, Min Lai and Richards (2005)

Exercise Prescription in Improving QOL of Stroke Survivors

Exercise plays a vital role in improving quality of life of stroke survivors. The various reports on the effect of exercise above establish this fact. However, subjecting stroke survivors to exercise needs professional active involvement which means exercises for stroke victims should be

prescribed and supervised. The exercise therapy-specific national guidelines for stroke (RCP/CSP 2004) should be viewed as a framework to guide clinical decision rather than as rigid rules. The guidelines are continually updated in light of new evidence.

- Recovery is more rapid in the first few months and movement patterns recur in similar hierarchical patterns in most patients
- The timing and achievement of independent sitting balance are key indicators of functional independence.
- The initial level of motor dysfunction and the time interval between paralysis and return of movement are important indicators of movement recovery.
- Studies have shown a link between unilateral neglect and poor function.
- There is a paucity of evidence with regard to the extreme of motor function. Why do some patients do very well and others do not?
- The description of active selected movement recovery has so far been neglected.
- Knowledge of long-term movement patterns is limited (Fawcus, 2000).

Appraisal of Reviewed Literature

Various studies on the effects of exercises on the quality of life of stroke survivors have been reported in the above review. Very relevant among them are the study done by Tang, Sibley, Thomas, Bayley, Richardson and McIlroy et al (2009) which reported a comparable improvement of stroke survivors' motor functions after subjecting them to different kinds of aerobic exercises such as ergometer cycling, brief walking and treadmill. The same was reported in Duncan, Richards and Wallace, (1998); Duncan, et al. (2003); Letombe et al. (2010)'s studies.

This study focused on holistic approach to stroke management and the use of improvised materials such as sandbag (for strengthening exercises) 20meters marked corridor (for aerobic/walking

exercises) local exercise mat (for flexibility exercises) whereas the other studies such as that of Duncan, Richards and Wallace, (1998); Duncan, et al (2003); Letombe, et al (2010), engaged the use of machines like bicycle ergometer, treadmills and multigym station for their training. This study enables stroke survivors to carry out this exercise procedures in the comfort of their houses. As such, aerobic exercise like walking might become routine to them without the need to go to hospital or the gym. Unlike others, this study combined three different exercise procedures for the treatment of the stroke survivors. Studies like Duncan, Richards and Wallace, (1998); Duncan, et al (2003); Letombe, et al (2010), Chou, (2011) and Kwakkel, at al (2010) used only one treatment for their interventions. This present study therefore is unique for holistic approach for all round improvemt of stroke survvors, covering the research gap not covered by other studies.

CHAPTER THREE

METHODOLOGY

The research method and procedures that were used in the collection and analysing data for this study are contained in this chapter. This includes the study location, research design, population of the study, sample and sampling techniques, research instruments, validity and reliability of the instruments, procedure for data collection, instrumentation and method of data analysis.

Study Locations

Osogbo (Oshogbo) is the state capital city of Osun State, which was carved out of Oyo State on August 27, 1991. Osogbo city is the headquarter of both Osogbo Local Government Area (situated at Oke-Baale Area of the city) and Olorunda Local Government Area (situated at Igbonna Area of the city). Osogbo shares boundary with Ikirun, Ilesa, Ede, Egbedore and Iragbiji. The central location of Osogbo makes it easily accessible from any part of thse state. It is about 48 km from Ife, 32 km from Ilesa, 46 km from Iwo, 48 km from Ikire and 46 km from Ila-Orangun. Osogbo city is located about 88 kilometres northeast of Ibadan, 100 kilometres south of Ilorin and 115 kilometres northwest of Akure (Nigeria Postal Service [NIPOST], 2009).

The city has a population of about 156,694 people based on the 1991 population census and the native tribe of the people is Yoruba (NIPOST, 2009). Apart from the civil servants, the people of Osogbo are predominantly traders, artisans and farmers who specialise in hand-woven textiles, tie and die clothes, leatherwork, calabash carving and mat weaving (Legend Microfinance Bank, 2008).

Research Design

This study employed one group repeated measures pre-test and post-test experimental design. This is the type of research design used when the researcher administers a test to measure a characteristic(s) in an individual or group multiple times after administering treatment or experiment

in order to determine the effect of the given treatment(s) or intervention(s) on the participants (Field, 2009). This design was preferred for this study because it allowed the researcher to measure the extent to which the participants had improved in their physical fitness, the use of their limbs with ease and quality of life by the fourth week and after the eighth week of the exercise intervention program.

Population of the Study

The population of the study comprised all 25 registered male and female outpatients who were right and/or left hemiplegic stroke survivors in two hospitals at Oshogbo. In one of the hospitals, Ladoke Akintola University of Technology (LAUTECH) Teaching Hospital, Osogbo, there were 15 participants while the second hospital, Osun State Specialist Hospital Asubairo, Osogbo, had 10 patients that participated in this study.

Sample and Sampling Technique

Purposive sampling technique was adopted to recruit all the 25 male and female stroke survivors from both hospitals. However, during the study four (4) of the participants were excluded due to inability to fulfil all the criteria for inclusion. Hence, 21 participants made the sample for the study, which consisted of 13 participants from LAUTECH and seven (8) participants from Osun State Specialist Hospital, Asubairo, Osogbo.

Instrument for Data Collection

The following instruments were used for collecting data.

Weight Scale: The body weights of participants were measured using the weight scale portion of the Health-o-meter. The weighting portion consists of a sensitive kilo pound beam and two graduated poise bars, which is graduated from 0 to 250 kg.

Height-o-meter Scale: The height scale was used for body height of the participants. The instrument was calibrated in metres from 0 - 3 metres.

Stopwatch: The Casio automatic stopwatch graduated to 1/10 of a second was used for all timings in the study.

Measuring Tape: This was used to measure out a distance (20m) on a flat plain surface where the participant used for walking exercise. It was also used in measuring the upper and lower limb length including shoulder height.

Goniometer: This is an apparatus of a protractor and two arms held together with a screw. A standardized goniometer (C-Hart.ING, China) calibrated from 0° to 360° was used to measure the joints' range of motion of upper and lower limbs joints of the participants.

Cable Tensiometer: The Smedly tensiometer (Quinton, Germany) calibrated in kilogram from 0kg to 50kg was used to measure muscular strength.

Quality of Life Questionnaire (QoLQ): The questionnaire was adapted from the World Health Organization's (WHO, 2004) World Health Organisation Quality of Life (WHOQOL) for assessment of the participant's Quality of Life (QoL) in five domains of life.

Calibrated Weight (Sandbag): Calibrated weights 1kg, 2kg and 3kg manufactured by Stanley Cox London were used for strengthening exercises of the hamstring, (knee flexors); gluteus muscles (hip extensors) and dorsiflexion (tibialis anterior) in the affected lower limbs and shoulder abductors, flexors, extensors and forearm muscles in the affected upper limbs.

Sphygmomanometer: A digital (electronic) blood pressure measuring kit model HEM- 712c (see Appendix 9) made by the Omron Company, China was used to measure systolic and diastolic blood pressure and the heart/pulse rates of the participants. Good metallic based dry cell battery was used to ensure proper functioning, accurate and consistent readings.

Wooden Chair: The wooden chair was used for sitting during the muscular strength, range of motion and blood pressure tests. The chair had armrest; backrest was padded with foam in order to allow participants to sit comfortably with straight back. The chair was high such that the participants can freely flex and extend their legs without touching the ground.

Validity of the Instrument

The instruments used in this study were standardised. Standardized instruments are tools that consistently produce the same information when used for measuring specific quality or characteristics among very large populations and aids accuracy in comparisons. Thus all standardised instruments are reliable; the reliability of the all the instruments used in this study have been quoted in several studies including Mackinnon, Ritchie, Hooper and Abernethy (2003), Handa, Sahara, Yoshizaki, Endou, Utsunomiya, Kuroiwa and Yamamoto (2007), Chapleau, Canet, Petit, Laflame and Rouleau (2011). However, the WHOQOL was modified in order to suit the specific objective of this study and was subjected to content and face validation by three experts from related fields of Exercise Physiology, Department of Human Kinetics Education; Physiotherapy, Department of Physiotherapy and Epidemiology, Department of Epidemiology and Environmental Health all from the University of Ilorin, Nigeria.

Reliability of the Instruments

Apart from the QoLQ, all other instruments used in this study were standardised and have required validity for this type of study (Chapleau at al., 2011; Teslim, Olayinka, Michael, Adesoji & Oluwole, 2013). A pilot study was conducted to determine reliability of the validated QoLQ using the split-half method. The QoLQ was administered to a set of 10 stroke survivors that were drawn from three different hospitals namely. Living Hope Medical Centre, Osogbo, Victory Point Hospital, Osogbo and Owode Clinic, Owode-Ede. This was not part of the

hospitals where the study was conducted but has similar characteristics, which the researcher was interested in studying. After administration, the reliability was determined using the Chronbach-Alpha statistic and the reliability coefficient of 0.90 was obtained which showed that QoLQ has high reliability and was adopted for the study.

Procedure for Data Collection

Ethical Clearance: The researcher completed the necessary ethical form and was duly cleared by the University of Ilorin Ethical Review Committee before commencing the study.

Attestation: After obtaining the ethical clearance, the researcher proceeded to obtain a letter of attestation, which was tendered together with his student identity card for proper identification and documentation to the management of the hospitals, the participants and their caregivers and/or their immediate family members.

Recruitment and Training of Research Assistants: In the early stage, stroke survivors are usually fragile; they have a higher risk of falls, injury or even complication when not properly handled. Therefore, eight (8) people were recruited, trained for four (4) days and observed for two (2) days after which the best five among them were retained as research assistants. The training specifically centred on operation of instruments, appropriate measurement protocols, communication strategy, observing critical danger signs and basic first aid tips.

Informed Consent: The participants and their caregivers were given enlightenment about the study through several interactive sessions that were organised at different times in the two hospitals, LAUTECH Teaching Hospital and Osun State Specialist Hospital. This gave the researcher opportunity to explain the procedures, benefits and discomfort of the study and allowed the participants and their caregivers to ask questions regarding the study, which the

researcher ensured that all were answered satisfactorily. Thereafter, the participants or their legal caregivers (for those who could not write) completed, signed and dated the informed consent form to confirm their interest in participate in the study. Baseline information regarding health history, medical clearance for exercise, duration of stroke, medications use and the affected limbs were then obtained for screening of the participants.

Instrumentation

Following a pre-test, post-test and post-test order, measurements of the same characteristics; physical, physiological and QoL of the participants were obtained on three different occasions. The first measurement was conducted without any treatment while the second and third measurements were conducted after the fourth and eighth weeks of exercise therapy intervention respectively.

Measurement of Physical Characteristics

Body Weight

Objective: To determine the bodyweight of the participants.

Instrument Required: Health-o-meter. The weight scale portion was used for measuring body weight.

Procedure: The participants were instructed to wear light and loose fitting clothing and remove their shoes for the measurement. The researcher ensured that the weight indicator was on 0.0kg before each of the participants mounted on the horizontal surface of the Health-o-meter, participants stood erect facing the Health-o-meter, waited for the reading to be taken and displayed before getting down. Bodyweight was recorded to the nearest 0.5kg.

Body Height

Objective: To measure the upright body height of the participants.

Instrument Required: Height scale

Procedure: Participants wore light and loose fitting clothing, removed their shoes and stood upright on a horizontal surface with the head facing forward. As much as it was possible, the researcher ensured that their weight was evenly distributed between both legs. The participants were instructed to stretch upward as much as possible without lifting their heels off the ground. The head and face were then checked to ensure they were in Frankfurthorizontal (F.H.) plane. This implies when the “point traction” point just above the tragus of ear and point infra-orbitale, the inferior most point on the infra-orbital crest of the eye makes a horizontal lie (Kansal, 1996). The height scale was then moved to the back of the participant, placed between the heels of both legs, and slightly touching the buttocks and back of the head. The horizontal bar was lowered until it rested on the highest part of participant’s head; then the height was recorded to the nearest 0.5m.

Body Mass Index (BMI)

Objective: To estimate body fat and muscle mass of participants using the ratio of height to weight.

Instrument Required: Weight scale portion of the Health-o-Meter and height scale.**Procedure:**

The result of body weight and body height measurements was used to compute BMI in Kg/m²

using the formular $\frac{\text{weight (kg)}}{\text{height (m}^2\text{)}}$; and was rated using the rating standard of WHO (2012) as shown

in table 2.

Table2: World Health Organisation Reference Cut-off for Body Mass Index (BMI)

Classification	Principle Cut-off Points BMI (Kg/m ²)
Underweight	< 18.50
Normal range	18.50 – 24.99
Overweight	25.00 -29.99
obese class 1	30.00 – 34.99
obese class 2	35.00 – 39.99
obese class 3	≥ 40.00

Adapted from WHO references for BMI (2010)

Measurement of limbs length and shoulder height

Objective: To determine the differences in the length of both right and left upper limbs, lower limbs and shoulder height in order to justify shortness in the affected one or otherwise.

Instrument requires: Measuring tape rule

Procedure: The participants were asked to stand erect without tilting to any side as much as possible. Measurements were taken for upper limb; at the pick of the shoulder to the tip of the middle finger for both right and left upper limbs respectively. While lower limb measurement was taken from the lateral tip of the iliac crest to the lateral base of the foot below the medial malleoli for both right and left lower limb respectively. Shoulder height for both right and left side was measured from the pick of the shoulder to the lateral base of the foot below lateral malleoli for both sides respectively.

All measurement was taken in centimetres; they were recorded as part of the data for analysis.

Measurement of Physiological Characteristics

Muscular Strength

Objective: To determine the maximal force (strength) generated by the participants' quadriceps muscles (knee extensors) during extension and hamstring muscles (knee flexors) during flexion.

Instrument Required: Cable tensiometer and wooden chair. The cable tensiometer contains a cable that is connected to a riser and a pointer. When force is exerted on the cable, the riser depresses and rotates indicating the strength score of the participant.

Procedure: The participants sat on the wooden chair with the strap of the cable tensiometer tied around the leg 10cm just above the ankle joint, and the hip and knee joint angles positioned at 90 degrees. The muscular strength of the quadriceps muscles (knee extensors) was measured by tying the other end of the tensiometer containing the spring gauge to the crossbar of the chair positioned behind the participant's leg. Then they were instructed to extend (straight) knee maximally. The riser on the cable tensiometer was depressed and muscular strength was recorded in Newton. For muscular strength of the hamstring muscles (knee flexors), the end of the cable tensiometer containing the spring gauge was tied to a table 1m away. The participant lie prone on a plinth with the knee fully extended. They were instructed to flex (fold) the knee maximally and the reading on the riser was recorded as muscular strength in Newton.

Functional Ability

Objective: To measure how long the participants took to perform the task of daily living.

Instrument Required: Stopwatch and wooden chair.

Procedure: The stopwatch was set to zero reading; the participants were asked to sit in a relaxed form on the wooden chair. The tester informed the participants to get ready and pressed the stopwatch simultaneously when the participants were instructed to stand upright from the chair. When in full upright posture, the stopwatch was stopped and the time the participants took to stand erect was recorded to the nearest 0.1 seconds.

Blood Pressure

Objective: To measure the systolic and diastolic blood pressure of the participants.

Instrument Required: A digital (electronic) blood pressure measuring kit model HEM- 712c (see Appendix 8) made by the Omron Company, China.

Procedure: In order to be fully relaxed during the test, participants were instructed to empty their bladder and sit quietly on a wooden chair with comfortable back and arm support for 10 minutes

before the measurement was conducted. The feet were placed flat on the ground, not crossing each other and one slightly ahead of the other. Measurement was taken on the left arm, which was supported on a table with elbow slightly flexed such that the arm lies at mid-chest aligning with heart level. Sleeves of cloth were rolled up to armpit level in order to avoid wrong measurements. The digital (electronic) blood pressure measuring kit cuff was rolled on the upper arm (around the biceps and triceps muscles) about 1 inch above the elbow bend and snug using the fabric fastener but not tight. the researcher placed the kit on the table at the level of the heart, the start button of the electronic device is pressed the blood pressure of the participants then automatically displayed on the BP monitor which is then recorded for analysis.

The measurement was conducted three times and the average was recorded as participants' blood pressure. Blood pressure was rated using the National Institutes of Heart, Lung and Blood, (2012) reference standard as shown in table 3.

Table 3: Blood Pressure Reference Standard Chart

Blood Pressure Category	Systolic mmHg (upper value)		Diastolic mmHg (lower value)
Normal	<120	And	< 80 (Athletics have lower value)
Pre hypertension	121 – 139	Or	80-89
High Blood Pressure (Hypertension)Stage 1	140 – 159	Or	90– 99
(Hypertension)Stage 2	≥160	Or	≥100
Hypertensive Crisis (Emergency care needed)	> 180	Or	> 110

Source: (Clinical Practice Guideline for the Management of Hypertension in the community A Statement by the American Society of Hypertension and the International Society of Hypertension, 2014).

Resting Heart Rate

Objective: Electronic method was used to measure heart rate which automatically displays the heart rate.

Instrument Required: A digital (electronic) blood pressure measuring kit made by the Omron Company, China.

Procedure: A digital (electronic) blood pressure measuring kit Model HEM- 712c (see Plate 1) was used. The instrument was used to measure the blood pressure (systolic and diastolic) of the subjects in this study. Stopwatch. The participants were made to sit on a wooden chair while the researcher or research assistant wrapped the cuff of the BP monitor/kit round the upper arm above the elbow of the left upper limb which was placed on a table in front of the researcher at the level of the heart, the start button of the electronic device was pressed the heart/pulse rate of the participants then automatically display on the BP monitor which was then recorded to analysis.

Joints Range of Motion

Objective: To assess the active range of motion at the participants' upper and lower limb joints. Active range of motion (ROM) is the joint movement performed by the participants using their muscles without any external assistance.

Instrument Required: The goniometer.

Procedure: The participants were instructed to lie-down or sit on the wooden chair depending on joints that were measured. Two reference points at the side of the hand or leg where the stationary and movable arms of the goniometer were placed with the pivot aligned to the joint. The researcher or assistant held the goniometer firmly as the participants were instructed to either flex or extend the

joint. The range of motion of each joint was measured three times and the average was recorded to the nearest 0.1° and rated using the cut-off values shown in table 4 (Luttgens & Hamilton, 1997).

Table 4

Adopted from the American Medical Association (AMA) and the American Association of Orthopedic

Joint and movement	N ⁰	Median(10 ⁰ – 90 ⁰ percentile) JROM(⁰)	Normal JROM (⁰)
Predominantly affected joint movements.			
Shoulder flexion	108	119 (90-153)	150 -180
Shoulder abduction	117	98 (75-130)	180
Hip flexion, Knee bent	105	110 (85-130)	100-120
Hip internal rotation	96	0 (-25 to 20)	20-30
Other joint movements			
Wrist flexion	109	55 (30 -75)	60 -80
Wrist extension	116	30 (8- 64)	60 -70
Shoulder internal rotation	83	57 (36 -85)	70 – 90
Shoulder external rotation	85	61 (30- 85)	90
Shoulder extension	81	54 (35 -73)	50- 60
Elbow flexion	107	135 (110- 150)	140- 150
Elbow extension	106	-27 (-51 to 10)	0 -10
Hip abduction	91	33 (20-46)	40
Hip adduction	44	20 (13-30)	20
Hip external rotation	79	32 (23-61)	45- 50
Knee flexion	105	130 (105-145)	150
Knee extension	101	-10 (-25 to 5)	0 -10
Ankle dorsalexension	85	4 (-15 to 20)	20
Ankle plantar flexion	45	41 (20-50)	40 – 50

Designed by the America Medical Association (NMA) and the America Association of Orthopedic Surgeon (AAOS) (2005).

Cardiorespiratory Endurance (VO₂max)

Objective: To estimate the participants cardiorespiratory endurance using values of maximal heart rate (HRmax) and resting heart rate (HRmin).

Procedure: The value obtained from measurement of resting heart rate was used for calculating VO₂max by applying the Uth-Sorensen-Overguard–Pedersen estimation formula:

$$VO_2\text{max} = 15.3 \times \frac{HR_{\text{max}}}{HR_{\text{min}}} \text{ ml/kg/min (Uth-SorensenKristain \& Preben, 2004).}$$

Where:

$HR_{\text{max}} = 205.8 - (0.685 \times \text{Age})$ (Mosley and Bee, 2018);

HR_{min} = heart rate at rest measured after participants have sat quietly for 10 minutes. The standard for rating $VO_2\text{max}$ is shown in table 5.

Table 5: Reference Cut-off for $VO_2\text{max}$ (ml/kg/min) for Different Ages

Age	Very poor	Poor	Fair	Good	Excellent	Superior
13-19	<25.0	25.0-30.4	31.0-34.9	35.0-38.9	39.0-41.9	>41.9
20-29	<23.6	23.6-28.9	29.0-32.9	33.0-36.9	37.0-41.0	>41.0
30-39	<22.8	22.8-26.9	27.0-31.4	31.5-35.6	35.7-40.0	>40.0
40-49	<21.0	21.0-24.4	24.5-28.9	29.0-32.8	32.9-36.9	>36.9
50-59	<20.2	20.2-22.7	22.8-26.9	27.0-31.4	31.5-35.7	>35.7
60+	<17.5	17.5-20.1	20.2-24.4	24.5-30.2	30.3-31.4	>31.4

Adopted from Cengage Learning, (2015).

Measurement of Quality of Life (QoL)

Objective: To determine the participants QoL.

Instrument Required: Questionnaire of life Questionnaire (WHOQOL – BREF). The questionnaire had two sections. Section A focused on demographic data, section B focused on QoL indices under physical exercise and life, the activity of daily living, pain perception, health and wellness, environment and psychological wellbeing of the participants.

Procedure: Experts in the Department of Linguistics, University of Ilorin interpreted the questionnaire to Yoruba Language and after administration; it was interpreted back to English Language. Quality of life was evaluated by a shortened version of the WHOQOL questionnaire (WHOQOL) - BREF (WHO 2004). The questionnaire contained 22 questions providing information about several factors of quality of life. This included the Physical Domain, relating to pain or discomfort, energy or fatigue, sleep, rest, mobility, daily activities, medicine dependency, and job

performance; the Psychological Domain, identifying with sentiments, learning, memory and consideration, confidence, perspective, otherworldliness, strictness, and positive or pessimistic reasoning; the Social Domain, concerning individual connections, social help and sexuality; lastly, the Environmental Domain, identifying with actual security, home climate, monetary security, opportunity for information assessment, event participation and activities undertaken during spare time. Questions under each of the domains were rated using a rating scale of 1 – 4 for each sub-variable. The scores were then recorded in line with the WHO coding system provided along the WHOQOL (Appendix 7).

Inclusion Criteria

Patients were included in the study if they had the following characteristics:

- i. stroke survivors who are ambulant with or without walking aids;
- ii. stroke survivors with controlled systolic and diastolic blood pressures;
- iii. stroke survivors who are on regular medication;
- iv. adult male and female who have survived stroke not more than 3 years on-set;
- v. able to comply with scheduled visits, exercise intervention plan and other procedures of the study;
- vi. between the ages of 40 and 80 years who could cope with the stress of the intervention exercises;
- vii. have been cleared by a physician to participate in exercise therapy and
- viii. fill and sign the informed consent form, indicating that the individual willingly gave consent for the study or a legal representative that participants has been well informed of all pertinent aspects of the study.

Exclusion criteria

Patients who possessed one or more of the following characteristics were excluded from the study:

- i. stroke survivor that is not ambulant with or without walking aids;
- ii. stroke survivors with irregular and/or uncontrolled blood pressure (not more than 145/100 mmHg or less than 100/65 mmHg) (Fasellis, Doumas & Papademetriou, 2011);
- iii. adult male and female stroke survivors that are less than 40 years or above 80 years of age;
- iv. stroke survivors that had the crises more than 3 years ago;
- v. participating in any regular therapy or progressive exercise programme at the time of this study;
- vi. failure to sign and date the informed consent form indicating that the individual (or a legally acceptable representative) has been well informed of all pertinent aspects of the study and
- vii. failure to complete all procedures or dropping out of the study.

Exercise Intervention Programme

The exercise intervention was designed in line with the ACSM's (2014) Frequency, Intensity, Type, Time and Progression (FITT & P) principle of exercise prescription for cerebrovascular (stroke) outpatients. For each exercise session, their heart rate, systolic and diastolic blood pressure was measured before and after the exercise to monitor and ensure participants conveniently tolerate exercise load (Clark, Lucett & Sutton, 2012; ACSM, 2014). The exercise protocol composed of 2 – 3 days per week exercise sessions ranging from 10 to 20 minutes duration per session for the 8 weeks period of intervention (American Heart Association [AHA]/American Stroke Association [ASA],

2016). For each session, there was a warm-up before work out activity and a warm down after the workout. The type of exercise conducted includes moderate-intensity aerobics, flexibility and strength exercises. This was sub-divided into 5minutes exercise 3minutes rest for about two times a week, over a period of 8 weeks. Initially, the exercise was at the pace participants could tolerate (around 2.6METs to 3.4METs) but this was increased progressively as the participants adapted to workload (ACSM, 2014). Motyl, Driban, McAdams, Price and McAlindon (2013) who studied stroke survivors' response to 6-12 minutes' walk test also the study of involving reported a test-retest sensitivity on a 20meters walk for patients, muscle strengthening and increasing joint flexibility activities. As such, the aerobic conditioning consisted of brisk walking on a 20 meters corridor for 3 – 6 repetitions. For skeletal muscle strengthening, exercises consisting of flexion and extension of the affected lower and upper limbs were implemented, with body mass-imposed resistance and external resistance using calibrated weight (sandbag) strapped on the ankle of the affected lower limb and lifted from the chest to lateral side of the body in shoulder abduction or elbow extension. Relaxation and elongation exercises were conducted before and after every session, including stretching to increase the flexibility of large muscle-joint groups (shoulder, elbow, hip joint, knee and ankle). The participants were treated on different days in the two centres Tuesdays and Fridays at LAUTECH Teaching Hospital, Osogbo while those at Specialist Hospital Asubiaro Osogbo were treated on Mondays and Thursdays Table 6 shows detail of the exercise programme from week one through week eight.

Table 6: Eight Weeks Exercises Intervention Programme Organised for the Participants

Week	Frequency	Intensity	Type	Time
1	3d/wk	2.6METs to 3.5METs/min	i) warm up exercise ii) workout: moderate intensity aerobic exercise (self paced walking over 20m distance); flexibility exercises (active/passive stretching of arms, legs and trunk); strength exercise with body weight. All exercises interspaced with rest intervals iii) warm down exercise.	10 mins
2	3d/wk	2.6METs to 3.5METs/min	i) warm up exercise ii) workout: moderate intensity aerobic exercise (self paced walking over 20m distance); flexibility exercises (active/passive stretching of arms, legs and trunk); strength exercise with body weight. All exercises interspaced with rest intervals iii) warm down exercise.	10 mins
3	3d/wk	2.6METs to 3.5METs/min	i) warm up exercise ii) workout: moderate intensity aerobic exercise (self paced walking over 20m distance); flexibility exercises (active/passive stretching of arms, legs and trunk); strength exercise with body weight. All exercises interspaced with rest intervals iii) warm down exercise.	10 mins
4	3d/wk	3.0METs to 4.0METs/min	i) warm up exercise ii) workout: moderate intensity aerobic exercise (self paced walking over 20m distance); flexibility exercises (active stretching of arms, legs, trunk and whole body); strength exercise with body weight. All exercises interspaced with rest intervals iii) warm down exercise.	12 mins
5	3d/wk	3.0METs to 4.0METs/min	i) warm up exercise ii) workout: moderate intensity aerobic exercise (self paced walking over 20m distance); flexibility exercises (active stretching of arms, legs, trunk and whole body); strength exercise with body weight. All exercises interspaced with rest intervals iii) warm down exercise.	14 mins
6	2d/wk	4.0METs to 4.5METs/min	i) warm up exercise ii) workout: moderate intensity aerobic exercise (fastest pace possible walking over 20m distance); flexibility exercises (active stretching of arms, legs, trunk and whole body); strength exercises with body weight and free weight. All exercises interspaced with rest intervals iii) warm down exercise.	14 mins
7	2d/wk	4.5METs to 5.0METs/min	i) warm up exercise ii) workout: moderate intensity aerobic exercise (fastest pace possible walking over 20m distance); flexibility exercises (active stretching of arms, legs, trunk and whole body); strength exercises with body weight and free weight. All exercises interspaced with rest intervals iii) warm down exercise.	16 mins
8	2d/wk	5.0METs to 6METs/min	i) warm up exercise ii) workout: moderate intensity aerobic exercise (fastest pace possible walking over 20m distance); flexibility exercises (active stretching of arms, legs, trunk and whole body); strength exercises with body weight and free weight. All exercises interspaced with rest intervals iii) warm down exercise.	18 to 20mins

Source: Researcher-designed (2018).

Procedure for Data Analysis

Data collected for this study were analysed using the Statistical Package for Social Sciences (SPSS) application software of 20.0 version. The variables of quality of life were categorical; data obtained with the WHOQOL-BREF for they were initially converted to WHOQOL transformed

scores (appendix 7) and then converted to a ratio scale of 0-100. Statistical analysis conducted were descriptive statistics of mean, standard deviation and percentage for demographic characteristics and answering the research questions. Hypotheses were tested using inferential statistic. The analysis involved General Linear Model (GLM) of One-Way Repeated Measures Analysis of Variance (ANOVA) with statistical significance set at $p \leq 0.05$. Turkey post-hoc test was used.

Each repeated measures ANOVA (F) generated four Multivariate results of the same value but the Hotelling's Trace (HT) which has greater statistical power when assumptions are violated was preferred for reporting the findings. In order to be sure of a true effect of the treatment, Mauchly's test was conducted on all data sets to ensure there was no violation of sphericity assumption. Where a violation occurred (that is, Mauchly's $p < 0.05$), the average of Greenhouse-Geisser and Huynh-Feldt correction estimate was taken and degree of freedom (df) was adjusted to obtain accurate F values (Field, 2009).

CHAPTER FOUR

RESULTS OF DATA ANALYSIS AND DISCUSSION OF FINDINGS

This chapter presents the results of data, analysis and discussions of findings of the study. The data collected in this research was subjected to statistical analyses employing both descriptive and inferential statistics.

Results

Table 7: Demographic Characteristics of Stroke survivors in Osogbo, Osun State, Nigeria

Variable		Frequency	Percentage
Gender			
	Male	12	57.1
	Female	9	42.9
Total		21	100.0
Occupation			
	Retiree	3	14.3
	C/S	1	4.8
	Self Employed	11	52.4
	Trading	1	4.8
Total		21	100.0

Table 7 shows demographic characteristics of the participants. The results showed that majority 12 (57.1%) of the stroke survivors were males while the remaining 9 (42.9%) were female. Majority of them 11 (52.4%) were self-employed, 3 (14.3%) were retirees, 1 (4.8%) were civil servants (C/S), and 1 (4.8%) were traders.

Table 8: Profile of Stroke Survivors in Osogbo, Osun-state Nigeria

Variable		Frequency	Percentage
Affected Side			
	Right side	13	61.9
	Left side	8	38.1
Total		21	100.0
Intake of medication			
	Yes	18	85.7
	No	3	14.3
Total		21	100.0

Table 8 shows the stroke profile of the participants. Majority of them 13 (61.9%) were affected on right side while the rest of them 8 (38.1%) were affected on the left-sided hemiplegia (that is affected their left side). Majority of the participants 18 (85.7%) take their medication regularly while 14% (3) of the participants did not take their medication regularly despite their health condition.

Table 9: Physical Characteristics of the Stroke Survivors in Osogbo, Osun State

Variables	N	Min	Max	$\bar{x} \pm SD$
Age(years)	21	41	80	57.3±11.03
Height (m)	21	1.57	1.8	1.65±0.05
Body weight(kg)	21	46.0	95.0	71.89±11.9
BMI (kg/m ²)	21	16.4	35.0	26.3±4.3
Right shoulder height(cm)	21	133	155	143±0.06
Left shoulder height(cm)	21	135	144	144±0.05
Right Upper Limb Length(cm)	21	34	81	68±0.09
Left Upper Limb Length (cm)	21	59	82	70±0.06
Right Lower limb length (cm)	21	60	93	84±0.77
Left Lower limb length (cm)	21	72	94	83±0.06

Table 9 shows the means and standard deviation of physical characteristics of stroke survivors. The mean age of the participants was 57.3±11.03 years. The youngest participant was 41 years old while the oldest of them was 80 years old. The mean height was 1.65±0.05m; the

shortest of them was 1.57m and the tallest among them was 1.8m. Average body weight of the participants was 71.89 ± 11.9 kg while the minimum and maximum weight was 46.0kg and 95.0kg respectively. The average BMI was 26.3 ± 4.3 kg/m² while the minimum and maximum BMI was 16.4 kg/m² and 35.0 kg/m².

Considering body proportionality, the result indicated that mean right shoulder height of the participants was 143 ± 0.06 cm; the minimum right shoulder height was 133cm while maximum was 155cm. The mean left shoulder height was 144 ± 0.05 cm, the minimum and maximum of 135cm and 144cm respectively. Right upper limb lengths have minimum and maximum of 34cm, 81cm and mean of 68 ± 0.09 cm respectively. Left upper limb length has minimum and maximum of 59cm, 82cm and mean of 70 ± 0.06 cm respectively. The mean right lower limb length was 84 ± 0.77 m with minimum of 60cm and maximum of 93cm. Left Lower limb length mean was 83 ± 0.06 cm with minimum and maximum of 72cm and 94cm respectively.

Table 10: Physiological Characteristics of Stroke Survivors in Osogbo, Osun-state

Variables	N	Min	Max	$\bar{x} \pm SD$
Systolic BP(mmHg)	21	108.00	144.00	127.4 ± 10.4
Diastolic BP(mmHg)	21	70.00	100.00	84.5 ± 7.74
Heart Rate (bpm)	21	71.00	95.50	82.9 ± 7.7
VO ₂ max (ml/kg/min)	21	24.30	35.10	29.9 ± 3.21
Respiratory Rate(RR) (bpm)	21	24.0	20.0	21.3 ± 1.20

Table 10 shows the physiological characteristics of stroke survivors. The minimum systolic blood pressure (SBP) was 108 mm Hg and maximum SBP to be 144 mm Hg while the mean SBP was 127.0 ± 11.0 mmHg. The mean diastolic blood pressure was 84.0 ± 9.5 mm Hg. While the minimum DBP was 60.00 mm Hg and maximum was 100.00 mm Hg, the mean heart rate of the participants was 82.9 ± 7.7 bpm, while the minimum and maximum HR was 71.00

bpm and 95.50 bpm respectively. The mean $VO_2\text{max}$ was 30.07 ± 3.38 ml/kg/min while the minimum and maximum $VO_2\text{max}$ was 24.30 ml/kg/min and 37.10ml/kg/min respectively.

Table 11: Rating of Physical and Physiological Characteristics of the Stroke Survivors in Osogbo

Variable and Categories		$\bar{x} \pm SD$	Frequency	Percentage
Body Mass Index		26.26 ± 4.33		
	Underweight		1	4.8
	Normal		5	23.8
	Overweight		11	52.4
	Obese class1		3	14.3
	Obese class 2		1	4.8
Total			21	100.0
Systolic BP		127.43 ± 11.01		
	Normal		7	33.3
	Pre-hypertension		8	38.1
	Hypertension stage 1		6	28.6
Total			21	100.0
Diastolic BP		84.5 ± 9.5		
	Normal		13	61
	Pre-hypertension		7	33.3
	Hypertension stage		1	4.8
Total			21	100.0
$VO_2\text{max}$		29.9 ± 3.21		
	Superior		4	19
	Excellent		4	19
	Good		11	52
	Fair		2	9.5
Total			21	100.0

Table 11 shows rating of physical and physiological characteristics of stroke survivors. The body mass index rating shows majority of them 11 (52.4%) had normal, 5(23.8%) were underweight, 3(14.3%) were overweight, 1 (4.8%) were obese class 1 and (4.8%) were obese class 2. Systolic and diastolic blood pressures of participants were categorized into normal 7(33.3%), pre-hypertension 8 (38.1), and hypertension stage one 6 (28.6%).

In the diastolic blood pressure, category 61% (13) had normal diastolic blood pressure, 33.3% (7) were pre-hypertension and only (4.8%) 1 of the participant was in hypertensive stage 1. Furthermore, VO₂max was categorized into Superior, Excellent, Good and fair with 19%, 19%, 52% and 9.5% respectively.

Answers to Research Question

Table12: Effects of Exercise on Quality of Life and Physiological Variables of Stroke Survivors in Osogbo, Osun-State

S/N	Variable	$\bar{x} \pm SD$			Remark
		Week 0	Week 8	%	
1	General Quality of Life	37.5 $\pm$ 7.65	57.44 $\pm$ 16.01	47	Higher
2	Physical Exercise	36.90 $\pm$ 7.36	54.46 $\pm$ 13.8	46.6	Higher
3	Pain perception	38.98 $\pm$ 7.36	50.59 $\pm$ 12.33	29.8	Higher
4	Health and Wellness	34.52 $\pm$ 7.81	50.60 $\pm$ 12.32	46.6	Higher
5	Environmental	37.30 $\pm$ 6.38	55.15 $\pm$ 12.14	47.9	Higher
6	Psychological Problem	38.39 $\pm$ 6.92	68.75 $\pm$ 15.31	79.1	Higher
7a.	Functional ability (s)	3.60 $\pm$ 0.72	1.33 $\pm$ 0.45	63.1	Higher
7b.	Activities of daily living	36.90 $\pm$ 7.36	59.52 $\pm$ 10.93	61.3	Higher
8a.	Lower limb(Knee flex) muscles strength (N)	42.15 $\pm$ 0.45	51.42 $\pm$ 0.45	21.9	Higher
8b.	Upper limb (shoulder abd) muscles strength (N)	41.76 $\pm$ 20.07	51.76 $\pm$ 18.32	23.9	Higher
9a.	SBP(mmHg)	127.43 $\pm$ 10.48	121.43 $\pm$ 7.71	4.7	Lower
9b.	DBP(mmHg)	84.57 $\pm$ 7.74	78.67 $\pm$ 7.11	6.9	Lower
9c.	HR (bpm)	82.98 $\pm$ 7.71	80.52 $\pm$ 8.34	2.96	Lower
10.	VO ² max (ml/kg/min)	29.93 $\pm$ 3.21	31.58 $\pm$ 3.35	5.51	Higher

Research Question One: What are the effects of physical exercises on the quality of life of stroke survivors?

Table 12 (1) revealed that the mean general quality of life of the participants increased from 37.5 $\pm$ 7.65 in week one to 57.44 $\pm$ 16.01 at week eight, the end of exercise intervention

period. This indicates an increase in the general quality of life of stroke survivors after exercise intervention; implying physical exercise has positive effects on QOL of the participants.

Research Question Two: How do physical activities in the form of exercise improve the living conditions (Self-satisfaction) and healthy well-being of stroke survivors?

Table 12 (4&5) shows that the mean value of environmental and health and wellness domains of QOL of the participants increased from 37.30 ± 6.38 , 34.52 ± 7.81 in week one to 55.15 ± 12.14 , 50.60 ± 12.32 in week eight at the end of the exercise treatment of the participants. This implies physical activities (exercises) improved the living conditions which consisted of environmental domains of QOL and healthy well-being of the participants.

Research Question Three: What is the effect of exercise on functional ability and activities of daily living of stroke survivors?

Table 12 (3a) reveals that the mean value of functional ability decreased from 3.60 ± 0.72 seconds in week one to 1.33 ± 0.45 second in week eight indicating less time was spent to perform the same action. The result of 3b shows that the mean value for activities of daily living increased from 36.90 ± 7.36 in week one to 51.42 ± 0.45 in week eight meaning that exercises have improved the stroke survivors' capability to carry out activities of daily living. So exercise improves both functional ability and activity of daily living of stroke survivors example is the study of Kwakkel, Veerbeek and Van-Wegen (2010) that augmented exercise therapy has small but favorable effect on activities of daily living.

Research Question Four: What are the effects of exercise on lower and upper limb muscles strength?

Table 12 (7a) shows that the mean value for the affected lower limb (knee flexors) muscle strength increases from 42.15 ± 0.45 Newton (N) in week one to 51.42 ± 0.45 N in week

eight an indication that exercise improves lower limbs muscle strength of stroke survivors, knees flexors (the hamstrings: Biceps femoris, semimembranosus, semitendinosus) was picked to represent the lower limb muscle in this study because it is one of the muscle group majorly affected by stroke.

The result in 7b shows that the mean value for upper limb muscle increased from $41.76 \pm 20.07\text{N}$ in week one to $51.76 \pm 18.32\text{N}$ in week eight. Shoulder abductors were adopted to represent upper limbs muscle in this study because stroke condition weakens shoulder abductors so they find it difficult to lift sideways and upwards meaning that exercise increases the muscle strength of both upper limb and lower limb muscle strength of stroke survivors.

Research Question 5: Will exercise improve pain perception of stroke survivors?

Table 12: (3) shows that the mean value for pain index of Qol increased from 38.98 ± 7.36 in week one to 50.59 ± 12.33 in week eight this shows that exercise intervention improves pain index of Qol that means pain felt/ perceived by stroke survivors lowers and hence improved their quality of life.

Research Question 6: Will aerobic exercise improves cardiovascular variables (Systolic blood pressure, diastolic blood and heart rate) of stroke survivors?

Table 12: (9a) shows that the mean value of systolic blood pressure (SBP) decreased from 127.43 ± 10.43 in week one to 121.4 ± 7.17 in week eight which mean exercise helps to reduce SBP of stroke survivors. 9b shows that the mean value of diastolic blood pressure of the participants' decrease $84.57 \pm 7.74\text{mmHg}$ in week one to $78.67 \pm 7.11\text{mmHg}$ in week eight which means that exercise reduced the diastolic blood pressure of stroke survivors. Table 12, (9c) also shows that the mean value of heart rate decrease from 82.98 ± 7.71 in week

one to 80.52 ± 8.34 week eight so exercise reduces heart rate of stroke survivors, therefore exercise help to reduce cardiovascular parameters (SBP, DBP and HR) of stroke survivors.

Research Question 7: Will physical exercise improve cardio-respiratory endurance ($VO_2^{\max}$) of stroke survivors?

Table 12: (10) shows that the mean of the cardiorespiratory endurance increase from 29.93 ± 3.21 ml/kg/min in week one to 31.58 ± 3.25 ml/kg/min in week eight this indicates an improvement in cardiorespiratory ($VO_2^{\max}$) endurance of the participants. So stroke survivors in this study will have more capacity and endurance for more tasks after this intervention.

Research Question 8: Will physical exercise improve the stroke survivors' ability to relate well with the environment?

Table 12, (5) shows that the mean value for environmental domains increases from 37.30 ± 6.38 in week one to 55.16 ± 12.14 in week eight this indicate that exercises improve the ability of the participants to relate well the environment this has been answered in research question two.

Research question 9: Will Stroke affect the body Symmetry of stroke survivors in Osogbo Osun state Nigeria.

Table 13: Effect of stroke on the Body Symmetry of Stroke Survivors in Osogbo Osun state Nigeria

Variables	Affected side for Rt hemiplegia RT side (Mean $\pm$ SD)	Non-affected side for Rt hemiplegia LT side (Mean $\pm$ SD)	Range	Affected side for Lt hemiplegia LT side (Mean $\pm$ SD)	Non-affected side for Lt Hemiplegia RT side (Mean $\pm$ SD)	Range
Shoulder height (cm)	142 ± 4.0	144 ± 6.0	22	144 ± 5.1	146 ± 4.07	13
Upper Limb length (cm)	66.88 ± 11.0	71.34 ± 6.8	19	68.12 ± 8.0	71.0 ± 3.6	23
Lower Limb length (cm)	80.5 ± 6.0	81.4 ± 6.05	18	84.3 ± 5.4	85.23 ± 10.1	20

Table 13; shows that the mean value of shoulder height for the affected side was lower ($142\pm4.0\text{cm}$) than that of the unaffected side ($144\pm6.0\text{cm}$) for right-sided hemiplegia also in left-sided hemiplegia the left shoulder height (the affected side) was shorter/lower $144\pm5.1\text{cm}$ than the right shoulder height $146\pm4.07\text{cm}$ respectively which is a reason for the body asymmetry of the stroke survivors noticeable in standing, the affected side is usually shorter than the affected side, the same is also the case for upper limb and lower limb length from table 14 above it was obvious that the affected had a lower mean value than the unaffected side, the right hemiplegic stroke had mean value of $66.88\pm11.0\text{cm}$ and 80.5 ± 6.0 for the affected right upper and lower limb respectively which was lower than the mean value of the unaffected lower limb the left upper and lower limb was $71.34\pm6.8\text{cm}$ and $81.4\pm6.05\text{cm}$ respectively. Therefore the answer to research question 9 was that stroke as a medical condition leads to asymmetry of the victims due to the weakness of the affected side.

Main Hypothesis

Table 14: Multivariate of Repeated Measures ANOVA and comparisons of the Effects of Exercise on Quality of Life (QoL) of Stroke survivors in Osogbo, Osun state

N	Test period	$\bar{x} \pm SD$	Hotelling's Trace (HT)	F	Hypothesis df	Error df	Sig
21	Wk0	37.5 ± 7.65	2.56	24.41	2	19	.000
	Wk4	44.34 ± 8.36					
	Wk8	57.44 ± 16.0					
Effects		QoL	Sum of Squares	F	Mean Square	Df	Sig
Within participants	Wk0 vs. Wk4		156436.01	374.44	156436.01	1	.000
	Wk4 vs. Wk8		15403.64	20.93	15403.64	1	.000
Between participants	Intercept		1768275.67		1768275.67	1	.000
	Error		34190.09	1034.3720	34190.09	20	

Significant at $P \leq 0.05$ level)

Table 14 shows the multivariate analysis of the repeated measures ANOVA for the main hypothesis, which tested the overall effects of exercise on Quality of Life (QoL) of stroke survivors after an eight-week exercise intervention programme. The result shows a significant difference in the participants' QoL, $F(2,19) = 178.87, p=0.00$; the actual effect is that during the eight-week exercise intervention, mean QoL actually increased from a pre-test score of 37.5 ± 1.7 at wk0 to post-tests' scores of 44.34 ± 8.25 in wk4 and 57.4 ± 16.0 at wk8. This implies that exercise, has positive effect on QoL of stroke survivors, it improves the overall

QoL of stroke survivors victims. Table 14 shows comparisons of the rate of change that occurred in QoL during the exercise intervention programme. The individual changes within participants indicates there is a significant increase in QoL between wk0 and wk4 $F(1) = 374.44, p=0.014$, also an increase rate between wk4 and wk8 $F(1) = 20.93, p=0.000$. The comparison also indicates a significant increase in the effect of exercise on QoL between each of the participants ($p=0.00$). The main hypothesis is therefore rejected since there is a significant difference in the quality of life of stroke survivors ($p=0.014$) before and after exercise intervention.

Sub Hypothesis 1: There will be no significant difference in healthy well-being of stroke

survivors before and after exercise interventions.

Table 15: Multivariate of Repeated Measures ANOVA and Comparisons of the Effects Exercise on healthy well-being Domain of Quality of Life (QoL) of Stroke survivors in Osogbo, Osun state

N	Test period	$\bar{x} \pm SD$	Hotelling's Trace (HT)	F	Hypothesis df	Error df	Sig
	Wk0	38.98± 7.36					
21	Wk4	57.14± 11.57	3.97	37.77	2	19	.000
	Wk8	50.60± 12.32					

Effects	QoL	Sum of Squares	Df	Mean Square	F	Sig
Within participants	Wk0 vs. Wk4	3439.36	1	3439.36	56.90	.000
	Wk4 vs. Wk8	225.07	1	225.07	8.70	.000
Between participants	Intercept	40927.78	1	1768275.67		
	Error	84.47	20	34190.09	484.52	.000

Significant level or P-value is set at 0.05.

Table 15 shows the multivariate analysis of the repeated measures ANOVA for the main hypothesis, which tested the effects of exercise on healthy well-being Domain of Quality of Life (QoL) of stroke survivors after an eight-week exercise intervention programme. The result from the above table shows a significant difference in the participants' healthy well-being domain of QoL, HT 3.97, $F(2,19) = 37.77$, $p=0.00$; the effect is that during the eight-week exercise intervention, mean QoL increased from a pre-test score of 34.52 ± 7.81 at wk0 to post-tests' scores of 47.32 ± 9.59 in wk4 and 50.60 ± 12.32 at wk8. This shows that exercise has a positive effect on healthy well-being domain QoL of stroke survivors. Therefore sub-hypothesis one is hereby rejected since there is a significant difference ($p=0.00$) in healthy well being of stroke survivors in Osogbo Osun-state before and after exercise intervention. Table 15 shows comparisons of the rate of change that occurred in QoL during the exercise intervention

programme. The individual changes within participants indicate there is a significant increase in QoL between wk0 and wk4 $F(1) = 56.90$, $p=0.008$, with an increased rate between wk4 and wk8 $F(1) = 225.07$, $p=0.000$. The comparison also indicates a significant difference in the effects of exercise on healthy well-being QoL between each of the participants ($p=0.00$).

Sub Hypothesis 2: There will be no significant difference in the ability to perform activities of daily living (ADL such as work capacity, performing daily living activities, ability to get around with ease and sufficient energy for everyday life) by stroke survival before and after exercise intervention.

Table 16: Multivariate of Repeated Measures ANOVA of Exercise Effects on Activities of daily Living of Stroke survivors in Osogbo, Osun state

N	Test period	$\bar{x} \pm SD$	Hotelling's Trace F (HT)	Hypothesis df	Error df	Sig
21	Wk0	36.90 $\pm$ 7.36	11.390	2	19	.000
	Wk4	54.46 $\pm$ 13.85				
	Wk8	59.52 $\pm$ 10.93				

Effects	QoL	Sum of Squares	Df	Mean Square	F	Sig
Within participants	Wk0 vs. Wk4	10744.04	1	10744.04	220.45	.000
	Wk4 vs. Wk8	537.57	1	537.57	8.28	.009
Between participants	Intercept	53126.86	1	53126.86	524.70	.000
	Error	2025.05	20	101.25		

Significant at $P \leq 0.05$ level).

Table 16 shows the multivariate analysis of the repeated measures ANOVA for the sub-hypothesis, which tested the effects of exercise on physical exercise domain (ADL) of Quality of Life (QoL) for stroke survivors after an eight-week exercise intervention programme. The result from the above table shows a significant difference in the participants' QoL, HT 11.390, $F(2,19) = 108.20$, $p=0.000$; the effect is that during the eight-week exercise intervention, mean QoL increased from a pre-test score of 36.90 $\pm$ 7.36 at wk0 to post-tests' scores of 54.46 $\pm$ 13.85 in wk4 and 59.52 $\pm$ 10.93 at wk8. Therefore, sub-hypothesis two is hence rejected since there is a

significant difference in the activities of daily living of stroke survivors before and after exercise correction. This shows that exercise has a positive effect on activities of daily living (physical exercises domain of QoL) of stroke survivors.

Table 16 shows comparisons of the rate of Effects of Exercise on activities of daily living (physical exercises) of Stroke survivors. The individual changes within participants indicate there is a significant increase in daily living between wk0 and wk4 $F(1) = 220.45$ $p=0.00$, with an increased rate between wk4 and wk8 $F(1) = 537.57$, $p= 0.00$. The comparison also indicates a significant difference in the effects of exercise on activities of daily living (physical exercises) between each of the participants ($p=0.00$).

Sub Hypothesis 3. There will be no significant difference in stroke survivors' functional ability before and after the exercise intervention.

Table 17: Multivariate of Repeated Measures ANOVA and Comparisons of effects of Exercise on the functional ability of stroke survivors in Osogbo, Osun state

N	Test period	$\bar{x} \pm SD$	Hotelling's Trace F	Hypothesis df	Error df	Sig
21	Wk0	3.65±0.45	7.30	2	19	.000
	Wk4	2.35±0.72				
	Wk8	1.33±0.45				

Effects	QoL	Sum of Squares	Df	Mean Square	F	Sig
Within participants	Wk0 vs. Wk4	34.97	1	34.97	106.65	.000
	Wk4 vs. Wk8	22.01	1	22.01	76.72	.000
Between participants	Intercept	125.64	1	53126	322.950	.000
	Error	7.781	20	125.644		

Significant at $P \leq 0.05$ level)

Table 17 shows the multivariate analysis of the repeated measures ANOVA for the sub-hypothesis, which tested the effects of exercise on the functional ability of stroke survivors after an eight-week exercise intervention programme. The result from the above table shows a significant difference in the participants' QoL, HT 7.30, $F(2,19) = 69.37$, $p=0.000$; the effect is

that during the eight-week exercise intervention, mean time in second spent to perform sit to stand functional task reduces from 3.65 ± 0.45 at wk0 to post-tests' scores of 2.35 ± 0.72 in wk4 and 1.33 ± 0.45 at wk8 (spending less time to carry out functional task indicate improvement in functions Douglas, Kristen, Kristina, Karen, Madeleine, Roberta, Newton, 2010). Therefore, sub-hypothesis three is hence rejected since there is a significance different in functional ability of stroke survivors before and after exercise intervention. This shows that exercise has a positive effect on functional ability of stroke survivors.

Table 17 shows comparisons of the rate of change that occurred in QoL during the exercise intervention programme. The individual changes within participants indicate there is a significant decrease in time spent for functional ability between wk0 and wk4 $F(1) = 106.65$, $p = 0.00$, with a reduced rate in time spent between wk4 and wk8 $F(1) = 76.72$, $p = 0.000$. The comparison also indicates a significant difference in the effects of exercise on functional ability between each of the participants.

Sub Hypothesis 4: there will be no significant difference in stroke survivors' hamstring (knee flexors) muscle strength before and after exercise interventions.

Table 18: Multivariate of Repeated Measures ANOVA of Effects of Exercise on hamstring (knee flexors) Muscle Strength of Stroke Survivors in Osogbo, Osun State

N	Test period	$\bar{x} \pm SD$	Hotelling's Trace F	Hypothesis df	Error df	Sig
21	Wk0	43.12 $\pm$ 0.45	3.37	2	19	.000
	Wk4	51.42 $\pm$ 0.72				
	Wk8	51.42 $\pm$ 0.45				

Effects	QoL	Sum of Squares	Df	Mean Square	F	Sig
Within participants	Wk0 vs. Wk4	1448.35	1	1448.35	67.549	.000
	Wk4 vs. Wk8	.000	1	.000		.010
Between participants	Intercept	174048.048	1	202.598	202.598	.000
	Error	7309.841	20	365.492		

Kn fx strth = knee flexion strength. Significant at $P \leq 0.05$ level)

Table 18 shows the multivariate analysis of the repeated measures ANOVA for the sub-hypothesis, which tested the effects of exercise on hamstring (knee flexors) muscle strength of stroke survivors after an eight-week exercise intervention programme. The result from the above table shows a significant difference in the participants' hamstring (kneeflexors) muscle strength HT 3.37, $F(2, 19) = 67.54$, $p=0.00$; the effect is that during the eight-week exercise intervention, mean hamstring (kneeflexors) muscle strength increased from a pre-test score of 43.12 ± 0.45 at wk0 to post-tests' scores of 51.42 ± 0.72 in wk4 but no increase in post-tests' scores of 51.42 ± 0.72 at wk8. Hence the sub-hypothesis four is rejected because a significant difference knee flexors muscle strength of stroke survivors before and after exercise intervention. This shows that exercise has a positive effect on hamstring (kneeflexors) muscle strength of stroke survivors.

Table 18 shows comparisons of the rate of change that occurred hamstring (knee flexors) muscle strength during the exercise intervention programme. The individual changes within participants indicate there is a significant increase in hamstring (kneeflexors) muscle strength between wk0 and wk4 $F(1) = 56.90$, $p = 0.00$, but no increased rate between wk4 and wk8 $F(1) = 225.07$, $p=0.00$. The comparison also indicates a significant difference in the effects of exercise on knee flexors muscles (hamstring) between each of the participants.

Sub Hypothesis 5. There will be no significant difference in stroke survivors' pain perception before and after exercise intervention.

Table 19: Multivariate of Repeated Measures ANOVA of Effects Exercise on Pain Perception (PPQOL) of Stroke survivors in Osogbo, Osun State

N	Test period	$\bar{x} \pm SD$	Hotelling's Trace (HT)	F	Hypothesis df	Error df	Sig
21	Wk0	38.98±7.37	4.43	42.14	2	19	0.000
	Wk4	54.46±13.85					
	Wk8	57.14±11.57					
Effects		PP QoL	Sum of Squares	Df	Mean Square	F	Sig
Within participants	Wk0 vs. Wk4		150.670	1	150.670	720	.000
	Wk4 vs. Wk8		6921.503	1	6921.503	77.36	.406
Between participants	Intercept		52917.493	1	52917.493	717.360	.000
	Error		1474.86	20	1474.86		

Significant at $P \leq 0.05$ level)

Table 19 shows the multivariate analysis of the repeated measures ANOVA for the sub-hypothesis, which tested the effects of exercise on pain perception (PP QOL) domain of Quality of Life (QoL) for stroke survivors after an eight-week exercise intervention programme. The result from the above table shows a significant difference in the participants' QoL, HT 4.43, $F(2,19) = 42.14$, $p=0.00$; the effect is that during the eight-week exercise intervention, mean QoL increased from a pre-test score of 38.98 ± 7.37 at wk0 to post-tests' scores of 54.46 ± 13.85 in wk4 and 57.14 ± 11.57 at wk8. This shows that exercise has a positive effect on pain perception(physical) domain QoL of stroke survivors. Hypothesis five is therefore rejected since there is a significant difference in pain perception of stroke survivors of Osogbo Osun before and after exercise intervention.

Table 19 shows comparisons of the rate of change that occurred in (PP)QoL during the exercise intervention programme. The individual changes within participants indicate there is a significant increase in pain perception (PP) QOL between wk0 and wk4 $F(1) = 720$, $p=0.00$, with

no significant difference between wk4 and wk8 $F(1) = 77.36$, $p=0.41$. The comparison also indicates a significant difference in the effects of exercise on pain perception (PP) QoL between each of the participants ($p=0.00$).

Hypothesis 6: There will be no significant difference in the systolic blood pressure (SBP) of stroke survivors before and after exercise intervention.

Table 20: Multivariate of Repeated Measures ANOVA of Exercise Systolic Blood Pressure (SBP) of Stroke Survivors in Osogbo

N	Test period	$\bar{x} \pm SD$	Hotelling's Trace	F	Hypothesis df	Error df	Sig
			(HT)				
	Wk0	127.0 $\pm$ 11.01					
21	Wk4	124.19 $\pm$ 7.61	0.443	4.209	2	19	.031
	Wk8	124.14 $\pm$ 7.64					

Effects	SBP	Sum of Squares	Df	Mean Square	F	Sig
Within participants	Wk0 vs. Wk4	165.76	1	165.76	7.005	.015
	Wk4 vs. Wk8	.048	1	.048	1.000	.329
Between participants	Intercept	328708.59	1	328708.59		
	Error	1479.85	20	73.99	4442.45	.000

Significant at $P \leq 0.05$ level).

Table 20 shows the multivariate analysis of the repeated measures ANOVA for the sub-hypothesis, which tested the effects of exercise systolic blood pressure (SBP) for stroke survivors after an eight-week exercise intervention programme. The result from the above table shows a significant difference in the participants' systolic blood pressure HT 0.443, $F(2, 19) = 4.209$, $p=0.031$; the effect is that during the eight-week exercise intervention, mean SBP decreased from a pre-test score of 127.0 $\pm$ 11.01mmHg at wk0 to post-tests' scores of 124.19 $\pm$ 7.61mmHg in wk4 and 124.14 $\pm$ 7.64mmHg at wk8. Hypothesis six is therefore rejected since there is a significant difference in the stroke survivors' systolic pressure before and after exercise intervention. Please note that a reduction in systolic blood pressure is an indicator of improving health condition.

This shows that exercise has a positive effect on systolic blood pressure (SBP) of stroke survivors.

Table 20 shows comparisons of the rate of change that occurred in systolic blood pressure during the exercise intervention programme. The individual changes within participants indicate there is a significant difference in systolic blood pressure between wk0 and wk4 $F(1) = 7.005$, $p=0.015$, with no significant difference in SBP between wk4 and wk8 $F(1) = 1.000$, $p=0.32$. The comparison also indicates a significant difference in the effects of exercise on systolic blood pressure between each of the participants ($p=0.00$).

Hypothesis 7: There will be no significant difference in the diastolic blood pressure (DBP) of stroke survivors before and after exercise intervention.

Table 21: Multivariate of Repeated Measures ANOVA of Exercise Effects on Diastolic Blood Pressure (DBP) of Stroke Survivors in Osogbo

N	Test period	$\bar{x} \pm SD$	Hotelling's Trace (HT)	F	Hypothesis df	Error df	Sig
21	Wk0	83.71±9.34	0.333	6.65	2	19	.018
	Wk4	83.71±9.34					
	Wk8	81.14±7.52					
Effects	DBP	Sum of Squares	Df	Mean Square	F		Sig
Within participants	Wk0 vs. Wk4	.000	1	.000	2.54		.20
	Wk4 vs. Wk8	138.85	1	138.86	6.658		.018
Between participants	Intercept	144171.429	1	144171.429			
	Error	1447.683	20	72.384	1991.755		.000

Significant level or P-value is set at 0.05; (significant at $P \leq 0.05$ level)

Table 21 shows the multivariate analysis of the repeated measures ANOVA for the sub-hypothesis, which tested the effects of exercise on physical exercise domain of diastolic blood pressure (DBP) for stroke survivors after an eight-week exercise intervention programme. The result from the above table shows a significant difference in the participants' DBP, $HT=0.333$, $F(2, 19) = 6.65$, $p\text{-value}=0.018$, hypothesis seven is therefore rejected since there is a significant

difference in the stroke survivors diastolic ; the effect is that during the eight-week exercise intervention, even though thereifc was no change in mean DBP from wk0 with pre-test score 83.71±9.34mmHg and wk4 same 83.71±9.34mmHg but mean DBP reduces from a pre-test score of 83.71±9.34mmHg at wk0 and wk4 to post-tests' scores of 81.14±7.52mmHg at wk8 which is an improvement in the stroke survivors condition. This shows that exercise has a positive effect on the DBP of stroke survivors after a long time of exercise intervention.

Table 21 shows comparisons of the rate of change that occurred in DBP during the exercise intervention programme. The individual changes within participants indicate that there was no significant difference in DBP between wk0 and wk4 $F(1) = 2.54$, $p\text{-value}=0.20$ but a significant a difference between wk4 and wk8 $F(1) = 6.658$, $p=0.018$. The comparison also indicates a significant difference in the effects of exercise on DBP between each of the participants.

Hypothesis 8: There is no significant difference in cardio-respiratory endurance of stroke survivors before and after exercise intervention in Osogbo.

Table 22: Multivariate of Repeated Measures ANOVA and Comparison of Effects of Exercise on Cardiorespiratory endurance ($VO_2\text{max}$) of Stroke survivors in Osogbo

Cardiorespiratory endurance (VO ₂ max) of stroke survivors in 8 weeks							
N	Test period	$\bar{x} \pm SD$	Hotelling's Trace (HT)	F	Hypothesis df	Error df	Sig
21	Wk0	30.07±3.38	.672	6.380	2	19	.008
	Wk4	30.42±3.33					
	Wk8	31.14±3.32					
Effects		VO ₂ max	Sum of Squares	Df	Mean Square	F	Sig
Within participants	Wk0 vs. Wk4	2.47		1	2.47	6.150	.022
	Wk4 vs. Wk8	11.12		1	11.12	8.461	.009
Between participants	Intercept	19594.6		1	19594.6	1812.754	.000

Significant at $P \leq 0.05$ level.

Table 22 shows the multivariate analysis of the repeated measures ANOVA for the sub-hypothesis, which tested the effects of exercise on cardio-respiratory endurance of stroke survivors after an eight-week exercise intervention programme. The result from the above table shows a significant difference in the participants' cardio-respiratory endurance, $HT .672F(2, 19) = 6.380, p=0.008$; the effect is that during the eight-week exercise intervention, therefore hypothesis nine is therefore rejected since a significant difference existed in cardio-respiratory endurance of stroke survivors before and after exercise intervention. Mean cardio-respiratory endurance increased from a pre-test score of 30.07 ± 3.38 ml/kg/min at wk0 to post-tests' scores of 30.42 ± 3.33 ml/kg/min in wk4 and 31.13 ± 3.32 ml/kg/min at wk8. This shows that exercise has a positive effect on cardio-respiratory endurance of stroke survivors.

Table 22 shows comparisons of the rate of change that occurred in cardio-respiratory endurance during the exercise intervention programme. The individual changes within participants indicate there is a significant increase in cardio-respiratory endurance between wk0 and wk4 $F(1) = 6.150, p = 0.022$, with an increased rate between wk4 and wk8 $F(1) = 8.461, p = 0.009$. The comparison also indicates a significant difference in the effects of exercise on cardio-respiratory endurance between each of the participants.

Sub-Hypothesis 9. There is no significant difference in the stroke survivors' ability to relate Well with the environment before and after exercise intervention in Osogbo.

Table 23: Multivariate of Repeated Measures ANOVA and comparison effects of Exercise on the ability to relate well with the environment (environmental domain of QOL of Stroke Survivors in Osogbo

N	Test period	$\bar{x} \pm SD$	Hotelling's Trace	F	Hypothesis df	Error df	Sig
	Wk0	37.30±6.38					
21	Wk4	46.82±11.55	10.908	103.63	2	19	.000
	Wk8	55.16±12.14					
Effects	DBP	Sum of Squares	Df	Mean Square	F		Sig
Within participants	Wk0 vs. Wk4	1904.76	1	1904.76	37.64		.000
	Wk4 vs. Wk8	1458.33	1	1458.33	210.00		.000
Between participants	Intercept	40117.22	1	40117.22			
	Error	476.59	20	476.59	1683.49		.000

Significant at $P \leq 0.05$ level.

Table 23 shows the multivariate analysis of the repeated measures ANOVA for the sub-hypothesis, which tested the effects of exercise on the environmental domain of Quality of Life (QoL) for stroke survivors after an eight-week of exercise intervention programme. The result from the above table shows a significant difference in the participants' environmental domain (EVT) QoL, $HT = 10.908$, $F(2,19) = 103.63$, $p = 0.000$; the effect is that during the eight-week exercise intervention, mean EVT QoL increased from a pre-test score of 37.30 ± 6.38 at wk0 to post-tests' scores of 46.82 ± 11.55 in wk4 and 55.16 ± 12.14 at wk8. This shows that exercise has a positive effect on ability to relate well with the environment of stroke survivors. Hypothesis 19

Table 23 shows comparisons of the rate of change that occurred in EVT QoL during the exercise intervention programme. The individual changes within participants indicate there is a significant increase in EVT QoL between wk0 and wk4 $F(1) = 37.64$, $p = 0.06$, hence hypothesis ten is therefore rejected since there is a significant difference in the environmental domain of QoL of stroke survivors of Osogbo Osun state. With an increased rate between wk4 and wk8 $F(1) =$

210.00, $p = 0.00$. The comparison also indicates a significant difference in the effects of exercise on environmental domain of QoL between participants.

Table 24: Multivariate of Repeated Measures ANOVA of Exercise Effects on Physiological Characteristics

N	Variable	Test period	$\bar{x} \pm SD$	Hotelling's Trace (HT)	F	Hypothesis Df	Error Df	Sig
21	Heart Rate(bpm)	Wk0	82.98 $\pm$ 7.71	.56	5.29	2	19	.015
		Wk4	81.98 $\pm$ 7.62					
		Wk8	80.52 $\pm$ 8.34					
21	Systolic BP(mmHg)	Wk0	127.00 $\pm$ 11.01	.44	4.21	2	19	.031
		Wk4	124.19 $\pm$ 7.61					
		Wk8	124.14 $\pm$ 7.64					
21	Diastolic BP(mmHg)	Wk0	83.71 $\pm$ 9.34	.33	6.66	2	19	.018
		Wk4	83.71 $\pm$ 9.34					
		Wk8	81.14 $\pm$ 7.53					
21	VO ₂ max ml/kg/min	Wk0	30.08 $\pm$ 3.39	.67	6.38	2	19	.008
		Wk4	30.42 $\pm$ 3.33					
		Wk8	31.15 $\pm$ 3.32					

Significant at $P \leq 0.05$ level.

Table 25: Summary of Findings

SN	Variables	Week0 to Week4	REMARK	Week4 to Week8	REMARK
1.	Gen QOL	37.5±1.7– 44.34±8.25	S(pvalue=0.014)	44.34±8.25-57.4±16.0	S (pvalue=0.00)
2.	Health/wellness	34.52±7.8-47.32±9.6	S(pvalue=0.008)	47.32±9.6-50.6±12.3	S(pvalue=0.00)
3.	Physical QOL(ADL)	36.9±7.36- 54.46±13.8	S(pvalue=0.00)	54.46±13.8-59.52±10.9	NS(pvalue=0.4)
4.	Functional ability(s)	3.65±0.45-2.35±0;72	S(pvalue=0.00)	2.35±0.72-1.33±0.45	S(pvalue=0.00)
5.	Knee flexion muscle strength	43.12±0.45-51.42±0.72	S(pvalue=0.00)	51.42±0.72-51.42±4.5	NS(pvalue=0.4)
6.	Pain feeling	38.8±7.36-57.14±11.5	S(pvalue=0.00)	57.14±11.5-50.59±12.3	NS(pvalue=0.4)
7.	VO2max(ml/kg/ min)	30.07±3.4-30.4±3.33	S(pvalue=0.02)	30.4±3.33-31.13±3.32	S(pvalue=0.009)
8.	SBP (mmHg)	127.0±11.0-124±7.6	S(pvalue=0.015)	124±7.6-124.14±7.64	NS(pvalue=0.3)
9.	DBP(mmHg)	83.7±9.3-83.71±9.31	NS(pvalue=0.2)	54.46±13.8-59.52±10.9	S(pvalue=0.018)

Significant at $P \leq 0.05$ level; S= Significance; NS= Not significance.

Table 25 presents the summary of findings at a glance.

shows different performance of the participants in 4 weeks intervals from week 0 to week 4 and from week 4 to week 8. According to table 25,(1) there was a significant difference the participants' general quality of life after the first four weeks p-value= 0.014, also at the end of this second four weeks that is week 8 p-value=0.00.

In this same table 25 (2) there was a significant difference in health/wellness domain of Qol in the 1st and 2nd four weeks of exercise treatment p-value=0.08 and p-value=0.00, for ADL(3.) there was a significant difference in the participants ability to carry out various activities of daily living at the end of the 1st and 2nd four exercise intervention with p-value=0.00 and 0.00 respectively in number 4 of the table there was significant difference in ability of the

participants' functional capacity at the end of 1st and 2nd four weeks of exercise interventions with p-value = 0.00 and 0.00 respectively. However the result from the same table even though there was a significant difference in the knee flexion muscle strength in the 1st four weeks but in the 2nd four weeks there was no significant difference with p-value=0.42. it was the same for pain perception domain of Qol the 1st four weeks brought a significant difference but no significant difference at the end of the 2nd four weeks of exercise intervention with p-value = 0.00 and 0.41 respectively. The result from table 25 (7) shows a significant different in the cardiorespiratory endurance of stroke survivors after the 1st and 2nd 4weeks of exercise in intervention with p-value of 0.02 and 0.009 respectively. Furthermore table 24 (8 & 9) shows a significant different in the participants' SBP after the 1st four weeks and a no significant difference after the 2nd four weeks of exercise intervention with p-value of 0.015 and 0.32 respectively, at same time there was no significant difference (p-value = 0.20) the participants' DBP after 1st four weeks of exercise treatment but a significant difference after the 2nd four weeks of exercise treatment.

Finally, the result from table 25 (10) shows a significant different in the participants' environmental Qol domains after the 1st and the 2nd four weeks of exercise treatments with the p-value of 0.06 & 0.00 respectively.

Discussion of Findings

The purpose of this study was to determine the effect of exercise on quality of life of stroke survivors. While the specific objectives set for this study were: investigate to what extent do physical exercises would improve the quality of life of stroke survivors; determine the effect of exercises on functional capacity of stroke survivors; assess whether additional health benefits are associated with regular and regularized exercises in stroke survivor; and to determine

whether exercise improved cardiovascular parameters (blood pressure and heart rate) of stroke survivors. The result reported significant differences in most of these parameters.

This study revealed there were more male stroke survivors than female in Osogbo, Osun State. This finding agrees with many studies, which indicated men have higher risk of developing stroke than women (AHA, 2008; Craig, 2007; Daniel & Conor, 2006). Majority of the participants were self employed. This study contradicts Ojo and Mohamed (2013) who found that retirees are at a higher risk of cardiovascular diseases than those who are self-employed.

Majority of the participants were right hemiplegic who had weakness on the right side (left hemispheric CVA). This disagrees with the study of Marileen et al. (2014) and Foerch et al. (2013) who found that left-sided strokes are more frequent than right-sided strokes. The result also shows that majority of the participants were on regular medication only few did not for a reason known to them. It is important to note here that the researcher counsel all the participants to comply with their doctors prescription and take their drug regularly which they do before they were allowed to participate in the study since it is part of the inclusion criteria.

The result shows that few of the participants had normal BMI the rest which are majority were in higher BMI categories studies have shown that people with higher BMI have liable to have hypertension and stroke this agree with the study of Kurth et al (2002); Rost et al (2001) and Woo (2002) that people with higher BMI are predisposed to hypertension and cardiovascular diseases (CVD), stroke is one of the CVD.

Systolic and diastolic blood pressures were categorized into 3 namely: Normal, Pre-hypertension and Hypertension stage1. The result shows that majority were in pre- hypertensive stage. Furthermore, VO₂max was categorized into Superior, Excellent, Good and fair with

percentage many falls into fair category stroke as condition lowers cardiovascular endurance of its victim

Main Hypothesis: There is no significant difference in the quality of life of stroke survivors before and after exercise intervention. The result from table 14 shows a significant difference in the participants' QoL, the actual effect is that during the eight-week exercise intervention, the QoL of the participant improves. This implies that exercise, has a positive effect on QoL of stroke survivors and it improves the overall QoL of stroke survivors victims. This agrees with the study of Chen and Rimmer, (2011) that gives a moderate improvement on QoL of stroke survivors' So, the main hypothesis is rejected since there is a significant difference in the quality of life of stroke survivors before and after exercise interventions. Involving stroke victims in regulated exercises like 20meters walk and flexibility exercises goes a long way in improving the overall quality of life of this population other than abandoning them to sedentary living after being discharged from the hospital. This also gave answer to the research question which stated; what are the effects of physical exercises on quality of life of stroke survivors? The effects of physical exercises on quality of life of stroke survivors are definitely improvement of QoL of the victim as a resultant effect of improvement of most their physiological variables and functional ability.

The study from hypothesis one found a significant difference in the participants' healthy well-being domain of QoL (see table 15). The eight-week exercise intervention improved well-being of the participants. Therefore stroke survivors' outpatients might benefit from exercise intervention since involving consistently for eight weeks, this shows that careful planned exercise could promote and increase their wellbeing. Lindwall & Asci (2014) and Bottomley (2002) corroborated that the general and healthy well-being of individuals who are elderly and stroke survivors could take

advantage of exercise since augmentation with various forms of exercises are beneficial. The participants also contributed by their responses that activities in form of exercise improve the living conditions (Self-satisfaction) and healthy well-being of stroke survivors.

Results from hypothesis two found that exercise had positive effect on the on ADL (physical domain of QoL). The participants reported significant improvements in ADL tasks such as using toilet unaided, wearing cloth, eating and bathing that were difficult prior to the exercise intervention (see table 16). This implies exercise is important to improve ADL of stroke survivors when they are well structured and properly supervised as Chou (2011), Kwakkel et al. (2010) established that exercise improves stride speed and other aspects of ADL when started as early as six month post stroke and sustained for about 20 minutes per session. Activity of Daily Living (ADL) should be the primary objective of any rehabilitative exercise intervention programme.

Functional ability is one of the areas of difficulty for stroke survivors. Such activities are carried out with the use of major muscles involving upper and lower limbs or eye co-ordination. Results of hypothesis three revealed that the participants improved significantly in their functional ability after the exercise intervention. Specifically, they spent shorter time in sitting down and standing up. This corroborated the study of Bocalini et al (2008), Douglas et al. (2010) and Kanai et al., (2021) that exercises improves general and specific body functions of stroke survivors implying that exercise therapists need to develop exercise regimens that will improve functional ability of stroke survivors.

Result from hypothesis four (see table 18) revealed that the participants improved significantly their hamstring (knee flexors) muscle strength during the eight-week exercise interventions. Knee flexors (the hamstrings: Biceps femoris, semimembranosus,

semitendinosus) was picked to represent the lower limb muscle in this study because it is one muscle majorly affected by stroke. This shows that exercise has a positive effect on hamstring (kneeflexors) muscle strength of stroke survivors. This corroborated the study of Pescatello, et al., (2004) and Moreland, et al., (2003) that exercise improve muscular functions and strength of stroke survivors. This is an indication that exercise might improve lower limbs muscle strength of stroke survivors when it is consistent and monitored for adherence. Furthermore strength exercises are essential components of any exercise intervention for improving quality of muscles to optimise health and performance. Improving stroke survivors' health demands continuous strengthening of both the affected and non-affected parts of the body as demonstrated by this study.

Further findings of this study indicated that the participants improved in their pain perception after the eight-week exercise intervention (see table 19). Generally stroke patients lose sensation of feelings on the affected part due to the paralysis and numbness but only experience pains at the shoulder and affected hip joints. However, they participants expressed that the pain felt before exercise has reduced and improved their physical performance culminating to improved QOL. This study therefore has contributed to findings that exercise has a positive effect on pain perception (PPQoL) of stroke survivors. The study of Hoffman, (2007) discovered that aerobic exercise caused an acute improvement in mood as well as a reduction in the perception of pain from a painful stimulus; and also in Nichols and Glenn (1994)'s; Richard and Melisa (2021)'s study, the study population experienced lower perception of pain and psychological symptoms after exercise was administered on some inpaired adults. There is the need to further explore this angle of intervention combining both qualitative and

quantitative studies for intervention since pain perception is key to recovery and prevention of recurring stroke.

Further findings as revealed by hypothesis six and seven revealed that the participants improved significantly in their systolic and diastolic blood pressure after eight-week of exercise intervention, (see table 20&21). The reduction in blood pressure (either systolic or diastolic) is an indication that the cardiovascular health has been improved preventing further recurring stroke and other cardiovascular diseases. It is important to note that systolic blood pressure represents the force of the flow of blood against arterial wall while diastolic pressure is the force of the same in the veins and ventricle of the heart (Marcin & McDermott, 2019). This shows that exercise has a positive effect on systolic blood pressure (SBP) of stroke survivors. Pescatello, et al.'s study of 2004 in which it was found that aerobic exercises are good for inducing reduction in both systolic and diastolic blood pressure is supported by this study. Finding of Carpio-Rivera, et al., (2016) was further confirmed that walking exercises brought about more reduction/changes in systolic blood pressure. Consistency of aerobic exercise of at least eight weeks might improve cardiovascular indicators when monitored and becomes lifestyle of stroke survivors to prevent further chronic conditions.

The result from hypothesis nine shows a significant improvement in the participants' cardio-respiratory endurance (VO₂max) at the end of eight weeks exercise intervention (see table 22) cardiorespiratory endurance is a measure of exercise endurance ability of any individual stroke survivors in this study improved in their VO₂max at the end of eight weeks this corroborated the study of Quaney, et al., (2009), which shows a significant improvement of stroke survivors' motor learning and VO₂max after subjecting them to aerobic exercise. Physical exercise participation might be very useful in improving cardio-respiratory endurance of stroke survivors (Kolata, 2002;).

The result from hypothesis 10 (see table 23) showed that significant improvement was experienced by the participants as regards the ability to relate well with the environment domain of Quality of Life after an eight-week exercise intervention programme. This corroborates the study of Balasubramanian, Bowden, Neptune and Kautz (2007), Corazon, et al., (2010) and Zverev, (2015); that engaging in physical exercise motivates elderly with stroke to relate better with their environment. Physical exercise might be a useful remedy to assist stroke survivors relate well with their environment thereby reducing falls and other limiting situations such as independence to do some personal chores.

At the same time finding of hypothesis eight revealed that the participants heart rate significantly improve at the end of the eight weeks exercise intervention (see table 24). This corroborates the study of Monteiro et al (2004) who discovered that exercise causes immediate increases in heart rate, cardiac output and peripheral vasodilation through the release nitric oxide and later reduces it to comfortable level after resting thereby leading to chronic adaptation in stroke survivors when consistance and taken as lifestyle daily activity. Physical and exercise Scientist needs to develop exercise programmes which improve stroke survivors' rehabilitation lifestyle modification. Exercise therefore is a major intervention medium might be useful in the control and regulations of cardiovascular indices in which heart rate is one.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

Quality of life of stroke survivors is usually one of the affected indices due to the adjoining disabilities and functional incapacities. Most studies on the effect of exercise on health including quality of life were conducted on healthy individuals. Hence, there are inconsistent reports on the effect of exercise on health-related quality of life in stroke survivors. The researcher however, observed that most stroke survivors in Osogbo, Osun State, were sedentary due to functional limitations and were dissatisfied with their state of health and general wellbeing. Since their condition limits their participation in exercise programmes like the healthy population, it was apparent to explore the type of exercise that can benefit them with a view to improving the various components of quality of life.

Hence, this study investigated the effects of physical exercise on the quality of life of stroke survivors in Osogbo, Osun State to meet the needs for more evidence-based knowledge on how exercise can be used to improve the quality of life of stroke survivors. The purpose identified in this study were to investigate: the extent to which physical exercises improved quality of life of, effect of exercises on functional capacity, were additional health benefits associated with regular and regularized exercises, whether exercise will improve cardiovascular parameters (Blood pressure and heart rate) of stroke survivors in Osogbo, Osun state.

To achieve the set out objectives, eight research questions and ten hypotheses were generated and tested. Various literatures were also reviewed to cover theoretical and conceptual basis of effects of exercise on quality of life of stroke survivors. The literature reviewed ended with an appraisal.

The study employed one group pre-test and post-tests multiple experimental designs. A total of 21 stroke survivors were recruited from the two tertiary health institutions in Osogbo (LAUTECH teaching Hospital and State speciality Hospital Osogbo, Osun State. Purposive sampling method was adopted in recruiting the sample for the study. Ethical clearance was obtained from the University of Ilorin Ethical Review Committee. Adapted WHOQOL – BREF questionnaire and other standardized test instruments and procedures were used in gathering data, while approved and appropriate formulae and equations were also applied where necessary. Eight weeks exercise intervention programme was conducted to improve quality of life the participants. The researcher with five trained research assistants carried out the measurement at various designated venues after the consent of all participants has been sought.

Descriptive statistics of percentage mean and standard deviation were used to describe the characteristics of the participants and answer the research questions. Linear Model (GLM) of One-Way Repeated Measures Analysis of Variance (ANOVA) with statistical significance set at $p \leq 0.05$ was employed to test hypotheses. The statistical package for social sciences (SPSS) version 20.0 was used for data analysis.

Conclusion

The following conclusions were arrived at based on the findings of the study;

1. That the stroke condition affects the right side more than the left in this study.
2. That more women fall, victims, compare with their male counterparts'
3. That physical exercise has positive effects on general quality of life of stroke survivors; as more days were spent on exercises their quality of life kept on improving more and more.

4. That exercises improved quality of life variable such as healthy well-being, activities of daily living (ability to physically perform physical activities), pain perception, psychological domains (such improving their emotion, sleep and sex life), environmental domains (ability to relate well with their environment) of stroke survivors.
5. That exercise improves the functional ability of stroke survivors.
6. That cardiovascular endurance (VO₂ max) of stroke survivors improves after eight of exercise interventions.
7. That cardiovascular variable such as systolic, diastolic blood pressure, heart rate of stroke survivors improves after eight weeks of exercise interventions.
8. That exercise has little effect on diastolic blood pressure of stroke survivors.
9. That most physiological variable responds positively to exercise intervention.
10. That physical exercise does not have effects on pain, ADL, knee flexor muscle strength and SBP in the second four weeks of intervention.
11. That most stroke survivors have body asymmetry in standing due to the effect of stroke.
12. Their Strength after eight weeks improved, improved functional ability by reduction in the time of standing up from sitting by range of 2 - 4 seconds; improved heart health

Implication of Findings

The implication of this study is that improvements in the quality of life indices such as functional ability, Activity of Daily Living (ADL), pain perception, ability to relate with their immediate environment and health and wellness. Stroke survivors might need to take advantage of daily physical activity to improve their cardiovascular indices through consistent aerobic exercise adherence. However, exercise professionals must work closely to design appropriate exercise programmes that caregivers and everybody involved in the management of stroke survivors can

readily implement at home. This will limit the attitude of abandoning stroke survivors after their discharge from the hospital and further aggravation of their conditions.

Recommendations

The following recommendations were made based on the findings of the study:

1. Policymakers in the field of therapeutic exercises should ensure that stroke victims are made to go through physical exercises such as aerobic (walking and flexibilities) and resistance exercises as part of their daily routine after their discharged from the hospital.
2. Doctors should refer stroke patients to exercise physiotherapist and expert intime to prevent complications.
3. There should be collaborative efforts among the physicians, physiotherapists, and exercise and sport scientist for continuity, monitoring and adherence to exercise programmes.
4. Exercise experts that are caregivers to stroke survivors should recommend and prescribe physical exercises especially aerobic exercises (regular walking) to them.
5. That exercise protocol designed in this study should be used in rehabilitation of stroke survivors that have stable and normal cardiovascular parameters.
6. Association of Stroke survivor should be educated and be lectured about the importance of physical exercises like walking regularly also before stroke patients are discharged from the hospitals there should be counselling on benefit of exercise for rehabilitation, lifestyle modification medium for healthy daily living.
7. Stroke survivors should be encouraged to be engaged in regular exercise after discharge from the hospital.

Suggestions for Further Studies

1. This study covered only stroke survivors in the tertiary hospital in Osogbo Osun-state, it is therefore recommended to replicate the study in another part of Nigeria.
2. It is also suggested that a follow-up study be done on the same participants to ascertain whether they continue the exercise procedure introduced to them during the study had seen the benefit of exercises.
3. Further studies that are on other physiological variables of stroke survivors is highly recommended.

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Appendix 1

TIME PLAN

POSTGRADUATE RESEARCH PLAN-																																				
	1/7/2015	1/8/2015	1/9/2015	1/10/2015	1/11/2015	1/12/2015	1/1/2016	1/2/2016	1/3/2016	1/4/2016	1/5/2016	1/6/2016	1/7/2016	1/8/2016	1/9/2016	1/10/2016	1/11/2016	1/12/2016	1/1/2017	1/2/2017	1/3/2017	1/4/2017	1/5/2017	1/6/2017	1/7/2017	1/8/2017	1/9/2017	1/10/2017	1/11/2017	1/12/2017	1/1/2018	1/2/2018	1/3/2018	1/4/2018	1/5/2018	1/9/2016
MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
TASK																																				
SURVEY OF LITERATURE																																				
WRITE PROPOSAL																																				
FIRST PROTOCOL																																				
GATHER DATA																																				
THESIS WRITING																																				
WRITE INTRODUCTION																																				
REVISE INTRODUCTION																																				
WRITE METHODOLOGY																																				
REVISE METHODOLOGY																																				
RESULTS AND DISCUSSION																																				
REVISE RESULTS AND DISCUSSIONS																																				
WRITE CONCLUSIONS																																				
REVISE CONCLUSIONS																																				
APPENDICES, ACKNOWLEDGEMENT e.t.c																																				
REVISE FIRST DRAFT																																				
PROOF READING																																				
PRINTING AND BINDING																																				

Appendix 2

BUDGETING

Table Show proposed researchbudget.

The table below shows the proposed expenditure required for execution of the study

S/N	Items	Amount	Remark
1.	School fees for three session (PhD) at 120,000	360,000	
2.	Stationaries	30,000	
3.	Typing, editing, printing and binding	45,000	
4.	Transportation`	90,000	
5.	Attendance of seminars, workshops and conference	300,000	
6.	Measurements and research instruments	200,000	
7.	Internet subscription for 3 sessions	100,000	
8.	Purchase of relevant books	30,000	
9.	Feeding and accommodation	200,000	
10.	Miscellaneous	120,000	
TOTAL		1,475,000	

Expected sources of funds: Personal savings

UNIVERSITY OF ILORIN, ILORIN, NIGERIA

UNIVERSITY ETHICAL REVIEW COMMITTEE

Vice Chancellor: Prof. S.A. Abdulkareem
B.ChE, M.ChE, (Detroit); Ph.D. (Louisville),
MNAICH, MNSE, MACS, R.Eng., (COREN)
Registrar: Mr. E.D. Obafemi
B.A (Hons), Cert. Public Information (Kaduna),
MNIPR



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Website: ethicalreview.unilorin.edu.ng
www.unilorin.edu.com

Our Ref: UIL/UERC/14/68OM003

Date: 12th April, 2018

Protocol Identification Code: UERC/EDU/225
UERC Approval Number: UERC/ASN/2018/1198

EFFECT OF PHYSICAL EXERCISE ON QUALITY OF LIFE OF STROKES SURVIVORS IN OSOGBO, OSUN STATE, NIGERIA

Name of applicant/Principal Investigator: OJO, Israel Arogundade
Address of Applicant: Department of Human Kinetics
Faculty of Education
University of Ilorin, Ilorin.
Type of Review: Full Committee Review
Date of Approval: 12/04/2018

Notice of Full Committee Approval

I am pleased to inform you that the research described in the submitted proposal has been reviewed by the University Ethical Review Committee (UERC) and given full Committee approval.

This approval dates from 12/04/2018 to 11/04/2021, and there should be no participant accrual or any activity related to this research to be conducted outside these dates.

You are requested to inform the committee at the commencement of the research to enable it appoints its representative who will ensure compliance with the approved protocol. If there is any delay in starting the research, please inform the UERC so that the dates of approval can be adjusted accordingly.

The UERC requires you to comply with all institutional guidelines and regulations and ensure that all adverse events are reported promptly to the UERC. No charges are allowed in the research without prior approval by the UERC. Please note that the UERC reserves the right to conduct monitoring/oversight visit to your research site without prior notification.

Thank You,

Ismaila Isah

For: University Ethical Review Committee



"...if it's not ethical, it's not scientific, if it's not scientific it's not ethical"

UNIVERSITY OF ILORIN, ILORIN, NIGERIA.

POSTGRADUATE SCHOOL

Vice-Chancellor:

Prof. S. A. Abdulkareem

B.ChE (Detroit); Ph.D. (Louisville);
MNAICH; MNSE; MACS; R.Eng (COREN)

Dean:

Prof. S. A. Bolu

B. Agric; M. Sc; Ph.D (Ilorin)
(Animal Nutrition) MNSAP, MASAN RAS.

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UIL/PGS/91/27

13th July, 2018

OJO, Israel Arogundade

Matric No.: 14/68M003

Department of Human Kinetics Education,
University of Ilorin,
Ilorin.

Dear Ojo,

Approval of Doctoral Research Protocol

I am pleased to inform you that the Board of Postgraduate School at the 268th meeting held on Wednesday 20th June, 2018 considered and approved your Doctoral Research Protocol titled:

Effects of Physical Exercise on Quality of Life of Stroke Survivor in Osogbo, osun State, Nigeria

You are to proceed with your Ph.D. programme accordingly.

Thank you.

Yours sincerely,

Olu Olajugba

Deputy Registrar/Secretary

FMD/JAA

UNIVERSITY OF ILORIN, ILORIN, NIGERIA

UNIVERSITY ETHICAL REVIEW COMMITTEE

Chairman: Prof. S.A. Abdulkareem
B.ChE, M.ChE, (Detroit); Ph.D. (Louisville),
MNAICH, MNSE, MACS, R.Eng., (COREN)
Mr. E.D. Obafemi
B.A (Hons), Cert. Public Information (Kaduna),
MNIPR



E-mail: P.A.B. 1515, Ilorin
uerc@unilorin.edu.ng
unilorin.uerc@gmail.com
Website: ethicreview.unilorin.edu.ng
www.unilorin.edu.com

Our Ref:

UIL/UERC/14/680MD03

Date:

12th April, 2018

Protocol Identification Code: UERC/EDU/225

UERC Approval Number: UERC/ASN/2018/1198

**EFFECT OF PHYSICAL EXERCISE ON QUALITY OF LIFE OF STROKES SURVIVORS IN OSOGBO,
OSUN STATE, NIGERIA**

Name of applicant/Principal Investigator: **OJO, Israel Arogundade**
Address of Applicant: **Department of Human Kinetics
Faculty of Education
University of Ilorin, Ilorin.**
Type of Review: **Full Committee Review**
Date of Approval: **12/04/2018**

Notice of Full Committee Approval

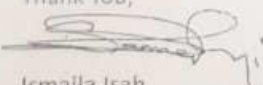
I am pleased to inform you that the research described in the submitted proposal has been reviewed by the University Ethical Review Committee (UERC) and given full Committee approval.

This approval dates from 12/04/2018 to 11/04/2021, and there should be no participant accrual or any activity related to this research to be conducted outside these dates.

You are requested to inform the committee at the commencement of the research to enable it appoints its representative who will ensure compliance with the approved protocol. If there is any delay in starting the research, please inform the UERC so that the dates of approval can be adjusted accordingly.

The UERC requires you to comply with all institutional guidelines and regulations and ensure that all adverse events are reported promptly to the UERC. No charges are allowed in the research without prior approval by the UERC. Please note that the UERC reserves the right to conduct monitoring/oversight visit to your research site without prior notification.

Thank You,


Ismaila Isah

For: University Ethical Review Committee



"...if it's not ethical, it's not scientific, if it's not scientific it's not ethical!"

UNIVERSITY OF ILORIN, NIGERIA
FACULTY OF EDUCATION
DEPARTMENT OF HUMAN KINETICS EDUCATION

Head of Department

Date.....



Ref: UIL/ED/HKE/073

LETTER OF ATTESTATION

This is to certify that the bearer OJD ISRAEL ARGUNDADE
with Matriculation Number 146801003 is an

Ph.D. Student in the Department of Human Kinetics Education.

He/she is currently working on his research project titled: EFFECT OF
PHYSICAL EXERCISE ON STROKE SURVIVORS'
QUALITY OF LIFE IN OSOGBO OSUNSTATE

Kindly assist him/her in whatever way you can.

Thanks for your cooperation and assistance.

HEAD OF DEPT.
HUMAN KINETICS EDUC.

Prof. A. A. Adesoye
Head of Department

UNIVERSITY OF ILORIN, ILORIN, NIGERIA

POSTGRADUATE SCHOOL

Vice-Chancellor:

Prof. S. A. Abdulkareem
B.ChE (Detroit); Ph.D. (Louisville);
MNAICH; MNSE; MACS; R.Eng (COREN)

Dean:

Prof. R. A. Bello
B.Sc., M.Sc., Ph.D.; Economics (ABU)
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Date: **3rd March, 2021**

UIL/PGS/91/55

OJO, Israel Arogundade

Matric. No.: 14/68OM003
Department of Human Kinetics Education
Faculty of Education
University of Ilorin
Ilorin.

Dear **Ojo**,

RE: REGISTRATION OF TITLE OF Ph.D. THESIS

The Board of the Postgraduate School, at its 289th Meeting held on Wednesday, 20th January, 2021 considered and approved the registration of the title of your Ph.D. Thesis as follows:

Effect of Physical Exercise on Quality of Life of Stroke Survivors' in Osogbo, Osun State, Nigeria

Kindly note that in line with Senate decision, you are expected to defend your Thesis not later than Three (3) months after Registration of the Title of the Ph.D. Thesis, with effect from **Friday, 4th March, 2021**. Failure to defend (your thesis) within the given deadline will amount to fresh presentation of abstract for the Registration of Title.

Please note the above information for due compliance and congratulations on this academic feat.

Yours sincerely,

M.A. Alfania
Secretary, Postgraduate School

A.A./M.A.



ADULT PRE-EXERCISE SCREENING TOOL

STAGE 1 (COMPULSORY)

AIM: to identify those individuals with a known disease, or signs or symptoms of disease, who may be at a higher risk of an adverse event during physical activity/exercise. This stage is self administered and self evaluated.

1. Has your doctor ever told you that you have a heart condition or have you ever suffered a stroke?
Yes
No
2. Do you ever experience unexplained pains in your chest at rest or during physical activity/exercise?
Yes
No
3. Do you ever feel faint or have spells of dizziness during physical activity/exercise that causes you to lose balance?
Yes
No
4. Have you had an asthma attack requiring immediate medical attention at any time over the last 12 months?
Yes
No
5. If you have diabetes (type I or type II) have you had trouble controlling your blood glucose in the last 3 months?
Yes
No
6. Do you have any diagnosed muscle, bone or joint problems that you have been told could be made worse by participating in physical activity/exercise?
Yes

No

7. Do you have any other medical condition(s) that may make it dangerous for you to participate in physical activity/exercise?

Yes

No

IF YOU ANSWERED 'YES' to any of the 7 questions, please seek guidance from your GP or appropriate allied health professional prior to undertaking physical activity/exercise

IF YOU ANSWERED 'NO' to all of the 7 questions, and you have no other concerns about your health, you may proceed to undertake light-moderate intensity physical activity/exercise

Name:

Date of Birth: Male Female Date:

Please circle response

This screening tool does not provide advice on a particular matter, nor does it substitute for advice from an appropriately qualified medical professional. No warranty of safety should result from its use. The screening system in no way guarantees against injury or death. No responsibility or liability whatsoever can be accepted by Exercise and Sports Science Australia, Fitness Australia or Sports Medicine Australia for any loss, damage or injury that may arise from any person acting on any statement or information contained in

REFERENCE

Fitness Australia (2011): Pre- exercise questionnaire by the health and fitness industry association. Journal of sports medicine Australia.

APPENDIX 6



QUESTIONNAIRE

UNIVERSITY OF ILORIN, ILORIN KWARA- STATE, NIGERIA.

DEPARTMENT OF HUMAN KINETICS, EDUCATION.

FACULTY OF EDUCATION.

INFORMED CONSENT FORM

**TOPIC: EFFECTS OF EXERCISE ON QUALITY OF LIFE OF STROKE SURVIVORS' IN
OSOGBO, OSUN- STATE.**

I hereby consent to participate in the above mentioned study to determine the effect of exercise on quality of life of stroke survivors 'in Osogbo, Osun-State. My permission to participate in this study is given voluntarily. I understand that I am free to withdraw my consent at any point if I so desire. I have read this form and i understand the test procedures that i will perform and attendant discomforts and benefits of the study. Having had an opportunity to ask questions that have been answered to my satisfaction, I consent to participate in this study.

Signature of Participants :_____

Date:_____

Signature of Researcher:_____

Date:_____

APPENDIX 7



QUESTIONNAIRE

UNIVERSITY OF ILORIN, ILORIN KWARA- STATE, NIGERIA.

DEPARTMENT OF HUMAN KINETICS, EDUCATION.

FACULTY OF EDUCATION.

SECTION A

PERSONAL DATA

INSTRUCTION: Please tick (☐) as applicable to you.

1. Gender: Male (☐), Female (☐)
2. Occupation: Civil servant(☐), Self- employed (☐), Retiree(☐), Others (please specify)
3. Age (What is your true age ?_____)
4. How long have you had CVA(Stroke) Less than 6 month-1 year(☐); 1 year- 5 years (☐); Above 5 years (☐)
5. What side of the body does it affect? Right(☐); Left (☐)
6. Are you on any medication? _____ (Specify what type of medication you are on)
7. Do you know if you are hypertensive? _____
8. Do you check your blood pressure regularly?_____
9. When was the last time you checked it?_____
10. What are the things you find difficult to do?

SECTION B.

MEASUREMENT OF ANTHROPOMETRIC AND PHYSIOLOGICAL VARIABLES

S/N	VARIABLES	VALUE			
		1 st measurement	2 nd measurement	3 rd measurement	Average
1.	Height (m)				
2.	Shoulder height (right)				
3.	Shoulder height (left)				
4.	Weight (kg)				
5.	BMI (kg/m) ²				
6.	Systolic BP (mmHg)				
7.	Diastolic BP (mmHg)				
8.	Heart rate (bpm)				
9.	VO ₂ Max				
10.	Muscle Strength				
i.	.Hamstring (Knee flexors)				
Ii	Quadriceps (Knee extensors)				
Iii	Hip Extensors				
Iv	Hip Flexors				
V	Dorsil flexors				
Vi	Planter flexors				
Vii	Shoulder abduction				
Viii	Shoulder flexors				
Ix	Shoulder extensor				
11.	Joints Range of motion				
I	Hip flexion and extension				
Ii	Knee flexion and extension				
Iii	Ankle dorsilflexion				
Iv	Ankle planter flexion				
V	Shoulder joints				
Vi	Elbow joints				
Vii	Wrist joints				
12.	Functional ability				
13.	Upper limb length (Right)				
14.	Upper limb length (left)				
15.	Lower limb length (Right)				
16	Lower limb length (left)				

SECTION C:

QUALITY OF LIFE INDICES

Note:

The following questions ask how you feel about your quality of life, health or other areas of your life

Instruction

Please tick (✓) answer that appears most appropriate,

Please keep in mind your standards, hopes, pleasures and concerns, The researcher wants to know how you rate your life indices in the last four weeks.

Instruction

Please use this scale to choose your answer: very poor=1, poor=2, Good=3, very good=4

S/N	General quality of life	Very poor (1)	Poor (2)	Good (3)	Very good (4)
1.	How would you rate your quality of life?				
2.	How satisfied are you with yourself				
3.	How would you rate your relaxation life?				
4.	To what extent do you feel your life to be meaningful?				
The following questions ask about how much you have experienced certain things in the last four weeks Physical Indices: Very dissatisfied=1, dissatisfied=2, satisfied=3, very satisfied=4.					
	Physical exercise	Very dissatisfied	dissatisfied	Satisfied	Very satisfied
5.	How fulfilled are you with your capacity for work?				
6.	How satisfied are you with your ability to perform your daily living activities?				
7.	How well are you able to get around?				
8.	Do you have enough energy for everyday life?				
	Pain perception	An extreme amount(=1)	Very much (=2)	A little (3)	Not at all (=4)
9.	To what extent does pain prevent you from tolerating physical exercises?				
10.	To what extent do you feel physical pain to prevent you from doing what you need to do?				
11.	Does pain prevent you from sleeping?				
12.	To what extent you regard pain affects life				

	generally?				
	Health and wellness	An extreme amount(=1)	Very much (=2)	A little (3)	Not at all (=4)
13.	Do feel worried by your state of health?				
14.	How much do you need any medical treatment to function in your daily life?				
		Very dissatisfied	dissatisfied	Satisfied	Very satisfied
15.	How satisfied are you with your wellness and state of health?				
16.	How can you rate your health and wellness?				
	Environmental	An extreme amount(=1)	Very much (=2)	A little (3)	Not at all (=4)
17.	How well are you able to cope with your environment?				
18.	How safe do feel with your physical environment ?				
19.	How healthy is your physical environment?				
20.	Do you feel acceptable by others in your environment?				
		Very dissatisfied (1)	Dissatisfied (2)	Satisfied (3)	Very satisfied(4)
21.	How satisfied are you with your sleep?				
22.	How satisfied are you with your sex life?				
	Psychological	An extreme amount(=1)	Very much (=2)	A little (3)	Not at all (=4)
23.	Do you feel emotionally disturbed?				
24.	Do you feel depressed most of the time?				
25.	Do you feel depressed and worried?				
26.	Do you feel afraid over the thought of future?				

Appendix 8

STEPS FOR CHECKING AND CLEANING DATA AND COMPUTING

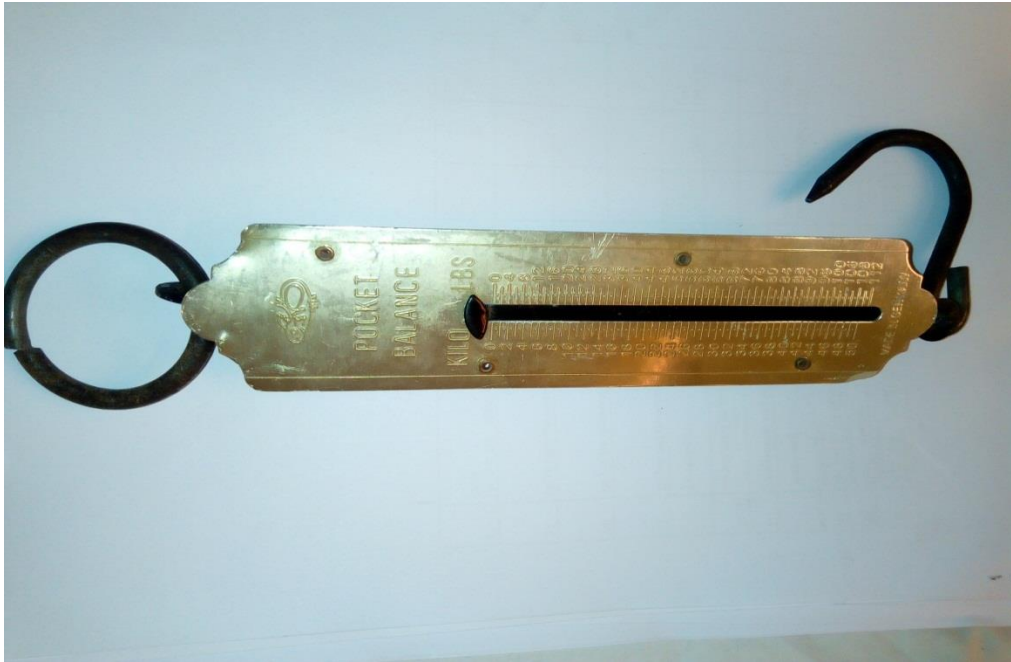
DOMAIN SCORES FOR THE WHOQOL-BREF

(Prepared by Alison Harper and Mick Power on behalf of the WHOQOL Group)

Steps	SPSS syntax for carrying out data checking, cleaning and computing total scores
Check all 26 items from assessment have a range of 1-5	RECODE Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 (1=1) (2=2) (3=3) (4=4) (5=5) (ELSE=SYMSIS). (This recodes all data outside the range 1-5 to system missing)
Reverse 3 negatively phrased items	RECODE Q3 Q4 Q26 (1=5) (2=4) (3=3) (4=2) (5=1) (This transforms negatively framed questions to positively framed questions)
Compute domain scores	COMPUTE PHYS= MEAN.6(Q3,Q4,Q10,Q15,Q16,Q17,Q18)*4. COMPUTE PSYCH= MEAN.5(Q5,Q6,Q7,Q11,Q19,Q26)*4. COMPUTE SOCIAL=MEAN.2(Q20,Q21,Q22)*4. COMPUTE ENVIR=MEAN.6(Q8,Q9,Q12,Q13,Q14,Q23,Q24,Q25)*4. (These equations calculate the domain scores. All scores are multiplied by 4 so as to be directly comparable with scores derived from the WHOQOL-100. The “.6” in “MEAN.6” specifies that 6 items must be endorsed for the domain score to be calculated.)
Transform scores to 0-100 scale	COMPUTE PHYS=(PHYS-4)*(100/16). COMPUTE PSYCH=(PSYCH-4)*(100/16). COMPUTE SOCIAL=(SOCIAL-4)*(100/16). COMPUTE ENVIR=(ENVIR-4)*(100/16)
Delete cases with > 20% missing data	COUNT TOTAL=Q1 TO Q26 (1 THRU 5) (This command creates a new column “total”. “Total” contains a count of the WHOQOL-BREF items with values 1-5 that have been endorsed by each subject. The “Q1 TO Q26” means that consecutive columns from “Q1”, the first item, to “Q26”, the last item, are included in the count. It therefore assumes that data is entered in the order given in the assessment.) SELECT IF (TOTAL>21). EXECUTE (This second command selects only

APPENDIX 9

RESEARCH PICTURES



Cable Tensiometer



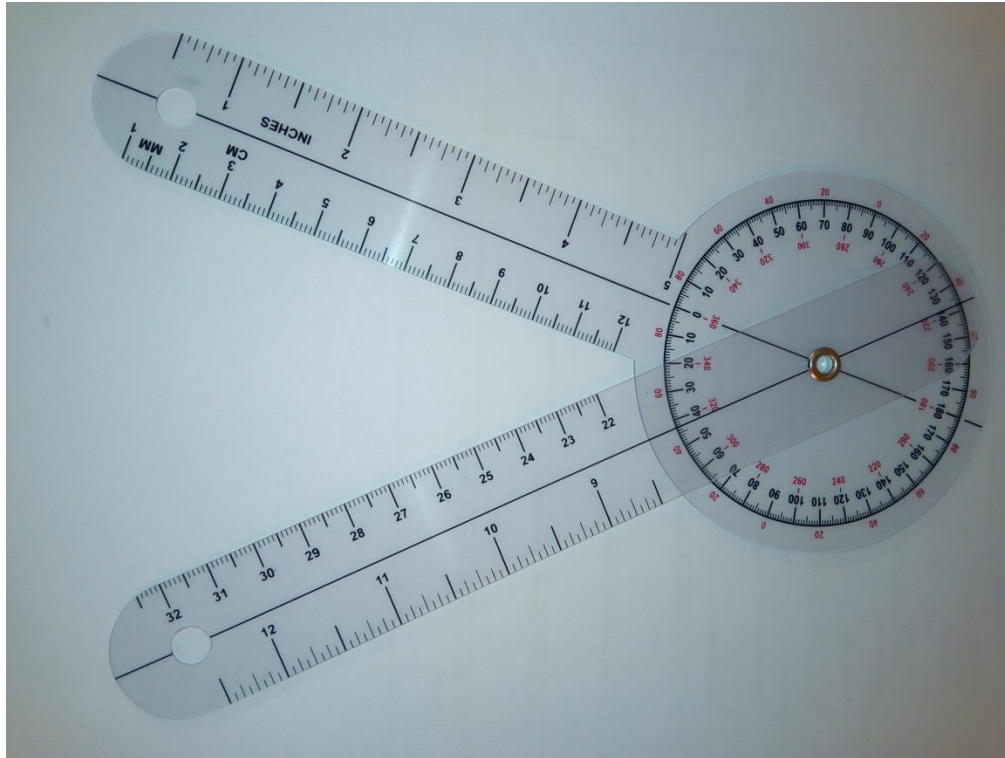
DIGITAL BLOOD PRESSURE KIT



STOPWATCH



MEASURING TAPE



GONIOMETER



STANDIOMETER



Wooden chair



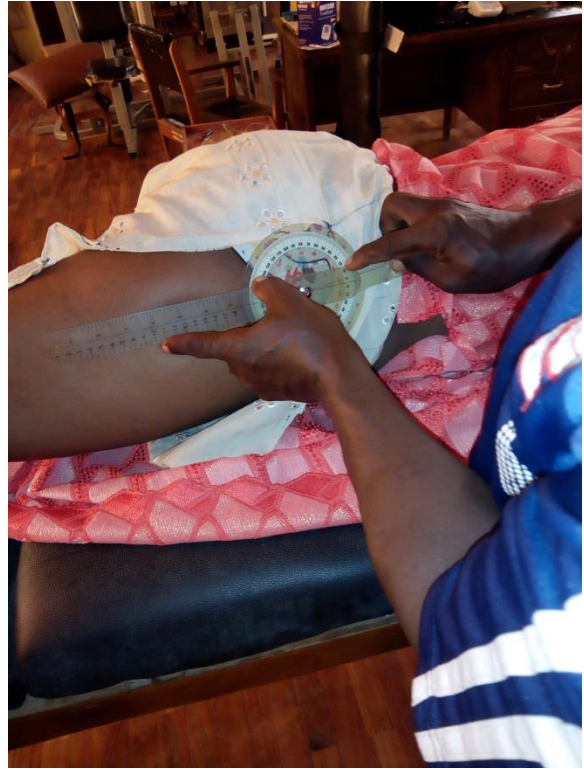
Sit and stand-up timed test



MEASURING ON KNEE JOINT RANGE OF MOTION



MEASURING OF HIP EXTENSOR MUSCLE STRENGTH



MEASURING OF HIP JOINT RANGE OF MOTION



MEASURING OF KNEE FLEXUS MUSCLE STRENGTH



FLEXIBILITY EXERCISES TO THE UPPERLIMB



FLEXIBILITY EXERCISES TO THE LOWERLIMB



FLEXIBILITY EXERCISES TO THE LOWER LIMB



FIRST-AID BOX



MEASUREMENT OF SHOULDER FLEXUS



WALKING EXERCISE ON A 20 METER CORRIDOR



MEASUREMENT OF BLOOD PRESSURE



AEROBIC EXERCISES (WALKING) ON A 20 METER CORRIDOR



STRENGTHENING EXERCISE



MEASUREMENT OF BLOOD PRESSURE

FLEXIBILITY EXERCISES TO THE WRIST JOINT



GONIOMETRY MESUREMENT OF THE WRIST JOINT