EFFECTS OF RELAXATION EXERCISE AND SLEEP ENVIRONMENT MODIFICATION ON STRESS, BLOOD PRESSURE AND SLEEP AMONG INSTITUTIONALIZED ELDERLY IN NAIROBI CITY, KENYA

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H87/20016/2010

A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF DOCTOR OF PHILOSOPHY (PHYSICAL EDUCATION) IN THE SCHOOL OF APPLIED HUMAN SCIENCES OF KENYATTA UNIVERSITY

OCTOBER 2017
DECLARATION

This thesis is my original work and has not been presented for a Degree or for any other award in any other university.

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This thesis is affectionately dedicated to my darling husband Luka Boro and our children Ryan and Rianne; and the entire Githang’a’s family for their unwavering inspirational love, support and prayers.
ACKNOWLEDGEMENT

It is with profound appreciation to the Almighty God, the source of all wisdom, knowledge and understanding with his immense grace in bringing this study to a successful completion.

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I recognize the love, support, patience and prayers made by my dear husband, Luka together with the love and inspiration from our precious children, Ryan Boro and Rianne Boro. To my loving parents, siblings especially Lucy Githang’a and very dear friends Grace Mwangi and Evelyn Khatenje for their encouragement and prayers, may our dear Lord bless you immensely.

In conclusion, I acknowledge assistance from other persons whose names I have not been able to append here. God bless you.
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<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AHA</td>
<td>American Heart Association</td>
</tr>
<tr>
<td>ADLs</td>
<td>Activities of Daily Living</td>
</tr>
<tr>
<td>AHRQ</td>
<td>Agency for Healthcare Research and Quality</td>
</tr>
<tr>
<td>BP</td>
<td>Blood Pressure</td>
</tr>
<tr>
<td>CVDs</td>
<td>Cardiovascular Diseases</td>
</tr>
<tr>
<td>DBP</td>
<td>Diastolic Blood Pressure</td>
</tr>
<tr>
<td>ESH</td>
<td>European Society of Hypertension</td>
</tr>
<tr>
<td>HHP</td>
<td>Harvard Health Publications</td>
</tr>
<tr>
<td>HR</td>
<td>Heart Rate</td>
</tr>
<tr>
<td>ISH</td>
<td>Isolated Systolic Hypertension</td>
</tr>
<tr>
<td>JNC</td>
<td>Joint National Committee</td>
</tr>
<tr>
<td>LAN</td>
<td>Light at Night</td>
</tr>
<tr>
<td>LTCFs</td>
<td>Long Term Care Facilities</td>
</tr>
<tr>
<td>mmHg</td>
<td>millimeters of mercury</td>
</tr>
<tr>
<td>NHANES</td>
<td>National Health and Nutrition Examination</td>
</tr>
<tr>
<td>NPS</td>
<td>National Prescribing Service</td>
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<tr>
<td>NSF</td>
<td>National Sleep Foundation</td>
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<td>NFK</td>
<td>Neem Foundation Kenya</td>
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<tr>
<td>NICE</td>
<td>National Institute for Clinical Excellence</td>
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<tr>
<td>NIH</td>
<td>National Institutes of Health</td>
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<tr>
<td>NCCIH</td>
<td>National Center for Complementary and Integrative Health</td>
</tr>
<tr>
<td>OSA</td>
<td>Obstructive Sleep Apnea</td>
</tr>
<tr>
<td>PMR</td>
<td>Progressive Muscle Relaxation</td>
</tr>
<tr>
<td>PSQI</td>
<td>Pittsburgh Sleep Quality Index</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<td>--------------</td>
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<tr>
<td>PSS</td>
<td>Perceived Stress Scale</td>
</tr>
<tr>
<td>RLS</td>
<td>Restless Legs Syndrome</td>
</tr>
<tr>
<td>SAD</td>
<td>Seasonal Affective Disorder</td>
</tr>
<tr>
<td>SBP</td>
<td>Systolic Blood Pressure</td>
</tr>
<tr>
<td>SCN</td>
<td>Suprachiasmatic Nucleus</td>
</tr>
<tr>
<td>SSA</td>
<td>Sub- Saharan Africa</td>
</tr>
<tr>
<td>UNICEF</td>
<td>United Nations International Children Education Fund</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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</table>
OPERATIONAL DEFINITION OF TERMS

Aged/ Elderly/ Old Person/ Old Adult: The individuals who are 60 years and above.

Average Stress: Global scores on PSS between 0 and 13.

Blood Pressure (BP): The force applied against the walls of the arteries as the heart pumps blood through the body in the elderly.

Chronic Insomnia: The inability of an elderly to sleep for 30 days consecutively.

Diastolic Blood Pressure: The lower figure which is the measurement of force as the heart relaxes to allow the blood to flow into the heart in the elderly.

Digital Automatic Blood Pressure Upper Arm Monitor: Measuring equipment used to assess blood pressure of the elderly.

Elderly Homes/ Long Term Care Facilities: Those homes where the elderly citizens reside in Nairobi County, Kenya.

Good Sleep Quality: Global score on PSQI of ≤ 5.

High Stress: Global scores on PSS between 14 and 20.

Hypertension/ Elevated Blood Pressure/ High Blood Pressure: Blood pressure is greater than or equal to 150 mm Hg (systolic) or greater than or equal to 90 mm Hg (diastolic) in this population.

Insomnia: Inadequate sleep in the elderly that is less than 7½ - 9 hours every night.

Modified Sleep Environment: A modification of the sleep environment of the elderly in terms of creating a state of pure darkness with the use of sleep masks.

Normal blood pressure: Blood pressure below 120/80 mm Hg for systolic and diastolic pressures respectively in the elderly.

Poor Sleep Quality: Global score on PSQI of > 5.
**Progressive Muscle Relaxation (PMR) Exercise/Technique:** Physical exercises carried out by the elderly that involves tensing and relaxing specific muscle groups to create awareness of tension and relaxation. It helps a person to relax, attain a state of increased calmness or otherwise reduce levels of anxiety, stress or anger.

**Pulse Pressure:** The difference between the systolic and the diastolic readings from the elderly.

**Relaxation Response:** The ability of the individual to invoke the body to produce chemicals and brain signals that direct the muscles to relax and increase blood circulation to the brain.

**Sleep Hygiene:** Measures employed to help capitalize on the hours spent when the old adults are sleeping.

**Sleep Masks:** Blindfolds used by the elderly to cover eyes and block out light during sleeping time at night.

**Sleep Quality:** The total amount of time spent by the elderly in the bed sleeping.

**Stress/Stress Level:** The elderly’s stress index calculated from the Perceived Stress Scale.

**Systolic Blood Pressure:** The top figure which measures the force that blood exerts on the artery walls as the heart contracts to pump out the blood in the elderly.

**Very High Stress:** Global scores on PSS > 20.
ABSTRACT

Stress is a key factor in reducing the efficacy of the treatment of high blood pressure and poor sleep quality in the elderly. Yet, high blood pressure and poor sleep quality are important preventable contributors to disease and death. Inadequate sleep is one of the most common side effects of stress resulting in reduced sleep quality. To effectively manage stress, the ability to relax and create a sleep inducing environment is paramount. Given the negative impact of stress on human health, many types of stress management therapies have been put forward for the elderly in order to decrease stress and promote well-being. The purpose of this study was to assess the effectiveness of Progressive Muscle Relaxation (PMR) exercise and sleep environment modification on stress, blood pressure and sleep quality of residents 60 years and above in Mji wa Huruma home for the aged in Nairobi County, Kenya. The study aimed at highlighting the benefits of PMR together with the modification of the sleep environment by use of sleep masks in management of stress, normalizing blood pressure and enhancing sleep quality of both male and female elderly citizens. The study adopted an experimental pre-test post-test control group design. A total of 46 participants were randomly selected from the home to create experimental and control groups with 23 participants in each group. After ethical clearance and research permit approval, data was collected using Perceived Stress Scale (PSS), Pittsburgh Sleep Questionnaire Index (PSQI) questionnaires and a sleep diary. Systolic and diastolic blood pressure data collected using a digital automatic blood pressure upper arm monitor was recorded. The physiological and psychological variables were assessed on both experimental and control groups at pre-test, mid-test and post-test. A total of 43 (93.5%) participants successfully completed the two months intervention programme. In the experimental group, PMR exercise was performed in 45 minutes sessions, three times weekly for two consecutive months and the participants used sleep masks during the entire intervention period. The control group, however, continued with their normal routine activities throughout the intervention period. For the purposes of comparison, data was collected in both experimental and control group. The data was coded and analyzed using Statistical Package for Social Sciences (SPSS) version 20. The results of repeated measures ANOVA and Post Hoc tests between experimental and control groups showed that there were statistically significant differences at \( p \leq 0.05 \) between the pre-test, mid-test and post-test scores on stress level and sleep quality, \( F = 18.969, p = 0.001; F= 10.902, p=0.02 \) respectively. Multiple linear regression showed a significant regression equation, \( F= 7.321, p <0.002 \) for stress level and \( F=27.408, p < 0.001 \) for sleep quality. The repeated measures ANOVA and Post Hoc tests on systolic and diastolic blood pressure showed that there were no statistically significant differences at \( p \leq 0.05 \) between the pre-test, mid-test and post-test scores, \( F = .371, p = .546; F=1.744, p=.194 \) respectively. Multiple linear regression on blood pressure showed a significant regression equation, \( F= 85.52, p <0.001 \). It was concluded that PMR and use of sleep masks were effective intervention measures in the elderly with high stress level, high blood pressure and poor sleep quality. The study recommended that PMR and sleep masks programmes should be expanded in the community areas with larger population of the elderly.
CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

In conformity with African Union definition, Kenya has adopted the definition of elderly people as those aged 60 years and above (United Nations International Children Education Fund [UNICEF], 2013). It is projected that by the year 2050, about 20% of the world’s population will be aged 60 years and above, twelve percent of whom will be in Sub-Saharan Africa (SSA) (HelpAge International, 2007 [HAI]; World Health Organization [WHO], 2011). In Kenya, various estimates put this age bracket at about 4% (Thumbi, 2005). As the quality of life in Kenya improves, more people are living longer such that the country currently has 1.2 million individuals aged 60 and above. The number is expected to reach 2.2 million in the next 10 years (Matt, 2009).

The City of Nairobi is identified as the greying of Kenya and as this East African powerhouse develops a robust economy, a burgeoning middle class is starting to live longer into old age (Matt, 2009). The growing population is creating problems that African countries have not had to deal with in the past (Matt, 2009). For instance, in traditional African societies, the elderly were revered and usually cared for by their grown up children but now many are becoming institutionalized (Matt, 2009; Olum, 2014). In the Kenyan situation, the homes for the aged are fairly few and fall short of the high demand considering that the number has been oscillating between 4-5% of the Kenya’s population (Matt, 2009; Olum, 2014). These institutions are supported mainly by non-governmental and faith based organizations providing various forms of care and social support to older persons (Olum, 2014).
Although health care for the elderly in Kenya, and specifically Nairobi has been improving for decades, many are still detrimentally affected by chronic diseases leaving them physically and financially unstable and therefore, dependent on caregivers (Acieno et al., 2010). In addition, with the waning of family support and the prevailing economic downturn in Kenya, they lack alternative sources of income, thereby increasing their vulnerability in society (Olum, 2014).

In Olum (2014), elderly in Kenya are faced with stress emanating from a host of problems that vary from economic, health, social to personal problems. It is highlighted that 43% of adults experience hostile health effects from stress. This outcome contributes to 75-90% of hospital visits associated with stress-related conditions and complaints including high blood pressure and poor sleep (Bruno, 2013; Harvard Health Publications [HHP], 2009; Olum, 2014). As the population ages, cardiovascular diseases (CVDs) becomes increasingly prominent as the leading cause of death among the elderly (Zoler, 2014).

Opie and Seedat (2005) observed that hypertension in SSA is a widespread problem of immense economic importance because of its high prevalence in urban areas and the severity of its complications. It is envisaged that the health expenses of the elderly could quadruple by 2020 and this poses an economic crisis in CVD management in Kenya which calls for innovations in their rehabilitation systems (Global Action on Ageing [GAA], 2007; Opie & Seedat, 2005; Zoler, 2014). The world report by GAA (2007) states that, services of prevention and rehabilitation that could contribute to preventing or postponing dependency and functional limitations that lead to the need for long-term care are still underdeveloped.
A study by Githang’a (2008) on the use of physical activities to ameliorate functional capacity for the elderly in homes, established that Kenya’s accelerated aging may pose a challenge. Consequently, the study recommended that the stakeholders in gerontology should undertake research to establish the nature and extent of their physical, social and mental health needs. The study stressed on the need to factor promotive, preventive and rehabilitative health strategies to improve functional independence. While the number of elderly persons is on the rise, few doctors are prepared to attend to their needs (Mabadeje, 1999; South Africa Hypertension Society, 2002). One of the main problems the healthcare industry faces is the management of high blood pressure in elderly patients which represents a management dilemma to cardiovascular specialists (Lionakis, Mendrinos, Sanidas, Favatas & Georgopoulou, 2012; Mabadeje, 1999).

Hypertension is often asymptomatic requiring optimal control and persistent adherence to prescribed medication (Mundan, Muiva & Kimani, 2011). In addition, lifestyle modification should be recommended to reduce the risks of cardiovascular, cerebrovascular and renal diseases (Hamilton, 2003; Mundan et al., 2011). Grander, Sands-Lincoln, Park and Garland (2013) suggest that there is demonstrated evidence of association between sleep quality and elevated cardiovascular risk. This has consequently led to sleep being progressively acknowledged as a major public health concern particularly for the elderly population.

The WHO (2011) concurs that on cardiovascular risk management requires lifestyle modification for all hypertensive patients. The Joint National Committee (JNC 8) panel set the target blood pressure for the population aged 60 years or older to less
than 150/90 mmHg, a major break from the long-standing practice of treating such patients to a target systolic pressure of less than 140 mmHg (James et al., 2014). When high blood pressure has been confirmed, appropriate lifestyle changes are advocated with emphasis on behavioral therapy that include relaxation exercises and sleep enhancement (Shinde, N., Shinde, K., Khatri, Hande, D. & Bhushan, 2013; WHO, 2011). By inducing relaxation responses, blood pressure is regulated and this reduces the risk of detrimental health complications like CVDs and stroke resulting from high blood pressure (Shinde et al., 2013).

Relaxation techniques for the older persons include a number of practices such as progressive relaxation, autogenic training, guided imagery, biofeedback, self-hypnosis, and deep breathing exercises (Benson, Casey & Dadoly, 2008; HHP, 2009; National Center for Complementary and Integrative Health [NCCIH], 2016). One of the most effective techniques is the Progressive Muscle Relaxation (PMR) exercise, which is not only simple to perform but also has better reported results oriented towards managing distress and poor sleep quality associated with stress in this population (Barnes, Powell-Griner, McFann & Nahin, 2004; Muriungi & Ndetei, 2013; Shinde et al., 2013).

The rationale underlying PMR exercises is to facilitate a relaxation response in voluntary muscles by alternating contraction and relaxation of muscle groups (Kyeng, Yeon & Hae, 2016; Shinde et al., 2013). The goal is to consciously produce the body’s natural relaxation response, characterized by slower breathing, lower blood pressure, and a feeling of calm and well-being.
Among other positive health effects in elderly individuals including those with limited mobility is that relaxation response induces sleep, reduces pain, and calms emotions (NCCIH, 2016; Sayed & Gehan, 2014). In the long-term, the overarching benefit is that whenever the body becomes tense, it will prompt the muscles to relax (Bonnet & Arand, 2016; Kyeng et al., 2016; Shinde et al., 2013).

Stress has been identified as a major contributing factor to hypertension and sleep disturbance amongst the elderly because of the stress response characterized by increased heart rate, blood pressure, metabolism and respiratory rate (Bruno, 2013; Kyeng et al., 2016). As people grow old, sleep quality becomes a concern because of inadequate sleep as a result of normal changes in sleeping patterns (National Sleep Foundation [NSF], 2016). This is because the elderly either sleep early, fall asleep late, wake up early or experience frequent awakenings throughout the night (Smith, Robinson & Segal, 2016). However, poor sleep due to sleep disturbances are not normal part of the aging process. This has, consequently, led to pharmacological interventions that harbor established side effects (Qaseem, Kansagara & Forciea, 2016). For example, sleep medications are associated with residual daytime sedation, lightheadedness, lack of motor coordination causing falls and functional dependence resulting in poor quality of life among the elderly population (Buscemi, Vandermeer & Friesen, 2007; National Institutes of Health [NIH], 2005; Smith et al., 2016).

The elderly are also susceptible to irregular night-time awakening due to the impaired levels in melatonin, a hormone that enhances sleep quality (Fulghum, 2007; Wilson, 2016), that is also associated with aging (Drake, Mills & Noble,
In addition, inappropriate sleep environment due to lighting in the room has been found to interfere with melatonin synthesis. Researchers recommend that the bedroom should be kept as dark as possible with the help of blackout drapes or sleep masks (Bonnet & Arand, 2016; Healthwise Staff, 2015; The Alternative Daily, 2016). Fulghum (2007) asserts that melatonin as a factor in sleep restoration also extends its powerful antioxidant effect to the enhancement of the brain and nervous system. This helps to protect against age-related damage and consequently leading to a tremendously improved quality of life among this significant population (Figueiro, 2015; Obayashi, Saeki, Iwamoto, Ikada & Kurumatani, 2013).

In conjunction to this, scholars state that melatonin levels are also affected by the amount of daylight exposure the elderly received in the previous day (Figueiro, 2015; Healthwise Staff, 2015). Consequently the elderly are advised to get adequate exposure to daytime brilliant sunshine to promote melatonin synthesis (Figueiro, 2015; Healthwise Staff, 2015). Approximately thirty minutes of sun exposure between 10 am and 3 pm at least twice a week to the face, arms, legs, or back without sunscreen is a standard treatment for circadian rhythm sleep disorders as well as reducing hypertension (British Broadcasting Corporation [BBC] News, 2013; Holick, 2002, 2007; Ward, 2013). Based on evidence that modest amount of daily daylight assists in preserving sleep and wake cycles, the elderly are encouraged to relax in the sun (Healthwise Staff, 2015).

Research has revealed that, many old adults with poor sleep desire to sleep well again without the use of sleeping medications and also that nonpharmacological interventions have not been identified to elicit adverse effects (Bonnet & Arand,
Nonpharmacological behavioral interventions are used to manage stress, poor sleep quality and other chronic problems. They are healthy interventions that involve the use of relaxation exercise and sleep hygiene which help the older adult in not only falling asleep faster but also waking up feeling refreshed and relaxed (Agency for Healthcare Research and Quality [AHRQ], 2005; Anspaugh, 2011; Bonnet & Arand, 2016; Neem Foundation Kenya [NFK], 2014; NIH, 2015; Yang, Ho, Chen & Chios, 2012). One of the pivotal goals of relaxation exercises and good sleep hygiene is to reduce anxiety over good sleep quality. Studies have shown that relaxation exercise and sleep hygiene are two healthy, nonpharmacological interventions that not only help the older adults fall asleep faster but also to awaken feeling refreshed and relaxed (AHRQ, 2005; Yang et al., 2012).

Anspaugh (2011), Benson et al., (2008), Freeman (2009) and NCCIH (2016) all concur that while muscle tension and inadequate sleep can also be associated with backaches and tension headaches, the relaxation response induced by relaxation exercises have been helpful in reducing these aches and pains. These relaxation inducing skills not only enable the elderly to sleep more soundly but also assist the body in alleviating the damaging consequences of stress.

These exercises have been used as treatment interventions in hospitals to assist people suffering from sleeping problems (Anspaugh, 2011; Bonnet & Arand, 2016; HHP, 2009; NFK, 2014; NIH, 2015). The more the elderly become aware of their health needs in terms of sleep patterns, stressors and risk of high blood pressure, the more they can use relaxation exercises and sleep as an advantage to increase their productivity hence improved quality of life (Healthwise Staff, 2015). Adherence to
healthy stress coping routines can make the difference between restlessness and restful sleep. It is from this standpoint that the elderly are encouraged to seek professional help, particularly over stress related issues such as, sleep impairment and elevated blood pressure (Durán-Cantolla, Aizpuru, Martínez-Null & Barbé-Illa, 2009; Hamidizadeh, Ahmadi & Falahi, 2005; NFK, 2014; Walters & Rye, 2009).

1.2 Problem Statement

Nairobi County’s population currently stands at over three million (UNICEF, 2013). It is emerging that with the complexities in living caused by modernization, a number of families have absconded the responsibility of taking care of their elders (Olum, 2014). Consequently, they are now being taken care of in existing homes for the elderly. Nairobi County typifies the current urban elderly population explosion and its associated stress, sleep and hypertension management, characteristic of many SSA cities (Olum, 2014). This population is at a phase in life that faces prolonged and precarious health problems (Opie & Seedat, 2005; Ramakrishnan & Chandran, 2013). There is little doubt that both physical and mental stress can cause significant elevations of blood pressure and poor sleep quality (Bruno, 2013).

Stressors amongst the elderly in these homes emanate from anxieties about poverty, health, transition, or family concerns which can keep their minds active at night making sleep difficult, leading to insomnia (HAI, 2007). Exposure to Light at Night (LAN) prevents production of the much needed sleep inducing hormone, melatonin. These interruptions in regular sleep patterns result in sleep deficit (Dvorsky, 2014). The exposure to LAN interferes with the normal sleep patterns as it prevents the production of melatonin (sleep hormone) at night when sleep is needed leading to
sleep debt (Dvorsky, 2014). Biochemical response of sleep produced under pitch darkness at night is responsible for restful sleep while reducing blood pressure, metabolism, glucose levels and body temperature (Dvorsky, 2014).

Stress and LAN, both inhibit adequate sleep in this population. Sleep loss is deemed to impair the elderly from living a healthy, safe and focused life and ironically the ability to enjoy good sleep may be under their control (Engle-Friedman, 2014). As a possible solution, the elderly are encouraged to access bright light in the morning and during the day preferably from the sun and avoid LAN in the evening by sleeping in a completely dark bedroom (Stevens, 2015). In the event sedatives are prescribed, there is likelihood of them causing side effects including headaches, dizziness, nausea, fatigue and impaired cognition (Bonnet & Arand, 2016; Buscemi, Vandermeer & Friesen 2007). Research has established that the quality of sleep in the elderly can be improved by the mere adjustment of their sleeping habits to create an environment conducive for sleep (AHRQ, 2005; Dvorsky, 2014; Mercola, 2012; NCCIH, 2016; Yang et al., 2012). Sleep hygiene education sensitizes old adults by helping them sleep more peacefully without the experiencing fragmented sleep.

Research further reveals that, although these behavioral therapies (relaxation and sleep hygiene education) are usually well tolerated with minimal risk of adversity, they are underutilized in many countries by the elderly (Bonnet & Arand, 2016). This may have fanned the progression of CVD through stress and poor sleep (Benson et al., 2008; Bruno, 2013). Thus, decreasing their functional independence necessitating institutionalization and at the same time increasing the health care burden on the country and posing potential economic crisis.
1.3 Purpose of the Study

The purpose of the study was to assess the impact of Progressive Muscle Relaxation exercises and the use of sleep masks on stress level, blood pressure and sleep quality of the elderly citizens residing in homes for the elderly in Nairobi City County.

1.4 Objectives of the Study

The objectives of the study were to:

i. Determine changes in pre-test stress levels of the elderly following administration of treatment at mid-test and post-test.

ii. Assess changes in pre-test blood pressure both systolic and diastolic of the elderly following administration of treatment at mid-test and post-test.

iii. Measure changes in pre-test sleep quality of the elderly following administration of treatment at mid-test and post-test.

1.5 Research Hypotheses

The study tested the following hypotheses from the observations:

H₀₁: There would be no significant differences in stress levels of the elderly at pre-test, mid-test and post-test.

H₀₂: There would be no significant differences in blood pressure of the elderly both systolic and diastolic at pre-test, mid-test and post-test.

H₀₃: There would be no significant differences in sleep quality of the elderly at pre-test, mid-test and post-test.
1.6 Significance of the Study

In view of the significant rise in the population of the elderly in many African countries including Kenya, it is imperative for measures to be put in place to improve the quality of their lives. This is because many are now accommodated in homes for the elderly. The change in demographics suggest that the demand for such facilities will continue to grow and as such, there is great need for cheaper effective ways of managing age-related conditions due to late-life stressors. Since the study aims at ameliorating the quality of life of the institutionalized individuals, the findings are hoped to optimize opportunities for their physical, physiological and mental health, to enable them actively take part in stress, hypertension and sleep management and to enjoy an independent life.

The findings of this study may not be limited to use by just the institutionalized elderly. The easy and simple to perform PMR exercises and use of sleep masks to block out sleep-hindering light seepage can be practiced by anyone at home. Therefore, the findings of this study could, in conjunction with or without prescribed medication, be a breakthrough in providing a relatively cheap but effective management technique for age-related conditions of stress, high blood pressure and sleeplessness among the elderly.

It is envisaged that the findings will enrich the body of knowledge in gerontology. The immediate stakeholders such as caregivers and the elderly themselves will be enlightened in the use of relaxation therapy, sleep hygiene and sleep environment for improving quality of life. Gerontologists and researchers will also gain knowledge about the association of relaxation therapy and sleep in this Kenyan population.
The execution of PMR exercises does not require any special training or equipment or clothing; and has no known side effects. It is a technique which can be engaged in the home for the aged without restrictions as it is a simple method that can be used to lower stress level, blood pressure and sleep disturbances. Since the goal of PMR exercise is to elicit a relaxation response, this practice could promote a habit of relaxation whenever the elderly are prone to distress and the body will learn to automatically respond by initiating lowered blood pressure, breathing rate, reduced muscle tension and improved sleep at night.

The learning and participation of this relaxation technique will demand a lot of patience and practice on the part of the elderly. This could help cultivate functional independence by promoting self-confidence, self-esteem, self-image and ability to make decisions by themselves and for their own good. Once the elderly become part and parcel of managing their treatment intervention, there is a better chance of long-term adherence to the treatment plan for stress, blood pressure and sleep disorders.

1.7 Delimitations of the Study

The study was confined to:

i. One home of the elderly in Nairobi County.

ii. The assessment of PMR technique as an intervention measure in managing stress levels, blood pressure and sleep quality.

iii. The evaluation of the use of sleep masks as an intervention measure in sleep environment modification.
iv. The assessment of sleep quality as a psychological measure of stress index.

v. The evaluation of blood pressure as a physiological measure of stress index.

1.8 Limitations of the Study

The findings of this study were interpreted in light of the researcher’s inability to control the medical condition and/or history, diet, sleep patterns and environment; and sunlight exposure of the participants. However, one home where the residents lived under similar conditions was investigated. In addition, the study could not rule out information bias because of validity limitations associated with self-report in the use questionnaires.

1.9 Assumption of the Study

The study assumed that the respondents would be honest throughout the entire intervention period.

1.10 Conceptual Framework

The compound association amongst stress, blood pressure and sleep has led to public health campaigns in order to address it (Grander et al., 2013). Stress is not only a major contributing factor to high blood pressure and poor sleep amongst the elderly but it also hampers the success of their treatment interventions (Bruno, 2013; Kyeng et al., 2016). Sources of stress in the elderly include loss of loved ones, loneliness, age-related diseases, declined physical strength, financial constraints, post-retirement and fear of institutionalization (Ramakrishnan & Chandran, 2013). When under stress, the body releases stress hormones that produce the stress
response otherwise known as “fight-or-flight” response (McEwen, 2007; Wilson, 2016). Heart rate and breathing rate rise and blood vessels narrow (Wilson, 2016). When the body remains in a stressful state for a long time, psychological and/or physiological damage can occur due to stress response (Wilson, 2016).

Another factor that induces stress response is exposure to LAN in the sleeping environment because at night, bright light upholds stimulation of the body. Sleep researchers believe older persons may be susceptible to disrupted sleep patterns due to the decline in melatonin levels associated with aging and LAN (Drake et al., 2004). Simply because, with less melatonin in their blood, the stimulus to fall asleep, stay asleep, and wake up feeling rested can potentially be compromised. This is why some may benefit from the use of sleep masks to enhance production of melatonin (Mercola, 2012). The timing of sleep is controlled by the hypothalamus, which responds to light and causes sleepiness at night when it is dark (Bowman, Beck & Luine, 2003; Wilson, 2016).

Chronic stress and chronic exposure to LAN may reduce the body’s ability to fight off illness due to the stress response and may play a role in developing high blood pressure and insomnia (Benson et al., 2008; Dvorsky, 2014). Anspaugh (2011), Benson et al., (2008), Bonnet and Arand (2016), Freeman (2009), NCCIH (2016), NIH (2015) and Shinde et al., (2013) all agree that PMR aims to consciously produce the body’s natural relaxation response which is based on the theory that an elderly can acquire the ability to relax all the major muscle groups sequentially until the whole body is tranquil.
These scholars explain that PMR is characterized by slower breathing, lower blood pressure, decreased levels of stress hormones and a rise in feeling of calmness and well-being, which in turn, induce relaxation and enrich sleep. Since relaxation is the opposite of stress, it is conceptualized that voluntarily created regular relaxation responses could counteract the negative effects of stress (HHP, 2009; NCCIH, 2016). This promotes quality sleep through induced physical and mental relaxation. Regular relaxation exercises early in the day for over two weeks promote more consistent sleep and wake patterns as well as relieve stress (HHP, 2009; Healthwise staff, 2015; NCCIH, 2016).

The habitual practice will enable the elderly to be conscious of where the muscle tension and stress emanate from and how they can tackle them in a constructive manner (Anspaugh, 2011; Freeman, 2009; Healthwise Staff, 2015; National Institutes of Health, 2015). The habit of learning to relax breathing and reduce muscle tension automatically causes the mind to follow. Learning to block out stressful thoughts will also relax the body (HHP, 2009). It is evident from research that this behavioral therapy can reduce systolic blood pressure in hypertensive elderly, and even reduce need for hypertension medication without an increase in blood pressure (Nagele et al., 2014; Sheu, Irvin, Lin & Mar, 2003). The long-term benefits of PMR include decreased blood pressure and heart rate, improved quality of sleep, reduction of salivary cortisol and generalized anxiety; and better management of cardiac rehabilitation (Anderson & Seniscal, 2001; Bonnet & Arand, 2016; NCCIH, 2016; Pawlow & Jones, 2002; Sheu et al., 2003; Wilk & Turkoski, 2001). This can, therefore, go a long way in promoting sleep efficiency, stress relief and most importantly, alleviating hypertension.
There is evidence that PMR and pure dark state of the sleeping room can help chronic poor sleep quality as a relaxed mind and body tends to sleep more and better (Dvorsky, 2014; Mercola, 2012). Relaxation exercises and reduction of the exposure to light at night have been attested as good sleep habits that create an environment conducive for sleep hence beneficial to nearly all old persons (Dvorsky, 2014; Mercola, 2012; NCCIH, 2016). It is acknowledged that restful sleep is possible when an elderly person prepares for it both mentally and physically in the course of the day and in the evening before sleeping through relaxation and sleep hygiene (Blumenthal, Babyak & Hinderliter, 2010; Bonnet & Arand, 2016; Muriungi & Ndetei, 2013; Unbehau, Spiegelhalder, Hirscher & Riemann, 2010).

Sleep hygiene are measures employed to help capitalize on the hours spent when the old adults are sleeping. According to Agency for Healthcare Research and Quality, (2005) and Yang et al., (2012), the old adults who practice relaxation exercise and block out all bright LAN, tend to worry less about sleeping adequately which plays a role in them falling asleep somewhat more quickly. The faster they fall sleep the more hours they get in sleep, which allows them to enjoy more restful sleep (AHRQ, 2005; Yang et al., 2012).

Accordingly, research studies show that sleep-deprived elders are more prone to stress, CVDs, poor daily performance, fatigue, anxiety and decreased quality of life (Bonnet & Arand, 2016; McCullough, 2001; Wilson, 2016). In the short term, stress can cause a rise in blood pressure. The relaxation response reduces it even allowing old adults on antihypertensive medications to reduce their dosage (NCCIH, 2016). Consequently, coping strategies, such as PMR and use of sleep masks, aimed at
reducing psychological stress are recommended before starting drug therapy for reducing elevated blood pressure (Nagele et al., 2014). Further, NCCIH (2016) states that relaxation exercises can be combined with use of sleep masks to promote sleep quality. These non-pharmacological approaches have been shown to significantly reduce blood pressure in people with hypertension (Blumenthal et al., 2010) as well as modulate sleep problems (NCCIH, 2016). Their potential effectiveness is similar to using medication. However, if hypertension is high enough to justify immediate use of medications, lifestyle changes are still recommended (Giuseppe, 2013). More to this, gerontologists advice that for any effective and appropriate management of such convoluted health concerns, primary care givers and physicians need to evaluate the sleep and stress status of the elderly in the institutions (Duthie, Katz & Malone, 2007; Ebersole, Hess, Touhy & Jett, 2005; Eliopoulos, 2001).

Sleep problems become more common with increase in age due to a change in many factors relating to sleep patterns and environment including LAN, lack of regular physical activity and daylight exposure; consumption of alcohol, caffeine and nicotine beverages close to sleeping time, diseases and medications (Freeman, 2009; Hartescu, Morgan & Stevinson, 2015; Healthwise Staff, 2015; Wilson, 2016). The elderly, especially those who reside in institutions, rank inadequate sleep as the number one sleep anomaly (Harbison, 2002). In Long Term Care Facilities (LTCFs), the elderly are not able to control their sleep environment particularly LAN despite studies showing that darkness is indispensable for sleep (Dvorsky, 2014; Healthwise Staff, 2015; The Alternative Daily, 2016). To dissipate this predicament, gerontologists, just like the Kenyan government health policy, emphasize the
preventive rather than curative approach in managing high blood pressure, poor sleep and high stress to this vital populace (Olum, 2014; WHO, 2002; Shinde et al., 2013). This convoluted approach in mitigating the factors affecting stress level, blood pressure and sleep quality in the elderly is depicted in Figure 1 below.

**Figure 1:** Relationship between Progressive Muscle Relaxation exercises and use of sleep masks on stress, blood pressure and sleep (Adapted from Anderson & Seniscal, 2001; AHRQ, 2005; Pawlow & Jones, 2002; Sheu et al., 2003; Wilk & Turkoski, 2001; Yang et al., 2012).
CHAPTER TWO: REVIEW OF LITERATURE

2.1 Progressive Muscle Relaxation (PMR) Exercise

Progressive Muscle Relaxation (PMR) is a technique for reducing stress. It involves alternate conscious tensing and relaxing groups of muscles in turn, throughout the body by creating distinctive awareness of tension and relaxation (Ramakrishnan & Chandran, 2013). In the context of therapy, progressive refers to a systematic, alternate contraction-relaxation of 16 large skeletal muscle groups, each group at a time until total muscle relaxation is achieved throughout the body (Bonnet & Arand, 2016; Kyeng et al., 2016; Ramakrishnan & Chandran, 2013).

Developed by an American physician, Edmund Jacobson in 1934, the technique trains a person to voluntarily relax individual muscles to induce both physiological and psychological relaxation by reducing the response to stress and skeletal muscle contractions; and decreasing the sensation of pain (Field, 2009). Jacobson argued that since muscle tension accompanies anxiety, one can reduce anxiety by learning how to relax the muscular tension.

This technique is based on the theory that progressive and sequential relaxation of muscles can induce a relaxation response until the entire body is fully calm (Bonnet & Arand, 2016; Williams & Carey, 2003). The relaxation of a muscle is obtained by identifying the difference between the state of tension and relaxation as well as by the heightened differentiation of muscle groups that are susceptible to mounting pressure (HHP, 2009).
According to Pawlow and Jones (2002), PMR entails both, a physical and mental component in which, physical involves conscious tensing and relaxing of muscle groups of the legs, abdomen, chest, arms and face. In a sequential pattern, with eyes closed, the individual generates tension in a given muscle group purposefully for approximately 10 seconds and then releases it for 20 seconds before continuing with the next muscle group (Bonnet & Arand, 2016; Kyeng et al., 2016). The technique begins with the face muscles then the rest of the muscle groups would follow in the order of jaw, neck, arms, fingers, chest, stomach, buttocks, thighs, calves and finally the feet. This sequence is repeated as many times as necessary (Bonnet & Arand, 2016; Kyeng et al., 2016). The mental component requires the individual to focus on distinguishing between the feelings of tension and relaxation (Pawlow & Jones, 2002).

The individual can learn from a professional, a manual, or an audio order on how to progressively relax major muscle groups. The sequence needs to be performed 2-3 times a week for 20-30 minutes per session. The relaxation technique requires patience and practice to develop successfully for it to be executed effectively during moments of distress (HHP, 2009). Within few weeks of practice, the simplicity of its performance allows an individual to self-relax effectively with utmost safety and independently at the home of the elderly (Kyeng et al., 2016; Shinde et al., 2013). Ideally, for training adaptations to kick in, the training programme should last a minimum of six weeks (Brown, 2013). In addition, the technique can be engaged in by every elderly anywhere in the home since it does not need special training, equipment or clothing.
2.1.1 Beneficial Effects of Progressive Muscle Relaxation Exercise to the Elderly

During stress, the body activates the stress response otherwise known as the “fight or flight” defense mechanism. Consequently, muscles become tense, heart and respiratory rates increase and physiological systems become taxed. In the event that the body is not able to relax, the chronic effect of such stress response is among burnout and medical problems. However, when the body is allowed to deeply relax the stress response is counteracted (HHP, 2009; Ramakrishnan & Chandran, 2013).

The progressive muscle contraction and relaxation induces a relaxation response in the body. A relaxation response is the ability of the individual to invoke the body to produce chemicals and brain signals that direct reduction in heart and respiratory rates; decrease blood pressure, muscle tension and muscle activity (HHP, 2009; Kyeng et al., 2016; Williams & Carey, 2003). This type of relaxation response is natural and without significant side effects as compared to adverse side effects induced by pharmacological drug use (NCCIH, 2016; Williams & Carey, 2003).

The aim of the relaxation response is for the elderly to be physically relaxed and mentally alert because acute stress creates a higher level of resting tension in the muscles. The many advantages of the relaxation response include inhibition of cumulative stress, reduced anxiety, a boost of energy, improved concentration and reduced medical problems (Bourne, 2000). It is recommended that Progressive Muscle Relaxation exercises should be practised consistently not only to prepare the mind and body for a peaceful sleep, but also to self-relax and tone down the stress level throughout the day (Garber et al., 2011; HHP, 2009; Kyeng et al., 2016; Sigfusdottir, Asgeirsdottir, Sigurdsson & Gudjonsson, 2011).
According to Vargogi and Darviri (2011), relaxation must be attempted in order to reduce pain, fatigue and tension, create a pleasant mental state, reduce anxiety as a response to stress and increase parasympathetic activities. The absence of relaxation in the elderly is associated with mental and physical tension that comes along with distress (Benson et al., 2008). Gerontologists argue that unmanaged chronic stress in the elderly contributes to a myriad of health complications which includes high blood pressure, sleep problems, chest pain, headaches, digestive problems, poor concentration, anxiety and depression (Benson et al., 2008; Kessler et al., 2011; Kyeng et al., 2016; Schoenborn, Adams & Perogoy, 2013).

It is through relaxation that the body produces ‘feel good hormones’ which include serotonin, prolactin, endorphins and oxytocin. These hormones benefit the body by reducing fatigue, decreasing anxiety, lowering the level of cortisol (stress hormone), blood pressure and heart rate thereby leaving the body more relaxed, calm and composed (Bonnet & Arand, 2016; Garber et al., 2011). Research has established that habitual deep relaxation relieves muscle tension and pain, increases motivation, boosts energy and sleep quality, moderates irritability, reduces blood pressure, while improving the immunity and decision-making ability of an elderly person, hence, enhancing productivity (Benson et al., 2008; Kessler et al., 2011; Schoenborn et al., 2013).

Other benefits include increase in knowledge concerning muscle tension, increase in the feeling of control, energized and improved sleep, lower blood pressure, enhanced performance of physical activities and help in the relationship with others (Titlebaum, 1998). Long-term benefits include reduction of salivary cortisol levels
and anxiety, decreased blood pressure, heart rate, and headaches, better management of cardiac rehabilitation and improvement of quality of life (Dehdari, Heidarnia, Ramezankhani, Sadeghian & Ghofranipour, 2009; Ghafari et al., 2009; Pawlow & Jones, 2002; Sheu et al., 2003; Wilk & Turkosi, 2001).

However, caution should be observed because exercises will only help sleep if done several hours before bedtime. It is recommended that exercises should be performed earlier during the day to avoid anxiety and hyperactivity that may follow when the activity is done at night consequently delaying onset of sleep in the elderly (Benson et al., 2008). Furthermore, for better and long-term benefits through relaxation training the elderly should engage in Progressive Muscle Relaxation at least twice a week for six to ten sessions (Bonnet & Arand, 2016).

2.2 Stress among the Elderly

The elderly might not experience job-related stress; but nevertheless, their stress levels can be high. It is a common belief that stress is an essential aspect of life (HHP, 2009; Ramakrishnan & Chandran, 2013). The rationale behind this stance is that some level of stress gives the body a protective cover which allows adaptation to life challenges. The stress response assists the body mentally and physically to prepare for the challenge as well as to react suitably during crisis (HHP, 2009). Acute stress is the most common form of anxiety among humans worldwide and it deals with the pressures of the near future or with the very recent past (McEwen, 2007). This type of stress is often misinterpreted and viewed negatively although it is also a good thing to have some acute stress in life (HHP, 2009).
Acute stress is a short term stress and as a result, does not have enough time to do the damage that long term stress causes (Johansson, Hassmén & Jouper, 2011; Seo, Tsou, Ansell, Potenza & Sinha, 2014). On the other hand, chronic stress which is excessive continued stress has a wearing effect on physical and mental wellness that can become a very serious health risk (McEwen, 2007). It can lead to burn out, memory loss, impaired daily functioning, reduced self-esteem, damaged spatial recognition, decreased appetite, clinical depression, disrupted social interactions in the elderly among other consequences (Benson, Casey & Dadoly, 2008; HHP, 2009; Rueggeberg, Wrosch & Miller, 2012; Seo et al., 2014). The severity varies from person to person, with gender an underlying differentiating factor. Women are able to take longer durations of stress than men without showing the same maladaptive changes (Bowman, Beck & Luine, 2003). Men can deal with shorter stress duration better than women; but once males hit a certain threshold, the chances of them developing mental issues increase drastically (Bowman, Beck & Luine, 2003).

2.2.1 Sources and Symptoms of Stress

According to HHP (2009) there are four common sources of stress. Stress could emanate from environmental influences like uncomfortable living or sleeping environment; social factors like bereavement and financial constraints; psychological elements like diseases and lack of physical activity; as well as from intrusive thoughts relating to the elderly perception of life in general (HHP, 2009). During crisis the body responds through a defense mechanism referred to as “fight-flight” reaction which is a stress response that allows the body to prepare itself to meet the challenge appropriately (McEwen, 2007). However, if the body is
frequently exposed to stressful events without adequate measures to dissipate the chronic stress, then the elderly succumb to the symptoms of stress physically, behaviorally, emotionally and cognitively (HHP, 2009).

According to Harvard Health Publications (2009), the physical symptoms of stress include muscle tension, neck and back pain; and fast heart and respiratory rates. In terms of behavior, the elderly may exhibit substance abuse, oversleeping or undersleeping (HHP, 2009). Emotionally, the elderly may seem pretty nervous, depressed, moody, and angry or overwhelmed by the pressure (HHP, 2009). The cognitive symptoms of stress include characteristics such as poor concentration, impaired focus and memory, indecisiveness, chronic worry and pessimism (Aldao, Mennin, Linardatos & Fresco, 2010; HHP, 2009; Seo et al., 2014; Shah, Hassan, Malik & Sreeramaleddy, 2010; Shinde et al., 2013; Ward, 2013). Since these symptoms of stress can lead to medical problems, the elderly are advised to be wary of them and initiate a management plan once they start to recognize them (Bonnet & Arand, 2016; Muriungi & Ndetei, 2013).

2.2.2 Stress Management: The Effect of PMR and Use of Sleep Masks on Stress Level, Blood Pressure and Sleep Quality

Stressful situations create opportunities for the old adult to sleep less and reduce physical activity yet those are the times when adequate sleep and physical activity are much needed (HHP, 2009). Inadequate sleep and physical activity lower the body’s immunity increasing the individual’s susceptibility to illness (Healthwise Staff, 2015). In distress, the body responds in various ways including muscle
tension. Not only does the body lose tension, PMR also elicits a relaxation response. In the Mosby’s Dictionary of Complementary and Alternative Medicine (2005) a relaxation response in which a deep state of physical, psychological and physiological relaxation may be achieved, is the physiological opposite of the “fight-flight” response. These physiologic relaxation responses of reduced heart, metabolic and respiratory rates provide adequate counterbalance and protection against stress.

During the PMR procedure, the muscles are forcibly contracted as one breathes in and relaxed when breathing out (Garber et al., 2011; Sigfusdottir et al., 2011). This successive contraction and relaxation of the major muscle groups leaves the entire body physically and mentally relaxed without anxiety (Garber et al., 2011; Sigfusdottir et al., 2011). This skill, acquired in a relatively short time allows the elderly to manage stress effectively overtime, creating an environment conducive for sleep allowing the person to fall asleep easily (Healthwise Staff, 2015). Regular relaxation enables the body to relieve symptoms of stress, fortifying self-esteem, confidence and physical relaxation while promoting health and wellbeing (Garber et al., 2011; HHP, 2009; Sigfusdottir et al., 2011).

According to Figueiro, (2015), light at night blocks melatonin hormone that can help the elderly fall asleep readily. Hence, the sleep environment can be a stressor. Since the elderly, living in Long Term Care Facilities do not have control over their sleeping environment, night time light disruptions can complicate their sleep patterns (Engle-Friedman, 2014; Figueiro, 2015; Mihai & Noor, 2010). However, these old adults can block out any unwanted light by using sleep masks as a compromise to encourage a good night’s sleep (Healthwise Staff, 2015; Obayashi et
al., 2013). To promote better sleep, sleep hygiene should be practiced regularly in conjunction with relaxation exercises (Anspaugh, 2011; Freeman, 2009; Healthwise Staff, 2015). Sleep of seven to nine hours every night, considered adequate for the elderly, is associated with many physical, physiological, behavioral and cognitive health benefits (Benson et al., 2008; HHP, 2009). According to Harvard Health Publications (2009), good sleep quality boosts the cognitive ability of memory consolidation. Good sleep also assists the brain in the learning of tasks and memory of new information. Consequences of lack of sleep are felt in metabolism and weight control (HHP, 2009). Weight gain may result because Sleep debt affects the body’s ability to process carbohydrates and causes hormonal disturbances affecting appetite. Consequently, weight gain is often associated with sleep debt (HHP, 2009).

Chronic sleep deprivation interferes with the safety of the elderly because of the heightened predisposition to falls during ADLs, in addition to the likelihood of making errors in taking of medications (Aldao et al., 2010; Jaussent et al., 2011; Leblanc, Desjardins & Desgagné, 2015a, 2015b; Obayashi et al., 2013). Poor quality of sleep may result in impaired cognitive ability characterized by irritability, impatience, poor concentration, disinterest, indecisiveness, reduced attention span and reaction time, declined alertness, poorer judgement, diminished spatial and situational awareness (Aldao et al., 2010; Jaussent et al., 2011; Leblanc, Desjardins & Desgagné, 2015a, 2015b; Obayashi et al., 2013). Finally, serious sleep disorders have been connected to altered immunity thus increasing the incidence of health problems like high blood pressure, elevated cortisol levels, diabetes, irregular heartbeat, depression and some cancers (Benson et al., 2008; HHP, 2009; Kessler et al., 2011; Schoenborn et al., 2013).
2.2.3 Measuring Stress Level

One way that the levels of stress can be measured is through psychological testing by use of the Perceived Stress Scale (PSS) to rate stressful life events (Kumutha, Aruna & Poongodi, 2014; Spira et al., 2012). The PSS is a short and easy-to-use questionnaire with established acceptable psychometric properties in comparative studies (Eun-Hyun, 2012).

Other methods of measuring stress can be through changes in blood pressure and galvanic skin response; and use of digital thermometer to evaluate changes in skin temperature, which can indicate activation of the “fight-or-flight” response which draws blood away from the extremities. In addition, cortisol which is the main hormone released during a stress response, can be and measured giving a 60-90 baseline stress level of an individual (Susic, 2013).

2.3 Blood Pressure

Blood pressure is the force applied against the walls of the arteries as the heart pumps blood through the body and it is recorded as two numbers. The blood pressure measure is written as a ratio, for example 122/84 mmHg which is read as “122 over eighty four millimeters of mercury” (AHA, 2016). The top number which is also the higher of the two numbers is referred to as the systolic blood pressure (SBP) while the bottom number usually the lower one is the diastolic blood pressure (DBP) (American Heart Association [AHA], 2016). The pressure is determined by the force and amount of blood pumped and the size and flexibility of the arteries. Increased pressure can injure blood vessels in the heart, kidneys, the brain, and the
eyes depending on whether systolic or diastolic pressure (or both) is elevated (Smith et al., 2006). The systolic pressure is the force that blood exerts on the artery walls as the heart contracts to pump out the blood. High systolic pressure is known to be a greater risk factor and is known to cause brain, heart, kidney, and circulatory complications and death, particularly in middle-aged and elderly adults (AHA, 2016).

American Heart Association (2016), explains that the diastolic pressure is the measurement of force as the heart relaxes to allow the blood to flow into the heart. A third measurement, pulse pressure, may also be important as an indicator of severity as this is the difference between the systolic and the diastolic readings (Kaplan, 2007). It indicates stiffness and inflammation in the blood-vessel walls. The greater the difference between the two numbers, the stiffer and more injured the vessels are thought to be. Research suggest that in people over 45 years old, every 10 mmHg increase in pulse pressure increases the risk for stroke by 11%, cardiovascular disease by 10%, and overall mortality by 16% (Connolly, 2014; Kaplan, 2007; Victor & Kaplan, 2007). The blood pressure ranges by Joint National Committee (JNC) 8 2014, are as follows:
<table>
<thead>
<tr>
<th>Blood Pressure Category</th>
<th>Ranges for Most Adults (systolic/diastolic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Blood Pressure</td>
<td>Systolic below 120 mmHg</td>
</tr>
<tr>
<td>(systolic/diastolic)</td>
<td>Diastolic below 80 mmHg</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>Systolic 120 - 139 mmHg</td>
</tr>
<tr>
<td></td>
<td>Diastolic 80 - 89 mmHg</td>
</tr>
<tr>
<td></td>
<td><em>(NOTE: 139/89 or below should be the minimum goal for everyone. People with heart disease, peripheral artery disease, diabetes or chronic kidney disease should strive for 130/80 or less.)</em></td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td>Systolic 140 - 159 mmHg</td>
</tr>
<tr>
<td>(Hypertension) Stage 1</td>
<td>Diastolic 90 - 99 mmHg</td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td>Systolic 160 mmHg or higher</td>
</tr>
<tr>
<td>(Hypertension) Stage 2</td>
<td>Diastolic 100 mmHg or higher</td>
</tr>
</tbody>
</table>

Source: American Heart Association (2016)

### 2.3.1 High Blood Pressure in the Elderly

According to Joint National Committee in James et al., (2014), the old adults are more likely to suffer from hypertension and Isolated Systolic Hypertension (ISH) than the young adults. According to the current guidelines on blood pressure classifications by JNC 8 (2014), ISH is defined as SBP which is greater than 140 mmHg and DBP which is less than 90 mmHg (James et al., 2014). ISH is common in the elderly because SBP is known to rise with age, whereas the DBP usually plateaus and has a tendency to drop in the elderly (Aronow, 2013). The SBP values are stronger determinants of cerebrovascular and cardiovascular diseases than DBP (Aronow, 2013). However, a too low DBP below 60 mmHg may be linked to a heightened risk of heart attack and even death (Aronow, 2013).
Isolated Systolic Hypertension (ISH) is the predominant category of untreated high blood pressure in the elderly according to the National Health and Nutrition Examination III (NHANES) in Aronow (2013). Worse still is the fact that ISH poses a significant health care concern as the target BP is very challenging to achieve by antihypertensive therapy (Aronow, 2013). However, numerous ISH studies have exhibited beneficial effects of other treatment interventions beyond drug therapy. With this discovery, cardiologists stress on the need to commence the management of ISH with lifestyle modifications similar to those used by old adults with other types of high blood pressure before antihypertensive medications (Blumenthal et al., 2010; Calhoun & Harding, 2010; European Society of Cardiology, 2013; Giuseppe, 2013; Gooneratne, Tavaria & Patel, 2011; Mundan et al., 2011; Shinde et al., 2013).

These lifestyle changes that not only assist in lowering blood pressure as part of the treatment programme but also positively affect other risk agents like obesity and diabetes, include stress coping mechanisms such as regular relaxation exercises and sleep hygiene (Blumenthal et al., 2010; Calhoun & Harding, 2010; European Society of Cardiology, 2013; Giuseppe, 2013; Gooneratne et al., 2011; Mundan et al., 2011; Shinde et al., 2013). Progressive Muscle Relaxation exercises on most days of the week for 30 minutes lower SBP by 4-9mm Hg (Aronow, 2013; Mayo Clinic Staff, 2016; National Institute for Clinical Excellence [NICE] Clinical Guidelines, 2011).

2.3.2 Blood Pressure and Sleeping in Darkness

There is growing indication that the blood melatonin rhythm plays a role in numerous cardiovascular functions including the daily variations in blood pressure (Dominguez-Rodriguez, Abreu-Gonzalez, Sanchez-Sanchez, Kaski & Reiter, 2010).
The instances when the body has unnatural reduction of melatonin have been shown to be a factor underlying cardiovascular illnesses because this hormone has antioxidant and anti-inflammatory regulatory functions (Dominguez-Rodriguez et al., 2010).

It is, therefore, recommended that the elderly make arrangements to keep their sleeping environment in total darkness and avoid bright light before bedtime by switching off all light emitting devices, using heavy curtains or black out shades, closing the blinds, or by wearing sleep masks (Fulghum, 2007; Mercola, 2012). Bright light signals the body to wake up while darkness tells the body to sleep; both of which have consequences on blood pressure (Dominguez-Rodriguez et al., 2010; Fulghum, 2007; Mercola, 2012; Siebenhofer et al., 2011).

2.3.3 Blood Pressure and Stress Management

The increase in heart rate and constriction in blood vessels during stressful situations forces production of cortisol, an acknowledged contributory factor to rise in blood pressure (Mayo Clinic Staff, 2016; McEwen, 2007). There is continuing research to decipher whether this temporary stress related blood pressure increments contribute to long term hypertension in the elderly (Mayo Clinic Staff, 2016). Nonetheless, other situations related to stress like poor sleeping habits do contribute to high blood pressure in the elderly (Blumenthal et al., 2010; Bragg, 2015; BBC News, 2013; Bruno, 2013; Calhoun & Harding, 2010; Grander et al., 2013; Lange & Born, 2011; Unbehaun et al., 2010; Ward, 2013).
At the same time, the temporary rise in blood pressure during distress in the long run exposes the old adult to potential risk of developing long term hypertension (Blumenthal et al., 2010; Bragg, 2015; BBC News, 2013; Bruno, 2013; Calhoun & Harding, 2010; Grander et al., 2013; Lange & Born, 2011; Unbehau et al., 2010; Ward, 2013). Research admits that there is a challenge in linking stress to hypertension in the elderly and studies have tried to explain this possible association through a number of ways (Mayo Clinic Staff, 2016). It is possible that worry, anxiety and depression, which are conditions associated with stress are linked to cardiovascular diseases. In addition, it is probable that hormonal surge during emotional distress causes vascular damage leading to cardiovascular conditions. It could also be that depression elicits self-destructive behavior such as lack of adherence to the treatment regime that controls high blood pressure or prevents other cardiac problems (Blumenthal et al., 2010; Bruno, 2013; Grander et al., 2013). Despite this deadlock, studies have established that the frequent dramatic increases in blood pressure in stressful situations cause significant damage to blood vessels, heart and kidneys in a similar manner as chronic high blood pressure (Calhoun & Harding, 2010; Castro-Costa, Dewey & Ferri, 2011; Lange & Born, 2011). Moreover, in the event when stress response includes ineffective management behaviors such as poor sleeping habits, the risk of hypertension is heightened (Calhoun & Harding, 2010; Castro-Costa, Dewey & Ferri, 2011; Lange & Born, 2011). Although researchers are not very sure about the link between stress and long term hypertension, it is agreed that lifestyle changes to lower physical and psychological stress are essential for improved general health, including blood pressure (European Society of Cardiology, 2013; NICE Clinical Guidelines, 2011).
The conscious sequential contraction and relaxation of muscles through PMR concomitant with deep breathing, helps in lowering blood pressure (Bonnet & Arand, 2016; Siebenhofer et al., 2011). Relaxation technique is a natural stress buster as it counteracts the effects of cortisol in the blood (Bonnet & Arand, 2016; Siebenhofer et al., 2011). Apart from the deep relaxation achieved through PMR, it also decreases systolic blood pressure by 5 mm Hg or more (Aronow, 2013). Also, the elderly can practice sleep hygiene that promotes restorative sleep which boosts the immune response thereby lowering the risk of hypertension because sleep debt tends to amplify the stressors (Leblanc et al., 2015a, 2015b). Lifestyle changes to reduce stress level in both, normotensive and hypertensive elderly should include relaxation exercises at least 3-5 times a week for thirty minutes to elicit a long term difference in reducing blood pressure (Aronow, 2013; Mayo Clinic Staff, 2016).

2.3.4 Blood Pressure and Lifestyle Changes

It is known that some antihypertensive medications deter the pineal gland from synthesizing melatonin, thus, contributing to sleep disturbances which are commonly reported by hypertensive elderly patients (Dominguez-Rodriguez et al., 2010). Conversely, the administration of this sleep hormone has been linked to a reduction in blood pressure and improved sleep quality in the hypertensive elderly (Dominguez-Rodriguez et al., 2010). There is sufficient evidence from research suggesting that replenished stores of melatonin moderates blood pressure in both, normotensive and hypertensive elderly by decreasing the resistance of the arteries to blood flow (Dominguez-Rodriguez et al., 2010).
Lifestyle changes are recommended to lower blood pressure before starting drug therapy (James et al., 2014). The first line of treatment for hypertension is identical to the recommended preventive lifestyle changes and includes sleep hygiene, dietary changes, physical exercise and weight loss (Blumenthal et al., 2010; James et al., 2014; Siebenhofer et al., 2011). These have all shown to significantly reduce blood pressure in elderly people with hypertension (Blumenthal et al., 2010; Siebenhofer et al., 2011). Their potential effectiveness is similar to using medication (Giuseppe, 2013). In hypertensive elderly, the replacement of melatonin has been reported to lower blood pressure through the reduction of catecholamine in the blood, relaxation of smooth muscle wall and because of its antioxidant properties (Dominguez-Rodriguez et al., 2010).

If hypertension is high enough to justify immediate use of medication lifestyle changes are still recommended (Giuseppe, 2013). This is where programmes, such as PMR and sleep therapy, aimed at reducing psychological stress are advocated for reducing hypertension (European Society of Cardiology, 2013; NICE Clinical Guidelines, 2011; Ospina, Bond & Karkhaneh, 2007). The unanimous conclusion drawn from research in this field suggests making extra effort in promoting relaxation responses and melatonin production which together facilitate blood pressure control (Dominguez-Rodriguez et al., 2010). Therefore, the use of sleep masks to block out all LAN that bleeds through the curtains or the ambient light in the bedroom will be beneficial in lowering blood pressure in both normotensive and hypertensive elderly (Dominguez-Rodriguez et al., 2010). In addition, the relaxation response elicited by PMR will assist in the reduction of blood pressure during stress episodes as well as in the long term (Bonnet & Arand, 2016; Ward, 2013).
The old adults with blood pressure in the normal ranges experience modest changes in blood pressure at rest or with exercise (Brown, 2013). This can be attributed to the drop in total peripheral resistance in the artery with improved elasticity of the smooth muscle in the arterial lining (Brown, 2013). Reduction of blood pressure by 5 mmHg can decrease the risk of stroke by 34% and ischemic heart disease by 21% (Law, Wald & Morris, 2003). It can also reduce the likelihood of dementia, heart failure and mortality from cardiovascular disease (Law, Wald & Morris, 2003). The aim of treatment should be to reduce blood pressure to <150/90 mmHg for elderly. Relaxation together with appropriate sleep routine can be highly beneficial in reducing anxiety and coping with stress-related problems if practiced routinely in daily life (Blumenthal et al., 2010; Calhoun & Harding, 2010; Mundan et al., 2011; Shinde et al., 2013).

2.4 Sleep Difficulties in the Elderly

Experts in gerontology unanimously agree that sleep inadequacy in people aged 60 years and above becomes an issue of concern. Although there is lack of agreement on the number of hours of sleep that the elderly should get every night, there is a common ground that the old adults are sleep deprived because of the changing sleep cycles with advanced aged (NSF, 2016; Smith et al., 2016). According to Carrier and Drapeau (2005), there are many reasons as to why sleep patterns may change as people age. The natural aging process is a factor that contributes to poor sleep quality as one ages (NSF, 2014). Advanced age makes it harder for the body to release melatonin hormone and other chemical messengers that help one sleep well. This means that the old adult experiences fragmented sleep and frequent night time
awakenings (Smith et al., 2016). The melatonin hormone which makes one feel sleepy is also impaired by lack of sunlight during the day, the case mostly observed in old adults (Figueiro, 2015). At the same time, the elderly become sensitive to factors such as light, noise and temperature in their sleeping environment, thus hindering sleep efficiency (NSF, 2016; Smith et al., 2016).

Advanced age is characterized by higher prevalence of sleep disorders such as Obstructive Sleep Apnea, Restless Leg Syndrome, insomnia and prostrate conditions all of which contribute to inadequate sleep (Leblanc et al., 2015a, 2015b; Mihai & Noor, 2010; Unbehau et al., 2010). These sleep disorders, compounded by increased incidences of neurological disorders like Parkinson’s disease and stroke, affect parts of the brain controlling sleep (Leblanc et al., 2015a, 2015b; Mihai & Noor, 2010; Unbehau et al., 2010). In addition, some medical conditions like arthritis induce chronic pain. The side effects of the medication could affect the duration and quality of sleep (NSF, 2016; Smith et al., 2016). Other conditions such as asthma, diabetes, osteoporosis, nighttime heartburn, post-menopause and Alzheimer’s also disrupt restful sleep (NSF, 2016; Smith et al., 2016).

It has been proposed that stress significantly increases the vulnerability of the sleep-wake cycle in the aging population (Bonnet & Arand, 2016; Figueiro, 2015; Mihai & Noor, 2010). Old adults are affected differently by various stressors like bereavement, retirement, physical inactivity, change of environment and surroundings as it happens with institutionalization, medical conditions and weighty life changing events (Olum, 2014; Rueggeberg et al., 2012; Smith et al., 2016). The anxiety and depression associated with these stress inducing factors make it difficult
for the old adult to fall asleep (Rueggeberg et al., 2012; Smith et al., 2016). At the same time, the loss of functional capacity makes the elderly more prone to sedentary lifestyle that reduces their need for sleep most of the time (Rueggeberg et al., 2012; Smith et al., 2016). Regardless of the outcome, lack of exercise is a hindrance to a good night’s sleep (Blumenthal et al., 2010; Giuseppe, 2013; Leblanc et al., 2015a, 2015b). It is, therefore, noteworthy that the most common reasons for sleep problems in this population are poor sleep habits, pain, medical conditions, medication, lack of exercise, stress and emotional disorders (American Psychiatric Association, 2008; Canadian Sleep Society, 2005).

2.4.1 Dangers of Poor Sleep Quality

It is evident that sleep is just as important as water and food. During sleep and rest, the body reinvigorates and rejuvenates as body cells are regenerated (NSF, 2016). There is compelling research showing that when the body is habitually exposed to impaired sleep in old age, there is an increased vulnerability and or worsening of health conditions like anxiety, depression, obesity, cardiovascular diseases, falls, accidents and balance problems (NSF, 2016).

Bonnet and Arand (2016) assert that old adults complaining of sleep difficulty should receive behavioral therapy for those specific sleep conditions that contribute to their poor sleep quality. Behavioral therapy is not only recommended, but is preferred in clinical practice as initial treatment for sleep disturbances, over pharmacotherapy options, because the latter options have a high risk of side effects particularly for the elderly (Bonnet & Arand, 2016; Qaseem et al., 2016; Schutte-
Rodin). This therapy includes interventions like sleep hygiene education and relaxation exercises that facilitate improved sleep (Bonnet & Arand, 2016). According to Neubauer (2013), any elderly person experiencing sleep problems should implement good sleep habits and keep up daily physical activity to help create an environment conducive for restive sleep.

Other recommendations for better sleep include limited drug and stimulant intake (caffeine, nicotine, alcohol), and limited fluid intake just before bed to avoid need for frequent urination (Ebrahim, Shapiro, Williams & Fenwick, 2013). According to Figueiro (2015), Mihai and Noor (2010) and Engle-Friedman, (2014), the elderly are advised not to go to bed hungry, to avoid spicy foods prior to sleeping and to create an optimum environment for sleep (quiet and dark room in comfortable ambient temperature). In addition, they should adapt a regular sleep-wake cycle and sleep a sufficient number of hours every night, to diminish worries at bedtime as much as possible, to be active, eat well and exercise (good health is strongly associated with good sleep), and avoid eating too much or exercise near bedtime (Canadian Sleep Society, 2005; Healthwise Staff, 2015; Neubauer, 2013).

Sleep psychologists and physiologists frown on untreated chronic sleep disturbances in the elderly. They further warn that in the event that the complaints are not managed appropriately, they become potential risk factors for physical, psychological and social consequences (Bragg, 2015; Calhoun & Harding, 2010; Castro-Costa et al., 2011; Lange & Born, 2011). These include body ache, fatigue, depression, irritability, over-eating, decreased quality of life, cognitive impairment, substance abuse (alcohol) to fall asleep at night or to stay awake during the day.
(drinking coffee and smoking), reduced ADLs (Blumenthal et al., 2010; Bruno 2013; Grander et al., 2013). These consequences further complicate the association between poor sleep, stress and blood pressure (Bonnet & Arand, 2016).

2.4.2 Sleep and Darkness

The sleep/wake cycle is controlled by a group of cells that react to light and dark signals found in the hypothalamus referred to as the Suprachiasmatic Nucleus (SCN) in the brain (Dvorsky, 2014). At night when there is darkness, the eyes send a signal to the pineal gland in the brain to produce melatonin hormone, which is the sleep hormone brain (Dvorsky, 2014; Fulghum, 2007; The Alternative Daily, 2016). This hormone is responsible for regulating the sleep/wake cycle by slowing the metabolism, lowering the blood pressure, glucose levels and body temperature which are essential factors in promoting a good night’s sleep (Bonnet & Arand, 2016; Dvorsky, 2014; Fulghum, 2007; Healthwise Staff, 2015; Stevens, 2015; The Alternative Daily, 2016).

On the other hand, when the eyes sense light at sunrise or due to LAN, the optic nerve conveys a signal to SCN informing the brain that it is time to rise up (Dvorsky, 2014). The melatonin hormone drops dramatically and the body is signaled to wake up (Dvorsky, 2014; Stevens, 2015). Over and above the signal to wake up, this signal elicits other increased physiological processes like blood pressure, glucose levels and cortisol levels (Dvorsky, 2014; Stevens, 2015). These physiological reactions are relatively low at night enabling the elderly to sleep restfully and they spike during the day to allow for stabilized energy levels in the
performance of ADLs (Figueiro, 2015; Mihai & Noor, 2010; Shinde et al., 2013). However, these natural occurrences in the body become disrupted when the sleep/wake cycle is interfered with by environmental factors like exposure to bright light at night or lack of it during the day (Dvorsky, 2014; Figueiro, 2015). Light At Night unnaturally raises the level of stress hormones (cortisol) at night thereby disrupting sleep (Bonnet & Arand, 2016; The Alternative Daily, 2016).

To counteract this problem, the sleeping environment should ideally be kept in absolute darkness by promoting sleep hygiene like use of sleep masks or blackout curtains that encourage total and continuous darkness (Bonnet & Arand, 2016; Dvorsky, 2014; Fulghum, 2007; Healthwise Staff, 2015; The Alternative Daily, 2016). The removal of artificial sources of LAN means that there is no optic sensation to the SCN enabling the body to secrete the much needed melatonin hormone (Bonnet & Arand, 2016; Dvorsky, 2014; Fulghum, 2007; Healthwise Staff, 2015; The Alternative Daily, 2016).

2.4.3 The Role of Sleep Masks in Sleep Hygiene

Researchers in sleep studies have identified an assortment of practices and routines referred to as “sleep hygiene” that assists in promoting restorative sleep in the elderly. Sleep hygiene is a term used to refer to interventions that make sleep a nightly reality by improving and maintaining it. Sleep therapists affirm that the only way for the elderly to improve their sleep quality is by adhering to sleep hygiene through stress management, appropriate sleep environment modification as well as a wise choice of healthier daytime habits (Bonnet & Arand, 2016; Engle-Friedman,
2014; Johansson et al., 2011; Leblanc et al., 2015a, 2015b; Smith et al., 2016). One practical measure for inducing relaxed sleep is for the elderly to limit the use of sleeping pills as they have side effects. Ideally, sleeping pills are only recommended for a short term (Qaseem et al., 2016; Smith et al., 2016).

These sleeping aids do not treat the root cause of sleep problems and can even exacerbate the situation in the long haul (Qaseem et al., 2016; Smith et al., 2016). Regular relaxation exercise also contributes to a good night’s sleep because it triggers the release of chemicals in the body that facilitate refreshing sleep (Blumenthal et al., 2010; Smith et al., 2016; Unbehaun et al., 2010). Relaxation prepares the body for a refreshing sleep as it diffuses the daily stress which disrupts sleep at night (Blumenthal et al., 2010; Smith et al., 2016; Unbehaun et al., 2010).

Lastly, the elderly can promote adequate sleep by naturally boosting the body’s melatonin levels (Figueiro, 2015; Obayashi et al., 2013). This could be done by switching off all artificial light sources at night before bed and or the use of a sleep mask to block out all seeping light rays into the eyes (Figueiro, 2015; Mercola, 2012). Melatonin hormone regulates the relationship between light and darkness; day and night (Figueiro, 2015; Obayashi et al., 2013). When the sun sets, the body begins to secrete melatonin as the first signal to sleep and the individual starts feeling drowsy (Figueiro, 2015; The Joint Chiropractic, 2016). Gradually, the level of the hormone increases, with a darkened bedroom further fostering better chances for a healthy rest and a promising good health in the long term (Figueiro, 2015; The Joint Chiropractic, 2016). Ideally, the elderly should sleep in darkened bedrooms because when they are exposed to all night long artificial light sources, there are
negative effects on their natural sleep cycle (Dvorsky, 2014; The Alternative Daily, 2016). Research emphasizes that exposure to room light prior to bed time as well as during sleep hours decreases melatonin duration significantly by 90 minutes (Dvorsky, 2014; The Alternative Daily, 2016). Artificial sources of LAN that pierce through bedroom darkness could be from security lights, street lamps, alarm clocks, mobile phones, passing headlights and hall way lights (Bonnet & Arand, 2016; Engle-Friedman, 2014; Figueiro, 2015; Mihai & Noor, 2010; Shinde et al., 2013).

In the Alternative Daily (2016), it has also been noted that a bedroom that has too much light at night makes true darkness, paramount in the lives of the elderly, impossible. This results in altered melatonin regulation and synthesis (The Alternative Daily, 2016). This is because LAN works as a drug disrupting the circadian rhythm and interfering with sleep/wake cycle which is the body’s natural clock (Dvorsky, 2014). A state of absolute darkness in the bedroom is important to the sleep wake cycle because when the sun sets and darkness sets in, the body automatically secretes more of the melatonin hormone (Dvorsky, 2014; Wilson, 2016). This hormone signals to the body that it is time to sleep and in the event this craving is hampered, the “fight-flight” stress mechanism is activated. In the morning when the sun rises, the level of melatonin reduces in the body signaling the body to awaken (The Alternative Daily, 2016).

Chronic exposure to artificial lighting at night whether dim or bright, deprives the body its ability to synthesize melatonin leading to grave health concerns because stress response suppresses the immune system (Dvorsky, 2014; The Alternative Daily, 2016). Inadequate sleep (less than seven to eight hours) in the short term will
lead to irritability, lack of concentration, visual and auditory hallucinations, impaired mood and learning, depression, facial wrinkles and acne. In the long term, there is a heightened risk of obesity, cardiovascular diseases, Alzheimer’s disease and cancer (Benson et al., 2008; Dvorsky, 2014; Kessler et al., 2011; Schoenborn et al., 2013; The Alternative Daily, 2016).

The interventions employed in sleep hygiene education include modification of the bedroom environment by reducing stimuli in the form of sleep masks to reduce ambient light and relaxation exercises (Hartescu et al., 2015; Stepanski & Wyatt, 2003). According to Bonnet and Arand (2016) and Espie (2011), sleep masks are one of the simplest and most effective tools that can be used to overcome sleep problems and obtain restful sleep by gaining the ability to fall and stay asleep. Sleep masks are devices applied during sleep hygiene behavioral therapy (Kyle, 2014). They are made of fabric intended to cover both eyes, with an elasticized strap that holds the mask on the head (Kyle, 2014). They are designed to keep all incoming light spilling through the curtains away from eyes and to induce a state of absolute darkness (Kyle, 2014). When the brain senses pure darkness, it signals the production of melatonin, the chemical of sleep (Espie, 2011). The quality and quantity of sleep is severely affected by the absence of true and continuous darkness which hinders the night hormone from being produced (Wilson, 2016).

According to Fulghum (2007), the principal factor affecting melatonin is light which inhibits the secretion of this hormone whereas darkness has the opposite effect, resulting in signaling the pineal gland to increase melatonin secretion. The light acts like a drug because melatonin production is stimulated by darkness and suppressed
by light, which is why the levels should be highest just prior to bedtime (Dvorsky, 2014). This perfectly orchestrated system allows the individual to fall asleep when the sun sets and awaken refreshed at sunrise, while providing potential anti-aging and disease-fighting benefits (Dvorsky, 2014; Mercola, 2012). The body produces optimal levels of melatonin under two conditions—enough darkness at night that activates the pineal gland and just as importantly, exposure to brilliant light (ideal sunshine) during the day suppressing its production (Dvorsky, 2014; Kyle, 2014).

Unfortunately, many old adults obtain very modest sunlight during the day because incapacity may keep them indoors all day (Stevens, 2015). It is this combination that actually causes the body to produce healthy levels of melatonin (Dvorsky, 2014; Fulghum, 2007). According to Bonnet and Arand (2016), Ebrahim et al., (2013), Qaseem et al., (2016) and Unbehaun et al., (2010), the worrying trend is that sleep has been greatly delayed by invasion of the night with people trying to manipulate the body clocks with stimulants and sedatives. Caffeine and nicotine keep people awake while alcohol and hypnotics counteract them when sleep is desired (Bonnet & Arand, 2016; Ebrahim et al., 2013; Qaseem et al., 2016 and Unbehaun et al., 2010).

An elderly person’s inability to sleep is a clear signal of disruption in melatonin production (Mercola, 2012). Such a person should ensure total darkness at bedtime by use blackout drapes and or a sleep mask; and also by turning lights off (Mercola, 2012). Even very small amounts of light, such as the glow from a clock radio, dimmed lights or streetlights shining through the bedroom window, can disrupt melatonin production (Dvorsky, 2014; Espie, 2011; Kyle, 2014; Mercola, 2012). If, however, the senior adult has made the necessary changes to the sleep routine and
still having trouble sleeping, melatonin supplement may be helpful as this can effectively and safely restore balance to the body's circadian rhythm (Fulghum, 2007; Mercola, 2012). Bonnet and Arand (2016) state that once older adults have successfully recovered from poor sleep quality through behavioral therapy (sleep hygiene and relaxation) they exhibit reduced daytime sleepiness, improved daytime functioning and quality of life with reduced co-morbidities.

2.4.4 Measuring Sleep Quality in the Elderly

The elderly are required to sleep between seven to nine hours each night. Nevertheless, the elderly are reminded that the most meaningful way in sleep evaluation is by how one feels in the morning (NSF, 2016). The best indicators of poor sleep are waking up feeling fatigued or feeling tired during the day (Smith et al., 2016). Sleep therapists’ advice the elderly on the importance of familiarizing themselves with their sleep patterns for effective and appropriate management of sleep needs (Figueiro, 2015, NSF, 2016).

The information accrued from sleep evaluation tools assist in initiating sleep as a tool to increase productivity and help the older adult in treating the sleep problem (Healthwise Staff, 2015). This assessment of sleep patterns over a number of weeks can be achieved using a sleep diary and where more advanced diagnosis is warranted, a Pittsburgh Sleep Quality Index (PSQI) is used for the assessment (Healthwise Staff, 2015). These tools while tracking the elderly’s sleep patterns, reveal underlying root cause of insomnia, and therefore, can help in the diagnosis of sleep problems for further treatment and appropriate management (Sayed & Gehan, 2014; Smith et al., 2016).
2.5 Other Related Studies

Sheu et al., (2003) conducted a study in Taiwan that examined the effect of PMR on blood pressure and psychosocial status in clients with essential hypertension. The study, which used a quasi-experimental design, involved 40 subjects from a hypertension outpatient clinic. Twenty subjects received PMR training once a week and practiced at home daily for 4 weeks. The training had an immediate effect, reducing pulse rate by 2.35 beats/min, systolic blood pressure by 5.44 mmHg, and diastolic blood pressure by 3.48 mmHg. After 4 weeks of PMR training, further decreases in pulse rate (2.9 beats/min), systolic blood pressure (5.1 mmHg), and diastolic blood pressure (3.1 mmHg) occurred. PMR significantly lowered patients' perception of stress, and it enhanced their perception of health. The study concluded that PMR is beneficial for patients with essential hypertension, and nurses may use it to enhance their independent function as well as their quality of life.

Schneider, Alexander, Staggers and Orme-Johnson (2005) tested the short-term efficacy and feasibility of two stress education approaches in the treatment of mild hypertension in older African Americans. This was a randomized, controlled, single-blind trial with 3 months of follow-up in primary care. Among the 213 African American men and women screened, 127 individuals (aged 55 to 85 years with initial diastolic pressure of 90 to 109 mmHg, systolic pressure of < or = 189 mmHg, and final baseline blood pressure of < or = 179/104 mmHg) were selected.

Mental and physical stress reduction approaches (Transcendental Meditation and Progressive Muscle Relaxation) were compared with a lifestyle modification education control program and with each other. The primary outcome measures
were changes in clinical diastolic and systolic pressures from baseline to final follow-up. The secondary measures were linear blood pressure trends, changes in home blood pressure and intervention compliance. Adjusted for significant baseline differences and compared with control, Transcendental Meditation reduced systolic pressure by 10.7 mmHg (p < .0003) and diastolic pressure by 6.4 mmHg (p < .00005). Progressive muscle relaxation lowered systolic pressure by 4.7 mmHg (p = .0054) and diastolic pressure by 3.3 mmHg (p < .02). The reductions in the Transcendental Meditation group were significantly greater than in the progressive muscle relaxation group for both systolic blood pressure (p = .02) and diastolic blood pressure (p = .03).

Hamidizadeh et al., (2005) conducted a quasi-experimental research to evaluate efficacy and feasibility of PMR on blood pressure of elderly subject with mild and moderate hypertension residing at Kahrizak Charity Foundation for elderly. In the study, fifty five hypertensive elderly men and women (27 experiments and 28 controls) were randomly studied. Data was collected using a client demographic questionnaire, checklist of BP and recorder, sphygmomanometer and stethoscope. For the experimental group, relaxation was performed in 20 minutes sessions, three times weekly for 6 weeks then calculated and compared with that of control. The Mann-Whitney test showed that SBP and DBP in the both groups before the intervention at pre-test was similar (p < 0.05).

The same test indicated that at post-test, the blood pressure means were significantly different between both groups (p < 0.05). Wilcoxon test also showed a significant difference in decline of blood pressure after the intervention (p < 0.05) in the
experimental group. When the results were compared with those of the control group, the hypothesis was accepted. Consequently, the study concluded that Progressive Muscle Relaxation (PMR) reduces the blood pressure in subjects practicing this program.

In a study on the effect of bedside light on the sleep quality of healthy sleepers by Cho, Joo, Koo and Hong (2013), it was established that unnecessary LAN may contribute to health problems. This experimental study investigated how all night long bedside light could disrupt the quality of sleep in 20 healthy sleepers. The control and experimental groups had 10 individuals in each where the former slept with lights off and the latter with lights on. The results concluded that LAN causes poor sleep in terms of depth as well as fragmentation. In addition, exposure to light at night interferes with brain activity particularly in the control of the quality and quantity of sleep.

A cross sectional analysis on effect of LAN on depression in the general elderly population was conducted by Obayashi et al., (2013). The investigators measured the intensities of the light sources present in the sleeping environment of 516 elderly participants, their daylight exposure as well as melatonin excretion in the urine during the night. The results concluded that chronic exposure to bright light in the home setting was significantly associated with depression. The researchers further recommended that based on their findings, the affinity for depression in the elderly may be lowered by ensuring total darkness in the bedroom when sleeping.
Kumutha et al., (2014) employed a pre-test and post-test control group design to assess the effects of PMR on stress levels and blood pressure in hypertensive elderly in India. The sample included 60 elderly with hypertension whose stress levels were evaluated using a Perceived Stress Scale (PSS) questionnaire and the blood pressure measured with a sphygmomanometer. The PMR programme was administered on the experimental group for three weeks. The results showed that there were considerable variations in the stress and BP measures when the post-test values were compared with those at pre-test. The researchers concluded that PMR exercises were beneficial to the hypertensive elderly as the programme led to the reduction of stress and blood pressure.

Sayed and Gehan (2014) investigated the effect of PMR on sleep quality of patients undergoing hemodialysis. The study adopted a quasi-experimental research design. Purposive sampling method was used to select 42 patients being treated with maintenance hemodialysis in Shahid Beheshti University of Medical Sciences. Sleep quality of samples was assessed by Pittsburgh Sleep Quality Index (PSQI). Progressive muscle relaxation was carried out in three sessions. They were also asked to do relaxation practice for a month, twice a day (once during the day and once before going to bed at night), and fill in the relaxation form after each practice. Afterwards, sleep quality of patients before and after relaxation were compared. Mean of samples’ sleep quality total score after relaxation was significantly lower than before relaxation (p < 0.001). The score of each sleep quality dimension (except for use of sleep medications) were significantly lower than before relaxation.
2.5.1 Summary of Related Studies

In their studies, Hamidizadeh (2005), Kumutha et al., (2014), Sayed and Gehan, (2014), Schneider et al., (2005) and Sheu et al., (2003) focused on PMR as an intervention measure in managing hypertension and/or stress levels. However, none of them tested the efficacy of PMR on both the physiological and psychological variables with focus on contribution of change to sleep patterns during reducing light intensity; and its influence on blood pressure and stress scores. This observation formed the basis of the current study which addressed the effect of PMR not only on blood pressure and stress levels, but also its effect on the sleep quality.

The present study did not come across any research on elderly that evaluated the effect of both PMR exercise and sleep environment modification on either blood pressure, stress level or sleep quality. Yet, studies such as those by Cho et al., (2013), Kumutha et al., (2014), Obayashi et al., (2013), Sayed & Gehan, (2014), Schneider et al., (2005) and Sheu et al., (2003) have recommended on further exploration on the effect of intervention on the three variables because of their close association. Moreover, studies on sleep in the elderly encourage the use of combined behavioral therapy in terms of sleep hygiene which cuts across relaxation techniques and methods of creating a sleep environment conducive for sleep. Therefore, the present study went further to determine whether sleep hygiene affected all the three variables.

the treatment was initiated once a week with home practice sessions. Schneider et al., (2005) exposed the test subjects to a randomized, controlled, single-blind trial with 3 months of follow-up in primary care, in an inner-city health center. Hamidizadeh et al., (2005) performed a 20-minute session three times a week for a span of six weeks while Sayed and Gehan (2014) employed three sessions of 30 minutes training then relaxation practice for a month, twice a day (once during the day and once before going to bed at night). Since there appeared to be no agreeable period as to how long PMR should be practiced to observe long term or short term effects, the present study reached a consensus period from vast studies on training adaptations and engaged the research participants to a two month period of PMR practiced over three sessions every week for 40 minutes. At the same time, for better comparison, the above studies guided the present study in to evaluating the effects of the treatments at two stages (at four and eight weeks).

Sayed and Gehan (2014) and Sheu et al., (2003) focused on a cross-section of individuals who visited the hypertension outpatient clinic once a week and therefore PMR was done then in addition to home participation. Additionally, their study assumed that the patients would actively engage in PMR training on a daily basis at home for the 4 weeks. Due to the nature of the elderly in relation to memory lapses and laxity, PMR in the current study was engaged in for a period of two months, three sessions weekly under the watch of the researcher. Furthermore, it is often a challenge for hypertensive elderly to find their way to hypertension clinics and therefore this study took place at their accustomed environment where they were less physically and emotionally guarded with a provision of resident nurse.
Hamidizadeh et al., (2005) and Schneider et al., (2005) assessed the efficacy of PMR as a stress reduction approach with reference to hypertension but did not relate this to stress index. This observation provided the basis for the current study for focusing on a stress reduction approach and establishing its effectiveness in stress management among older persons with or without hypertension. In the present enquiry however, stress index and sleep quality were evaluated and compared to PMR prior to and after the intervention. This study differed from it in that, both stress and hypertension were investigated. In regard to research instruments, studies by Kumutha et al., (2014) and Sayed and Gehan (2014) provided the current study with a structural framework in employing standardized tools. The Perceived Stress Scale (PSS) and Pittsburgh Sleep Quality Index (PSQI) used in the two studies allowed the researcher in the current study to assess stress levels and sleep quality in the elderly using validated and reliable instruments.

From the in depth analysis given above, the present research addressed the apparent gaps identified in the mentioned studies as presented. In addition to this analysis, all the cited enquiries were carried out in other countries other than Kenya and therefore the findings could not be an adequate reference point for the elderly Kenyans. Therefore, the results of the current study provided a more indigenous research that could make recommendations and suggestions specific to Kenya’s older persons.
CHAPTER THREE: METHODOLOGY

3.1 Research Design

This study adopted the experimental pre-test post-test control group design. The design also manipulated combined interventions having randomly assigned the research respondents to either a control or experimental group. This design allowed for prediction of phenomenon in order to improve lives (Blackstad, 2008) and thus it permitted the researcher to evaluate the physiological and psychological indices of stress, measured from both groups at pre-test, mid-test (four weeks) and post-test (eight weeks). The responses prior, during and after treatment were used to determine changes arising from an eight week period of PMR exercises and sleep environment modification intervention programme.

3.2 Measurement of Variables

The independent variables were PMR exercises and use of sleep masks which were jointly used as treatment to predict their effect on dependent variables of blood pressure measures, stress index and sleep quality. The identified intervening variables were the use of sleep and hypertension medication, day time exposure to sun as well as alcohol consumption.

3.3 Location of the Study

The study was carried out in Nairobi County, Nairobi City represents the current urban elderly population increase as cities continue to attract a large influx of migrants from rural areas, causing urban growth to remain high (Ezeh, Chepngeno, Abdhalah & Zewdu, 2006).
According to HelpAge Kenya (2014), a non-governmental organization that affiliates with Long Term Care Facilities (LTCF) across the country, Nairobi County has five homes - Little Sisters of the Poor (Nyumba ya Wazee) in Kasarani, Cheshire Home for the Aged in Kariobangi, Mother Mercy Home in Kariobangi, Mji wa Huruma in Runda and Missionaries of Charity in Dandora.

The study purposively sampled Mji wa Huruma home hosting 48 residents. The availability of an onsite hospital in case of any emergency, a residential nurse and a high number of residents who met the inclusion criteria were the reasons for this choice of the home. In addition, the positive response received from the home administrators allowing the study for research purposes also contributed to its selection.

Apart from Mji wa Huruma which is run by Nairobi City Council, the other four homes are run by missionaries and charitable institutions. The main aim of these LTCF’s is to provide physical, mental, spiritual and social support to the elderly.

3.4 Target Population

All 48 elderly male and female residents aged 60 years and older at the Mji wa Huruma home constituted the target population.

3.4.1 Inclusion Criteria

The research included only those residents in Mji wa Huruma who met the following criteria:
i. Were at least 60 years old

ii. Able to follow instructions in Swahili or English languages

iii. Capable of giving informed consent and of sound mind

iv. Capable of wearing the sleep masks throughout the duration of sleep

v. Physically capable of performing the muscular relaxation exercises as prompted.

A baseline survey was conducted to determine the inclusion criteria where the age and cognitive faculties of the elderly were confirmed from the records kept by the home administrator. The home administrator was also sought for surrogate consent where necessary. The other items were clarified by the resident nurse and the home administrators.

3.4.2 Exclusion Criteria

The researcher excluded individuals who were cognitively impaired or too frail to carry out simple instructions on muscle relaxation exercises and use of sleep masks.

3.5 Sampling Technique

Mji wa Huruma home for the elderly was purposively selected owing to its unique status in having a resident nurse, onsite hospital as well as the research approval given by the home administrators. The presence of a resident nurse was paramount because the clinician assisted in identifying the sample as well as in collecting data. In addition, the nurse was also on standby in case of emergency with the participants.
3.6 Sample Size

In effect, of the 48 residents, two failed to meet the inclusion criteria. Therefore, the remaining 46 residents constituted the sample size. These 46, who met the inclusion criteria were randomly assigned to either the Experimental group (23 participants) or Control group (23 participants).

3.7 Research Instruments

In order to achieve the objectives of the study, a PMR protocol sheet (Appendix F) was employed together with a stopwatch to implement the PMR technique. The protocol contained prompts for the sequential relaxation/tension of sixteen muscle groups, while being aware of the differences between the two states. This protocol has standardized and validated procedures of a classic muscle relaxation program by Jacobson (Field, 2009). There is extensive empirical evidence demonstrating the efficacy of relaxation exercise in improving stress, hypertension and sleeping patterns among the elderly (Lichstein & Riedel, 2006).

Data on self-report measures of sleep and stress index was collected using the Perceived Stress Scale (PSS) (Appendix G) and Pittsburgh Sleep Quality Index (PSQI) (Appendix J) respectively. These questionnaires were also translated into Swahili for better communication with the research participants. The stress and sleep questionnaires accrued a global score for all the itemized questions. The PSQI is commonly used to quantify monthly sleep in older adults whose internal consistency reliability and construct validity measures have been comprehensively evaluated for their psychometric value in older persons (Spira et al., 2012). It is an effective
instrument used to measure the quality and patterns of sleep in the older adult. It differentiates “poor” from “good” sleep by measuring seven components. Scoring of answers is based on a 0 to 3 scale, where 3 reflect the negative extreme on the Likert scale. A global sum of “5” or greater indicates a “poor” sleeper (Smyth, 2012). The PSS is a short and easy-to-use questionnaire with established acceptable psychometric properties in comparative studies (Eun-Hyun, 2012).

An adapted sleep diary (Appendix K) of Morin (2003) was used to record data on participant’s sleep/wake activity by the caregivers for two weeks as recommended by Mihai and Noor (2010). It is a practical and economical instrument, frequently used in the sleep research (Lichenstein & Riedel, 2006). The sleep diary includes information regarding bedtime, wake time, the number of awakenings during the night, time spent asleep, time spent exposed to sunshine during the day, as well as any sleeping medication and/or amount of alcohol that the subject may be consuming.

The physiological variables were measured using a Digital Automatic Blood Pressure Upper Arm monitor (OMRON M2 MODEL) (Appendix H). Readings from the Omron M2 fulfill the ESH international protocol and its 2010 revision requirements and therefore, the device can be used for blood pressure measurements (Jirar et al., 2011). Blood pressure readings were logged onto a Blood Pressure Record (Appendix I) by the resident nurse. The record sheet was also used to capture data on any hypertensive medication that the subject was taking.
All questionnaires used were standardized tools with established validity found to have good internal consistency and reliability in a variety of geriatric populations (Eun-Hyun, 2012; Spira et al., 2012). These tools originally in English were translated into Kiswahili (Appendices G, J and K) and then back-translated to ensure accurate translation of the measures.

3.8 Recruitment and Training of Research Assistants

The investigator recruited the home’s resident nurse and six caregivers as research assistants to assess blood pressure, sleep quality and stress level measures of the research participants.

The nurse, who was a clinician, was already trained and experienced in assessing and recording BP. The principal investigator and the medical practitioner collaborated in interviewing the participants and in scoring the questionnaires on both stress indices and sleep quality.

The six caregivers were trained on how to use the sleep diary to enter the items as observed or reported by the research subjects. They were also shown how to tie the sleep masks on the individuals in the intervention group in case the subjects needed help in doing so. The investigator also recruited two instructors with more than five years in administering PMR to oversee the exercise sessions in the study group.
3.9 Pre-testing of Research Instruments

Pretesting of the instruments was done to train research assistants on data collection procedures noting that the validity of the instruments had been ascertained and documented.

3.10 Pilot Study

The pilot study was carried out for a week using ten elderly citizens who were purposively selected from the Community Outreach Programme at Mji wa Huruma and who were not involved in the study.

3.11 Reliability of Research Instruments

During the pre-testing, the test re-test method was used to determine the reliability of the instruments. According to Kothari (2004), a research instrument is reliable if it yields consistent results over a period of time. A time lapse of two weeks was given between the first and second administration of the instruments. The two sets of data were correlated using the Pearson’s product moment correlation to assess the questionnaires reliability which showed a significant correlation ($r = 0.82$). The instruments were also discussed and critiqued by the supervisors to ensure clarity and adequacy of the research tool items. The researcher used the suggestions to improve the research tools and ensure content validity. Since these tools were found to be reliable, they were used further to proceed with the data collection to the study.
3.12 Data Collection Procedures

Subsequent to enrollment, the researcher arranged mutually agreeable date and time to meet the participants for screening and establishing pre-test assessment scores on both, physiological and psychological variables. During the meeting, PSS and PSQI questionnaires were administered to the experimental and control group in the form of an interview set-up by the investigator and the medical physician.

The PSQI includes a scoring key for calculating a subject’s 7 sub scores, each of which can range from 0-3. The sub-scores are tallied, yielding a ‘global’ score that can range from 0 to 21. A global score of 5 or more indicates poor sleep quality, the higher the score, the worse the quality of sleep of the person (Smyth, 2012). The Perceived Stress Scale has 10 items rated on a 5-point likert scale where scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items. The ratings are summed up with higher scores indicating more perceived stress. Scores around 13 are considered average.

Blood pressure readings were taken by the resident nurse following a 5-minute rest period while the participant was seated comfortably. The left arm used was relaxed, uncovered and supported at the level of the heart. An adjustable cuff was used for an arm circumference 27 to 34cm ‘adult’ cuff 16 x 30cm. The blood pressure was measured at least 2 times within one test period and averaged for a final score in accordance to the protocol by the American Heart Association (AHA, 2016). The readings were then logged in the blood pressure record. The participants were encouraged to be relaxed before being tested.
The participants were issued with sleep masks and instructed on how to use them at bedtime as blindfolds during the intervention period under the supervision of caregivers enlisted as research assistants. In addition, sleep diaries were issued to the research assistants to monitor and assess all the participants on a daily basis throughout the entire study period for measures of patterns and quality of their sleep. All participants were evaluated within 48 hours before and after the intervention.

Participants in the experimental group were assigned to an organized eight week group therapy of PMR programme engaged by the researcher and PMR instructors. Unbehaun et al., (2010) explain that the effectiveness of a combination therapy of relaxation activities has been upheld over the years. The PMR intervention included a total of 24 sessions, held three times a week; each for duration of 40 minutes. This technique involved systematically relaxing the major muscle groups of the body with the goal of physical and mental relaxation.

The PMR technique consisted of two processes namely tensing and relaxing of muscle groups, tensing for five seconds and relaxing for 10 seconds. The first session included an introductory group discussion about stress and the participants were taught how to relax and contract 16 muscle groups as shown in Appendix F. The participants lay down or sat up, comfortably covered with a warm blanket, closed their eyes and assumed a serene demeanor as instructed in the PMR protocol (Appendix F). Thereafter, only group PMR sessions were performed. Classes for the programme were scheduled at the same time in the morning (9-12 pm) and in similar settings (therapy room). Studies advocate daytime physical exercise as opposed to relaxation before bedtime, since near bedtime may lead to excitation depending on
the intensity, and increase sleep-onset latency (Leblanc et al., 2015a, 2015b). For training adaptation to occur, a consistent and sustained stimulus needs to be introduced consistently at least 30 minutes, 3-4 days per week (Connolly, 2014).

The participants in the control group were encouraged to follow their daily routine activities which included taking regular medication, regular BP checking and dietary management and not to begin any new exercise program. The participants however were compensated and received same PMR and sleep environment modification interventions for two months after completion of the study.

The interventions were delivered by the same set of instructors who had experience in PMR training. To avoid data bias, care was taken to ensure that PMR and use of sleep masks for the experimental group was the only content of the group sessions for the PMR group. All the intervention research assistants were instructed not to personally influence either by encouraging or discouraging the participants beyond intended interventions.

These therapeutic sessions were led by the researcher and research assistants for two months during which ongoing BP measures, stress and sleep quality indices were assessed after a month in both the control and experimental groups. Subsequently, after two months treatment period, post-test was administered using the same stress and sleep index questionnaires to the test and control group. Physiological variables were reassessed using the same research instruments after intervention. These post-test assessments were done within 48 hours after the intervention period.
3.13 Data Analysis and Presentation

Data was processed and organized for analysis using the Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics were used to describe and synthesize data. The data was summarized using frequency distribution, percentages, means, and standard deviations; and presented in tables. Inferential statistics was used to analyze the collected data. For continuous variables, all values were expressed as mean ± SD. Repeated measures ANOVA and Post Hoc (Scheffe’s Confidence Interval) tests were done to test for differences in stress level, blood pressure and sleep quality scores. In addition, multiple linear regression was calculated to predict the duration for normalcy of the three variables on all the participants. A $p$ level of $\leq 0.05$ was considered to be statistically significant.

3.14 Logistical and Ethical Considerations

Soon after the research proposal was accepted by the Graduate School, the researcher sought ethical approval from the Kenyatta University Ethics and Review Committee to conduct the study. This was followed by the application for a research permit from the National Commission for Science, Technology and Innovation (NACOSTI).

Further, an introductory letter and an informed consent form (Appendix L and Appendix N respectively) to the administrators of the home including Nairobi City County, and the elderly sought permission for the use of premises and research participation respectively.
During initial meetings with the participants, the researcher established rapport with the study participants by explaining the purpose of the study and what was expected from them. The informed consent form (Appendix N) was distributed and read out to the participants and signed or thumb printed by the individuals and then collected by the researcher and research assistants. Thereafter, 46 participants who met the inclusion criteria volunteered and gave consent to participate in the study. They were then assigned to either the experimental group or the control group. Necessary arrangements on data collection were discussed and followed as depicted in appendices F and H for research protocol on PMR and Blood Pressure taking procedures with the research assistants.

Emergency measures taken during the study involved the services of a resident nurse on call at the home for the elderly. The nurse was requested to be present during the pre-testing, relaxation sessions, mid-testing and post-testing as well as in the absence of the researcher throughout the intervention period in case of any unforeseen eventuality.
CHAPTER FOUR: FINDINGS

4.1 Demographic Profiles of the Elderly

The study recruited participants from the residential target population of 48 (26 males and 22 females) elderly in Mji wa Huruma home for the aged. In this target population, two participants (male) did not meet the inclusion criteria due to cognitive impairment and frailty and were therefore excluded from the study.

Of the elderly residents who met the inclusion criteria, 46 (24 males and 22 females) were randomly distributed to the experimental or control group comprising of 23 (12 males and 11 females) and 23 (12 males and 11 females) participants respectively. It is the 46 (95.8%) participants that made up the sample size and were set for investigation throughout the two months study period.

After the baseline assessment, there was a drop-out in both study groups with one participant (female) dropping out from the experimental group and two participants (one male and one female) dropping out from the control group. The reason for drop out was the participants leaving the home due to unavoidable circumstances. A total of 43 (93.5%) participants completed the intervention period successfully and the data obtained analyzed accordingly.
Figure 4 displays demographics of the study population in Mji wa Huruma.

46 Participants Randomized

**Target Population:**
48 residents

- 26 Males:
  - 2 excluded (7.7%)
  - 24 included

- 22 Females:
  - All included

**Experimental Group:**
23 (12 male and 11 female) participants
1 female dropped out (4.3%)
= 22 participants

**Control Group:**
23 (12 male and 11 female) participants
1 male and 1 female dropped out (8.7%)
= 21 participants

43 (93.5%) Participants

*Figure 4: Elderly Population in Mji wa Huruma*

4.1.1 Use of Antihypertensive Medication by the Study Group

In both the control and experimental groups, there were reported cases of use of antihypertensive medication. This information is displayed in Table 4.1.
Table 4.1

Hypertension status and use of medication

<table>
<thead>
<tr>
<th>Blood Pressure Category</th>
<th>Antihypertensive Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental Group</td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
<td>2 (Diuretic and Beta</td>
</tr>
<tr>
<td></td>
<td>blocker)</td>
</tr>
<tr>
<td>Stage 2 hypertension</td>
<td>1 (Diuretic)</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 4.1 indicates that three participants in the experimental and control groups were hypertensive. In the experimental group, two participants had Stage 1 hypertension and one with Stage 2 hypertension. In the control group, one participant had Stage 1 hypertension and two had Stage 2 hypertension. Altogether, six participants suffered from hypertension in the study group.

With regard to the type of drug that the hypertensive participants were on, it was observed that in the experimental group there was one participant on a Beta blocker and two on a Diuretic. In the control group, one participant was on a Diuretic and the other two were on Beta blockers.

4.1.2 Exposure of Participants to Daylight

The data collected in regard to daily exposure to daylight in the outdoors between 10 am to 3pm was reported in Table 4.2.
### Table 4.2

*Exposure to Daylight*

<table>
<thead>
<tr>
<th>Mean of Time Spent in Daylight</th>
<th>Study Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental Group</td>
</tr>
<tr>
<td>0-5 mins</td>
<td>6</td>
</tr>
<tr>
<td>6-30 mins</td>
<td>7</td>
</tr>
<tr>
<td>&gt;30 mins</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
</tr>
</tbody>
</table>

At the close of the intervention period it was observed that in terms of minutes, the mean category of daylight exposure by the participants in the experimental group was six, seven and nine for 0-5 mins, 6-30 mins and >30 minutes respectively. In the control group, the number of the participants was eight for both 0-5 mins and 6-30 mins, and five in the >30 minutes daylight exposure categories.

### 4.2 Stress Level Scores at Pre-test, Mid-test and Post-test

This study sought to establish the stress levels between the experimental and control groups at pre-test, mid-test and post-test. The results in tables 4.3 and 4.4 describe the stress scores from all three testing phases for the experimental and control groups.
Table 4.3

<table>
<thead>
<tr>
<th>Global Score Scale</th>
<th>Stress Level</th>
<th>Experimental Group (n = 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pre-test</td>
</tr>
<tr>
<td>0-13</td>
<td>AVERAGE STRESS</td>
<td>F (%)</td>
</tr>
<tr>
<td>14-20</td>
<td>HIGH STRESS</td>
<td>0 (0)</td>
</tr>
<tr>
<td>&gt;20</td>
<td>VERY HIGH STRESS</td>
<td>8 (36.4)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>22 (100%)</td>
</tr>
</tbody>
</table>

From Table 4.3, the experimental group had no participants who scored average on stress levels at pre-test. However, eight (36.4%) respondents in the experimental group had high stress levels while 14 (63.6%) recorded a high score on the stress scale continuum. During the intervention at mid-test phase, eight (36.4%) of the 21 participants had average stress while seven (31.8%) participants had high and very high stress levels respectively. During post-test, 16 (72.7%) participants scored average on stress, four (18.2%) high stress and two (9.1%) very high stress.

Table 4.4

<table>
<thead>
<tr>
<th>Global Scores Scale</th>
<th>Stress Level</th>
<th>Control Group (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pre-test</td>
</tr>
<tr>
<td>0-13</td>
<td>AVERAGE STRESS</td>
<td>F (%)</td>
</tr>
<tr>
<td>14-20</td>
<td>HIGH STRESS</td>
<td>3 (14.3)</td>
</tr>
<tr>
<td>&gt;20</td>
<td>VERY HIGH STRESS</td>
<td>10 (47.6)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>21 (100%)</td>
</tr>
</tbody>
</table>
Table 4.4 shows the stress level status of the control group in all three test phases. At pre-test phase, three (14.3%) recorded average stress score, while 10 (47.6%) and eight (38.1%) had high and very high stress levels respectively. During the study period, five (23.8%) participants had average stress, seven (33.3%) high stress and nine (42.9%) presented with very high stress levels. At the post-test observations, five (23.8%) participants scored average stress while nine (42.9%) and seven (33.3%) participants recorded high and very high stress scores respectively.

### 4.2.1 Differences in Stress Level at Pre-test, Mid-test and Post-test

The mean differences in stress levels at pre-test, mid-test and post-test between experimental and control groups are shown in Table 4.5.

<table>
<thead>
<tr>
<th>Testing Phase</th>
<th>N</th>
<th>Mean±SD</th>
<th>MD (E-C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>22</td>
<td>24.32±5.73</td>
<td>3.20</td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>21.12±5.72</td>
<td></td>
</tr>
<tr>
<td>Mid-test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>22</td>
<td>16.41±7.74</td>
<td>-3.78</td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>20.19±6.39</td>
<td></td>
</tr>
<tr>
<td>Post-test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>22</td>
<td>12±6.25</td>
<td>-6.48</td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>18.48±5.15</td>
<td></td>
</tr>
</tbody>
</table>

The pooled means of stress level scores at pre-test for the experimental and control groups showed very high stress (X=24.32±5.73 and X=21.12±5.72 respectively). At mid-test, the mean for both experimental and control group displayed high stress
There was a mean difference of -3.78 in the stress level between experimental and control groups at mid-test indicating a decline in stress level in the experimental group at mid-test.

The post-test results in Table 4.5 showed that the experimental group had a mean (\(\bar{X} = 12 \pm 6.25\)) showing average stress while the control group recorded high stress (\(\bar{X} = 18.48 \pm 5.15\)). The table also indicates that there was a mean difference of -6.48 in the stress scores between experimental and control groups between the two test phases. These findings indicate that there was a decline in stress level in the experimental group.

To determine whether the differences in stress levels at pre-test, mid-test and post-test between the experimental and control groups were significant, repeated measures ANOVA and Post Hoc (Scheffé’s Confidence Interval) tests were conducted. The results of the tests are summarized in Table 4.6

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>120.334</td>
<td>1</td>
<td>120.334</td>
<td>18.969</td>
<td>.001*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1011.938</td>
<td>2</td>
<td>505.969</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1132.272</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the \(p \leq 0.05\) level
The repeated measures ANOVA results in Table 4.6 show that the mean difference in stress level between the experimental and control groups was statistically significant (MD = -3.78; -6.48, F = 18.969, df = 1, p = .001).

It was therefore concluded that there was significant difference between the experimental and control groups in the stress levels. To assess which testing phases were different from the other, a post-hoc (Scheffé’s Confidence Interval) test was done to compare the means at mid-test and post-test. The results are shown in Table 4.7.

<table>
<thead>
<tr>
<th>Table 4.7 Post-Hoc Test on Phase of Testing and Stress Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I) Experimental/Control</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Pre-test</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Mid-test</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Post-test</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

*The mean difference is significant at p ≤ 0.05

The analysis showed a statistically significant difference between the experimental and control groups at mid-test and post-test. Consequently, the hypothesis (H₀₁) that did not expect any significant difference in the mean stress levels between the two groups at pre-test, mid-test and post-test was not accepted. Thus, concluding that the treatment had a significant effect on stress level at mid-test and post-test based on the pre-test findings.
Multiple linear regression was calculated to predict the duration the intervention would have to be done to ensure that no participant was experiencing high stress based on pre-test and mid-test stress levels. The results are presented in Table 4.8.

<table>
<thead>
<tr>
<th>Model (Constant)</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SEB</td>
</tr>
<tr>
<td>(Constant)</td>
<td>12.126</td>
<td>3.628</td>
</tr>
<tr>
<td>Pre-test</td>
<td>-.254</td>
<td>.151</td>
</tr>
<tr>
<td>Mid-test</td>
<td>.474</td>
<td>.126</td>
</tr>
</tbody>
</table>

Notes. $R^2 = .268 \ (p \leq .05)$

A significant regression equation $F \ (2, \ 40) \ 7.321, \ p < 0.002$, with an $R^2$ of 0.268 was found. This implies that the pre-test and mid-test values account for 26.8% of the values of the post-test results. Consequently, applying the multiple regression equation, the $Y = a + b_1X_1 + b_2X_2 + b_kX_k$ where ‘$a$’ is a constant (y-intercept), $b_1$ is the unstandardized regression coefficient and $X$ is the duration of time taken for the intervention to yield results. At pre-test $X$ is equal to 0 (zero) while at mid-test it is equal to 4. Replacing the values of the equation with the corresponding values in table 4.8, the total duration of time required for all the participants to score average stress would be 14 weeks.

4.3 Blood Pressure Ranges at Pre-test, Mid-test and Post-test

This study sought to establish the changes in blood pressure as recorded at pre-test following administration of treatment at mid-test and post-test between the experimental and control groups at pre-test, mid-test and post-test. The results were also obtained for the control group and presented in tables 4.9 and 4.10 respectively.
Table 4.9

<table>
<thead>
<tr>
<th>Blood Pressure Ranges (mmHg)</th>
<th>Experimental (n = 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
</tr>
<tr>
<td>Systolic/Diastolic</td>
<td></td>
</tr>
<tr>
<td>≤ 90/60</td>
<td>Hypotension</td>
</tr>
<tr>
<td>&lt; 120/80</td>
<td>Normal</td>
</tr>
<tr>
<td>120/80 – 139/89</td>
<td>Prehypertension</td>
</tr>
<tr>
<td>140/90 – 159/99</td>
<td>Stage 1 hypertension</td>
</tr>
<tr>
<td>≥ 160/100</td>
<td>Stage 2 hypertension</td>
</tr>
<tr>
<td>Total</td>
<td>22(100%)</td>
</tr>
</tbody>
</table>

Table 4.9 shows blood pressure ranges in the experimental group at pre-test, mid-test and post-test. Although there was no record of hypotension all through the three test phases, normal blood pressure was observed in seven (31.8%) participants at pre-test, 11 (50%) participants were observed at mid-test and 12 (54.5%) at post-test. Prehypertension was noted in nine (40.9%) participants at pre-test, seven (31.8%) at mid-test and 10 (45.5%) at post-test.

Though four (18.2%) of the experimental group participants’ presented with Stage 1 hypertension at both pre-test and mid-test, none was observed at post-test. There were only two participants who had Stage 2 hypertension at the pre-test phase while no observations of Stage 2 hypertension were made at both the mid-test and post-test.
As can be seen in Table 4.10, there was one participant with hypotension at pre-test phase. The observations on participants made in the normal blood pressure category reduced from eight (38.1%) at pre-test, seven (33.3%) at mid-test to six (28.6%) at post-test. In the prehypertension category the number of observations increased from six (28.6%) participants at pre-test to nine (42.9%) at mid-test and 10 (47.6%) at post-test. In Stage 1 hypertension, the number of observations remained unchanged at two (9.5%) participants in all three test phases whereas in the Stage 2 hypertension, there were four (19.1%) participants at pre-test and three (14.3%) both at mid-test and post-test phases.

### 4.3.1 Differences in Systolic Blood Pressure at Pre-test, Mid-test and Post-test

The mean differences in systolic blood pressure at pre-test, mid-test and post-test between experimental and control groups are shown in table 4.11.
Table 4.11

<table>
<thead>
<tr>
<th>Systolic Blood Pressure (mmHg)</th>
<th>Testing Phase</th>
<th>N</th>
<th>Mean±SD</th>
<th>MD (E-C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>22</td>
<td>129.95±19.57</td>
<td>2.10</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>127.86±25.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>22</td>
<td>122.95±14.42</td>
<td>-6.43</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>129.38±20.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>22</td>
<td>117.77±11.62</td>
<td>-12.33</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>130.10±20.16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The means of systolic blood pressure at pre-test were; $\bar{X}$ = 129.95±19.57 mmHg for the experimental group and $\bar{X}$ = 127.86±25.14 mmHg for the control group. At mid-test, the means were observed as; $\bar{X}$ = 122.95±14.42 mmHg and $\bar{X}$ = 129.38±20.32 mmHg for the experimental and control groups respectively. The mean of SBP at pre-test and mid-test for both the experimental and control groups showed that the participants’ blood pressure was in the prehypertension blood pressure category.

There was a mean difference in SBP of -6.43 mmHg between the experimental and control groups at the two test phases indicating a decrease in the experimental group and an increase in the control group.

At post-test, the mean SBP in the experimental and control group was; $\bar{X}$ = 117.77±11.62 mmHg and $\bar{X}$ = 130.10±20.16 mmHg respectively. The mean SBP for both groups at pre-test and post-test showed that the blood pressure category for the experimental group changed from prehypertension (pre-test) to normal at post-test
while that of the control group remained in the prehypertension category at both stages. The results in Table 4.11 show a mean difference of -12.33 mmHg in SBP between the experimental and control groups at post-test indicating a decrease in mean SBP of the experimental group and an increase in the control group.

To determine whether the differences in SBP at mid-test and post-test between the experimental and control groups were significant, repeated measures ANOVA test was conducted. The results of the test are summarized in Table 4.12.

<table>
<thead>
<tr>
<th>Table 4.12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis of Variance (ANOVA) on Systolic Blood Pressure at Pre-test, Mid-test and Post-test</td>
</tr>
<tr>
<td>Sum of Squares</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Between Groups</td>
</tr>
<tr>
<td>Within Groups</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

*Significant at the $p \leq 0.05$ level

The repeated measures ANOVA results in Table 4.12 show that the mean difference in SBP between the experimental and control groups was not statistically significant ($MD = -6.43; -12.33, F = .371, df = 1, p = .546$). It was therefore concluded that there was no significant difference between the experimental and control groups in SBP at mid-test and post-test. Hence, the hypothesis ($H_{02}$) that there would be no significant difference in the mean systolic blood pressure between the two groups was not rejected. Thus, concluding that the treatment did not have a significant effect on systolic blood pressure at mid-test and at post-test.
4.3.2 Differences in Diastolic Blood Pressure at Pre-test, Mid-test and Post-test

The mean differences in diastolic blood pressure at pre-test, mid-test and post-test between experimental and control groups are shown in table 4.13.

<table>
<thead>
<tr>
<th>Testing Phase</th>
<th>Diastolic Blood Pressure (mmHg)</th>
<th>N</th>
<th>Mean±SD</th>
<th>MD (E-C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td></td>
<td>22</td>
<td>80.68±12.03</td>
<td>.54</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td>21</td>
<td>80.14±10.75</td>
<td></td>
</tr>
<tr>
<td>Mid-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td></td>
<td>22</td>
<td>74.91±14.56</td>
<td>-4.61</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td>21</td>
<td>79.52±11.99</td>
<td></td>
</tr>
<tr>
<td>Post-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td></td>
<td>22</td>
<td>72.73±10.08</td>
<td>-7.89</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td>21</td>
<td>80.62±13.20</td>
<td></td>
</tr>
</tbody>
</table>

A comparison of pre-test and mid-test showed that the mean diastolic blood pressure at pre-test was $\bar{X} = 80.68\pm12.03$ mmHg and $\bar{X} = 80.14\pm10.75$ mmHg for the experimental and control groups respectively. At mid-test the experimental group had a mean DBP of $\bar{X} = 74.91\pm14.56$ mmHg while the control group had $\bar{X} = 79.52\pm11.99$ mmHg. Both the experimental and control groups had normal diastolic blood pressure at pre-test and mid-test. There was a mean difference in DBP of -4.61 mmHg between experimental and control groups at the two test phases representing a decrease in the experimental group and an increase in the control group.
At post-test, the mean DBP in the experimental group was $\bar{X} = 72.73 \pm 10.08$ mmHg while that of the control group was $\bar{X} = 80.62 \pm 13.20$ mmHg. The mean DBP showed that the experimental group had normal blood pressure while the control group had DBP in the prehypertension category at post-test. There was a DBP mean difference of -7.89 mmHg between experimental and control groups at post-test. This indicated a decrease in diastolic blood pressure in the experimental group and a corresponding increase in the control group.

To determine whether the differences in DBP at mid-test and post-test between the experimental and control groups were significant, repeated measures ANOVA test was conducted. The results of the test are summarized in Table 4.14.

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>471.325</td>
<td>1</td>
<td>471.325</td>
<td>1.744</td>
<td>.194</td>
</tr>
<tr>
<td>Within Groups</td>
<td>17.942</td>
<td>2</td>
<td>8.971</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>489.267</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the $p \leq 0.05$ level

The repeated measures ANOVA results in Table 4.14 show that the mean difference in DBP between the experimental and control groups was not statistically significant (MD = -4.6; -7.89, $F = 1.744$, df = 1, $p = .194$). It was therefore concluded that there was no significant difference between the experimental and control groups in DBP at mid-test and post-test based on the pre-test. Hence, the hypothesis ($H_{03}$) that there would be no significant difference in the mean diastolic blood pressure between the
two groups was accepted. Thus, concluding that the treatment did not have a significant effect on diastolic blood pressure at mid-test and at post-test.

Multiple linear regression was calculated to predict the duration the intervention would have to be done to ensure that all the participants were within the normal blood pressure range based on pre-test and mid-test blood pressure values. The results are shown in table 4.15.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>17.366</td>
<td>8.584</td>
</tr>
<tr>
<td>Pre-test</td>
<td>-.030</td>
<td>.079</td>
</tr>
<tr>
<td>Mid-test</td>
<td>.890</td>
<td>.096</td>
</tr>
</tbody>
</table>

*Notes. R²= .81 (p≤.05)*

A significant regression equation $F (2, 40), 85.52, p < 0.001$, with an $R^2$ of 0.810 was found. This implied that the pre-test and mid-test values accounted for 81% of the values of the post-test results. Consequently, applying the multiple regression equation, the $Y= a+b_1X_1+B_2X_2+b_kX_k$ where ‘a’ is a constant (y-intercept), $b_1$ is the unstandardized regression coefficient and $X$ is the duration of time taken for the intervention to yield results. At pre, $X$ is equal to 0 (zero) while at mid-test it is equal to 4. Replacing the values of the equation with the corresponding values in table 4.15, the total duration of time required for all the participants blood pressure ranges to be within the normal range would be 20 weeks.
4.4 Sleep Quality at Pre-test, Mid-test and Post-test

This study sought to establish whether there were any significant differences in the quality of sleep between the experimental and control groups at pre-test, mid-test and post-test. The results in Tables 4.16 and 4.17 describes the pre-test, mid-test and post-test results of sleep quality scores for the experimental and control groups respectively.

<table>
<thead>
<tr>
<th>Pittsburgh Sleep Quality Global Score</th>
<th>Sleep Quality</th>
<th>Experimental Group (n = 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pre-test</td>
</tr>
<tr>
<td>≤ 5</td>
<td>GOOD SLEEP</td>
<td>F (%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 (22.7)</td>
</tr>
<tr>
<td>&gt; 5</td>
<td>POOR SLEEP</td>
<td>17 (77.3)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>22 (100%)</td>
</tr>
</tbody>
</table>

Table 4.16 compares the sleep quality at pre-test, mid-test and post-test of the intervention amongst the elderly in the experimental group. In the pre-test evaluation, five (22.7%) participants scored good sleep quality on the PSQI while 17 (77.3%) scored to poor sleep quality. During the intervention period, 10 (45.5%) of the participants in the experimental group reported to have had good sleep while 12 (54.5%) had poor sleep. By the end of the study, 18 (81.8%) participants had adequate sleep while four (18.2%) had poor sleep.
Table 4.17

Sleep Quality for Control Group at Pre-test, Mid-test and Post-test

<table>
<thead>
<tr>
<th>Pittsburgh Sleep Quality Global Score</th>
<th>Sleep Quality</th>
<th>Control (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Mid-test</td>
</tr>
<tr>
<td>≤5 GOOD SLEEP</td>
<td>F (%)</td>
<td>F (%)</td>
</tr>
<tr>
<td></td>
<td>5 (23.8)</td>
<td>3 (14.3)</td>
</tr>
<tr>
<td>&gt;5 POOR SLEEP</td>
<td>16 (76.2)</td>
<td>18 (85.7)</td>
</tr>
<tr>
<td>Total</td>
<td>21 (100%)</td>
<td>21 (100%)</td>
</tr>
</tbody>
</table>

Table 4.17 describes the quality of sleep for the control group in which five (23.8%) participants had adequate sleep and 16 (76.2%) had poor sleep during the pre-test evaluation. At mid-test, three (14.3%) participants had good sleep while 18 (85.7%) poor sleep. At the end of the intervention, one (4.8%) participant had adequate sleep compared to 20 (95.2%) participants who recorded poor sleep.

4.4.1 Differences in Sleep Quality at Pre-test, Mid-test and Post-test

The mean differences in sleep quality at pre-test, mid-test and post-test between experimental and control groups are shown in table 4.18.
Table 4.18

<table>
<thead>
<tr>
<th>Testing Phase</th>
<th>N</th>
<th>Mean±SD</th>
<th>MD (E-C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>22</td>
<td>11.18±3.85</td>
<td>1.52</td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>9.67±4.18</td>
<td></td>
</tr>
<tr>
<td>Mid-test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>22</td>
<td>5.86±3.68</td>
<td>-4.80</td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>10.67±4.60</td>
<td></td>
</tr>
<tr>
<td>Post-test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>22</td>
<td>4.27±3.44</td>
<td>-6.63</td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>10.90±4.59</td>
<td></td>
</tr>
</tbody>
</table>

The experimental and control groups pooled means of the quality of sleep at pre-test was $\bar{X} = 11.18±3.85$ (poor sleep quality) and $\bar{X} = 9.67±4.18$ (poor sleep quality) respectively. At mid-test, the mean of the sleep quality in the experimental group was $\bar{X} = 5.86±3.68$ (good sleep quality) while that of the control group was $\bar{X} = 10.67±4.60$ (poor sleep quality). In addition, there was a mean difference of -4.80 between experimental and control groups at the two test phases indicating an improvement of sleep quality in the experimental group and a decline in the control group.

At post-test, the experimental group had a mean of $\bar{X} = 4.27±3.44$ (good sleep quality) whereas the control group had $\bar{X} = 10.90±4.59$ (poor sleep quality). At the same time, there was a mean difference of -6.63 in the sleep quality between the experimental and control groups at the two test phases. This finding indicated that there might have been enhancement of sleep quality in the experimental group while the control group’s sleep quality remained constant.
To determine whether the differences in sleep quality at mid-test and post-test between the experimental and control groups were significant, repeated measures ANOVA and Post Hoc (Scheffé’s Confidence Interval) tests were conducted. The results of the tests are summarized in Table 4.19.

Table 4.19  
**Analysis of Variance (ANOVA) on Sleep Quality at Pre-test, Mid-test and Post-test**

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>392.248</td>
<td>1</td>
<td>392.248</td>
<td>10.902</td>
<td>.002*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>112.178</td>
<td>2</td>
<td>56.089</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>504.426</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the $p \leq 0.05$ level

The repeated measures ANOVA results in Table 4.19 show that the mean difference in sleep quality between the experimental and control groups was statistically significant ($MD = -4.80; \ -6.63, \ F = 10.902, \ df = 1, \ p = .002$). It was therefore concluded that there was a significant difference between the experimental and control groups in the sleep quality. To assess which testing phases were different from the other, a post-hoc test was done to compare the means at mid-test and post-test. The results are shown in table 4.20.

Table 4.20  
**Post-Hoc Test on Phase of Testing and Sleep Quality**

<table>
<thead>
<tr>
<th>(I) Experimental/Control</th>
<th>(J) Experimental/Control</th>
<th>Mean Difference (I-J)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>Mid-test</td>
<td>1.636 (*)</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>2.199 (*)</td>
</tr>
<tr>
<td>Mid-test</td>
<td>Pre-test</td>
<td>-1.636 (*)</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>.563</td>
</tr>
<tr>
<td>Post-test</td>
<td>Pre-test</td>
<td>-2.199 (*)</td>
</tr>
<tr>
<td></td>
<td>Mid-test</td>
<td>-.563</td>
</tr>
</tbody>
</table>

*The mean difference is significant at $p \leq 0.05$*
The analysis showed a statistically significant difference between the experimental and control groups at mid-test and post-test. Consequently, the hypothesis (H04) that did not expect any significant difference in the mean sleep quality between the two groups was rejected. Thus, concluding that the treatment had a significant effect on stress level at mid-test and post-test.

Multiple linear regression was conducted to predict the duration the intervention would have to be done to ensure that no participant was having inadequate sleep based on pre-test and mid-test sleep quality values. The results are shown in table 4.21.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SEB</td>
</tr>
<tr>
<td>(Constant)</td>
<td>12.350</td>
<td>4.353</td>
</tr>
<tr>
<td>Pre-test</td>
<td>-.209</td>
<td>.130</td>
</tr>
<tr>
<td>Mid-test</td>
<td>.897</td>
<td>.125</td>
</tr>
</tbody>
</table>

Notes. $R^2 = .578$ (p $\leq .05$)

A significant regression equation $F (2, 40), 27.408, p <0.001$, with an $R^2$ of 0.578 was found. This implied that the pre-test and mid-test scores accounted for 57.8% of the values of the post-test results. Consequently, replacing the values of the equation with the corresponding values in table 4.21, the total duration of time required for all the participants to obtain adequate sleep would be 10.70 (rounded off to 11) weeks.
CHAPTER FIVE: DISCUSSION OF THE FINDINGS

5.1 Comparisons of Stress Level at Pre-test, Mid-test and Post-test

The study examined the effects of Progressive Muscle Relaxation exercises and use of sleep masks over two months on perceived stress. According to research done using Cohen Perceived Stress Scale, scores of 0-13 are considered average stress, 14-20 high stress and scores greater than 20 denote very high stress (Eun-Hyun, 2012).

Using this interpretation of the stress scale, as observed in Table 4.3, the experimental group had reduced number of participants in high and very high stress level at mid-test (from 36.4% and 63.6% at pre-test to 31.8% in both scales at mid-test). The level of stress decreased further after eight weeks with 72.7% of the participants scoring average stress on the PSS scale. The results demonstrated that after four weeks (mid-test) of programme intervention involving PMR exercises and sleep enhancement, there was a positive change in the experimental group. These results showed that relaxation exercises in conjunction with sleep enhancement using sleep masks had a consistent positive effect in reducing stress levels among the elderly in a home for the aged in Nairobi, Kenya.

However, the control group maintained its average stress level (0-13 global stress score) at mid-test and post-test with the number of the elderly with high stress level (14-20 global stress score) at post-test increasing further. These observations indicated that lack of intervention in this group may have contributed to the high level of stress noticed at mid-test and post-test. With regard to research on uncontrolled stress as observed in the control group in the present study, such a
situation could have a lasting effect on the elderly’s physical, psychological and social functioning (HHP, 2014; NCCIH, 2016; Seo et al., 2014; The Alternative Daily, 2016). Indeed, relaxation exercises together with improved sleep environment had a positive effect throughout the eight weeks of intervention in mobilizing participants in the experimental group towards average stress level.

These results illustrated the beneficial effects of relaxation exercises coupled with the use of sleep masks at night to counteract stress levels in the elderly for a period of eight weeks. These findings are in agreement with studies done either on PMR or the influence of light at night by Cho et al., (2013), Leblanc et al., (2015a, 2015b), Ramakrishnan and Chandran (2013) and Shah et al., (2010). They found that relaxation exercise and/or removal of light at night improved the mental, physical and physiological domains of the elderly. Thereby promoting stress relief and better sleep leading to improved quality of life and functional independence. The present study was unique because it combined both relaxation and the effect of the removal of light at night on stress level in the elderly and established their beneficial impact within just four weeks of intervention.

5.2 Differences between Stress Level at Pre-test, Mid-test and Post-test

In the present study it was established that Progressive Muscle Relaxation exercise and the use of sleep masks were effective interventions in the reduction of stress in the elderly in the home for the aged after four weeks of treatment. In the experimental group, the mean stress level decreased from 24.32±5.73 (very high stress) to 16.41±7.74 (high stress) while that of the control group remained within
the high stress levels, that is, 21.12±5.72 at pre-test and 20.19±6.39 at mid-test. The presence of high stress levels in the home for the aged at pre-test was in agreement with Olum (2014) who identified that the majority of the elderly in Kenya are faced with a host of problems ranging from economic, health, and social to personal problems.

These stressors lead to adverse effects on the stress coping mechanism of the body among vulnerable populations leading to conditions such as atherosclerosis, hypertension, cancers, osteoporosis, insomnia, arthritis, Type 2 diabetes, dementia, diminished sense of self-worth, backaches, headaches and many more (Bruno, 2013; NFK, 2014; Shah et al., 2010; Shinde et al., 2013). Stress is symptomized by worries, hypervigilance, hyperactivity and a state of alertness; elements predisposing to night time awakenings. A chronic stressful state causes disinterest in life as well as fatigue which tend to foster a declined level of physical activity during the day subsequently contribute to sleep disturbances (Leblanc et al., 2015a, 2015b; Sinha & Jastreboff, 2013; Slavich, 2016).

These high stress levels could be attributed to the fact that the elderly in long term care facilities frequently report experiencing stress (Olum, 2014) even at bedtime with thoughts pestering them due to lack of control, trepidation, fear of the unknown and extreme worries about the future (Aldao et al., 2010; Barlow & Durand, 2004; Hofman, Schulz, Heering, Muench & Bufka, 2010). Despite the elderly being observed as capable of maintaining a high level of motivation, their anxiety at bedtime make all their efforts counterproductive encouraging elevated sleep-onset latency (Barlow & Durand, 2004; Hofman et al., 2010; Leblanc et al., 2015a,
The persistent stressful situation of the elderly sleeping badly and the resultant fatigue makes them feel that pharmacological solutions are warranted to negate their existing sleeping problems hence discouraging more proactive measures of managing the said problems (Hofman et al., 2010; Leblanc et al., 2015a, 2015b). These factors were also observed in a home for the elderly in Nairobi and may have been the reason why some participants were on medication.

However, research suggests that nonpharmacological interventions such as PMR exercise and sleep masks were equally effective and without side effects as compared to pharmacological solutions (Garber et al., 2011; Yang, 2012). In the present study, the intervention involving relaxation exercise and the removal of light at night may have assisted in the management of this very high stress status. The significant difference demonstrated between the experimental and control groups after four weeks of intervention were important in enhancing the efficacy of these nonpharmacological means of stress management among the elderly. The role of PMR exercises and sleep environment modification in the deterrence of the mentioned health implications resulting from very high stress levels is widely recognized (Garber et al., 2011). These findings support those by Bonnet and Arand, (2016), Garber et al., (2011), Gerber, Lindwall, Lindgård, Börjesson and Jonsdottir, (2013b), Shinde et al., (2013) and Sigfusdottir et al., (2011) who proposed that relaxation buffers the damaging effects of stress because seniors who engage in PMR exercises display fewer stress symptoms such as mood impairment, depression and anxiety.
There was a reduction in the mean stress level in the experimental group from 24.32±5.73 (very high stress) at pre-test to 12±6.25 (average stress) at post-test in contrast to that in the control group that remained at high level of stress after 8 weeks of intervention. The significant differences between the two study groups at $p \leq 0.05$ at post treatment concur with those of a study by Kumutha et al., (2014) who found considerable variations between control and experimental groups in an intervention involving PMR exercises which reduced the stress levels and blood pressure in a geriatric population in India. Similarly, in Unbehaun et al., (2010) these psychotherapeutic relaxation techniques are reputable measures employed in the management of inadequate sleep. These techniques embrace progressive muscle relaxation, autogenic training and mindfulness activities which induce positive impact on physiological, psychological and emotional stimulations which otherwise disturb the process of falling asleep.

In the present study, the experimental group had a significant drop in stress levels where the 63.6% of the participants who had scored very high stress (>20) at pre-test had reduced to 9% at post-test. This was in contrast to observations made on the control group that remained unstable throughout the intervention period. The PMR exercises and sleep environment enhancement may have contributed to the noticeable reduction in the stress levels of the participants in the experimental group.

Research suggests that high unmanaged stress contributes to excessive wear and tear of the body, leading to profound and detrimental repercussions to an elderly’s physical and mental health (Sinha & Jastreboff, 2013; Slavich, 2016; Thoits, 2010). High stress is undoubtedly linked to pathogenesis of arterial heart disease.
Blumenthal et al., 2010; Bruno, 2013), adjustment in immune, nervous, muscular and skeletal systems and a decline in physical functioning with time (Kjellberg & Wadman, 2007; Lambert, G., Schlaich, Lambert, E., Dawood & Esler, 2010; Segerstrom & Miller, 2004).

In view of the above, scholars agree that the aim of stress management should be to reduce blood pressure to <150/90 mmHg for the elderly who are hypertensive. In addition, for those who are normotensive, the target is to lower blood pressure to 140/90 mm Hg or below. The PMR exercise can be highly beneficial if practiced routinely in everyday life to ease anxiety and survive stress-related problems (European Society of Cardiology, 2013; NICE Clinical Guidelines, 2011). The findings of the current study showing positive enhancements concurs with the declaration by NFK (2014) that a healthy lifestyle involving relaxation training and sleep hygiene are potentially effective measures in stress management.

The Kumutha et al., (2014) assessment of the effects of a three week PMR programme on stress levels and hypertension in hypertensive elderly in India showed that progressive muscle relaxation exercise had a profound positive effect on both variables. Their research concluded that PMR was an effective tool in the management and rehabilitation of individuals with hypertension as well as high stress. The current study also observed reduction in both, blood pressure measures and stress level scores in the Kenyan institutionalized elderly who engaged in PMR training programme coupled with sleep enhancement.
The efficacy of PMR in stress management is further echoed by Muriungi and Ndetei (2013) who stated that one of the most effective types of relaxation techniques is the Progressive Muscle Relaxation (PMR) exercises, oriented toward managing distress associated with stress in geriatric population. Rueggeber et al., (2012) explained that deleterious physical health is observed in those old people who are both sedentary and have high perceived stress.

Bonnet and Arand (2016), state that there is evidence on the efficacy of relaxation and sleep hygiene education in the management of sleep disturbances. PMR exercises have an upper hand over other techniques in treating sleep difficulties as it is a method that the elderly learn fast and can even engage in before falling asleep as well as during longer wake time at night (Shinde et al., 2013; Sinha & Jastreboff, 2013; Slavich, 2016; Unbehaun et al., 2010).

5.3 Comparisons of Blood Pressure Range at Pre-test, Mid-test and Post-test

The current study revealed that there were six participants who were already hypertensive (Table 4.1). There were three hypertensive participants in each of the experimental and control groups who were on beta blockers and diuretics antihypertensive medications. The number of participants with normal blood pressure at pre-test in the experimental group had risen to 50% at mid-test and 54.5% at post-test while that in the control group had reduced from 38.1% at pre-test to 33.3% at mid-test and 28.6% at the post-test. The 9.1% cases of Stage 2 hypertension recorded at pre-test in the experimental group reduced to nil at mid-test and post-test while in the control group there was no observable change at both mid-
test and post-test. The prevalence of high blood pressure in the control group predicts challenges to the health status of the old persons because the higher the blood pressure, the greater the harm. Presence of High Blood Pressure predisposes one to health problems including kidney disease, eye problems, stroke and heart attack which according to mortality statistics, are the principal causes of death in elderly men and women (European Society of Cardiology, 2013; Heron, 2009). Unlike in the control group, the drop in hypertension cases reported in the experimental group signify the beneficial effects of relaxation exercises and the introduction of a pitch dark room during sleep. In addition, the observed sunlight exposure during the day (Table 4.2) may have contributed to this too.

These interventions and observations may have encouraged the secretion of neurohormones such as melatonin, serotonin, prolactin, endorphins and oxytocin that benefit the body by reducing fatigue, decreasing anxiety, lowering the level of cortisol (stress hormone), blood pressure and heart rate thereby leaving the body more relaxed, calm and composed (Bonnet & Arand, 2016; Garber et al., 2011). A relaxation response encourages the body to experience a reduced heart rate and respiratory rate; decreased blood pressure, muscle tension and muscle activity (HHP, 2009; Kyeng et al., 2016; Williams & Carey, 2003) that contribute to normal blood flow, muscle relaxation, sleep efficiency in addition to reducing tension; all of which may have reduced the incidence of high blood pressure in the present study.

Dominguez-Rodriguez et al., (2010), assert that sleep is a factor that influences blood pressure in the elderly as it alters Autonomic Nervous System tasks. Sleep problems affect blood pressure response, thereby heightening the individual’s
vulnerability to high blood pressure (Calhoun & Harding, 2010). Lange and Born (2011) and Dominguez-Rodriguez et al., (2010) emphasize that sleep actually improves an individuals’ immunity as neurohormones secreted have antioxidant and anti-inflammatory regulatory functions.

It is observed that health complications that are brought about by high blood pressure can be minimized even with the slightest drop in mean blood pressure as demonstrated in a number of studies conducted in different parts of the world replicating significant associations between sleep and cardiovascular health (Amagi, Ishikawa & Gotoh, 2004; Castro-Costa et al., 2011; Ferrie, Shipley & Cappuccio, 2007; Gangwisch, Heymsfield & Boden-Albala, 2008; Hublin, Partinen, Koskenvuo & Kaprio, 2007; Lan, T., Lan, H., Wen, Lin & Chuang, 2007; Shankar, Koh, Yuan, Lee & Yu, 2008).

Even though the statistically insignificant decrease in mean SBP and DBP between pre-test and post-test in the experimental group in the present study focused on daytime blood pressure, absence or reduced nocturnal dipping of blood pressure is regarded as a firm, self-determining predictor of cardiovascular risk (Calhoun & Harding, 2010). Various research studies have concluded that lack of nocturnal blood pressure drop by 5% contributed to a 20% higher risk in either cardiovascular diseases or complications such as chronic kidney disease, diabetes and resistant high blood pressure (Ben-Dov et al., 2007; Dolan, Stanton & Thom, 2009; Kario et al., 2001; Ohkubo, Hozawa & Nagai, 2000).
5.3.1 Differences between Systolic and Diastolic Blood Pressure at Pre-test, Mid-test and Post-test

The analysis done between group differences in Table 4.11 showed that there were mean differences in SBP between the experimental and control groups at pre-test and after 4 weeks of intervention at the time of mid-test. In both groups, the means were 129.95±19.57 mmHg, 127.86±25.14 mmHg at pre-test and mid-test 122.95±14.42 mmHg, 129.38±20.32 mmHg for the experimental and control groups respectively. These results showed that there was a decrease in SBP of 7 mmHg in the experimental group after four weeks of intervention. In the control group, there was a slight increment of 1.52 mmHg after the four weeks of intervention. Despite the drop in the mean SBP in the experimental group, the change was not statistically significant at $p \leq 0.05$.

However, the 7 mmHg drop in SBP in the current study tallies with the study by Sheu et al., (2003) on elderly with essential hypertension in which SBP dropped by 5.1 mmHg after daily PMR over four weeks. In the present study, the change may have been statistically insignificant probably because the PMR exercise was initiated three times as compared to daily as done by Sheu et al., (2003) or perhaps because research shows that physiological adaptations take between 6-12 weeks to manifest themselves or become effective (Brown, 2013). Furthermore, research indicates that the control of systolic blood pressure is usually difficult particularly in the elderly even with antihypertensive medication (Aronow, 2013; Mitchel, 2014; National Prescribing Service [NPS], 2010).
Results in Table 4.11 shows noticeable directional change differences in pre-test and post-test SBP between the experimental group (129.95±19.57 to 117.77±11.62 mmHg) and control group (127.86±25.14 to 130.10±20.16 mmHg). In the experimental group, SBP dropped by 12.18 mmHg whereas the control group saw a rise of 2.24 mmHg in the SBP. The findings suggest a beneficial effect of Progressive Muscle Relaxation exercises in conjunction with sleep hygiene on lowering SBP among the elderly. Studies show that even modest changes in blood pressure can reverse or mitigate cardiovascular complications such as coronary heart disease and stroke (Calhoun & Harding, 2010; Shinde et al., 2013) responsible for a high percentage of deaths. This is considered second to high blood pressure and diabetes in deaths (Grander et al., 2013).

Analysis in Table 4.13 showed that the mean DBP for the experimental and control groups at pre-test were 75.09±9.41 mmHg and 74.90±7.84 mmHg and at mid-test as 74.91±14.56 mmHg and 79.52±11.99 mmHg respectively. It is evident that the DBP for the experimental group dropped by 0.18 mmHg while that of the control group rose by 4.62 mmHg within the four weeks of PMR training and sleep enhancement. Even though the change in DBP at mid-test was not statistically significant, research shows that any little drop in mean DBP can alleviate cardiovascular problems (Calhoun & Harding, 2010) because chronically and significantly elevated diastolic blood pressures ≥100 mmHg increases the incidences of older adults suffering from hypertension related health issues. These health complications include heart problems, chronic kidney disease, cognitive impairment and even premature death (Bragg, 2015).
Calhoun and Harding (2010) stated that a 2 mmHg decrease in diastolic blood pressure contributes to a 17% decrease in high blood pressure prevalence, a 6% decrease in arterial disease and a 15% decrease in stroke incidences. When high blood pressure has been confirmed, appropriate lifestyle changes are advocated with emphasis on relaxation and sleep enhancement (WHO, 2011). In this study there was one participant who had Stage 1 hypertension (140-159 mmHg systolic pressures) and another with Stage 2 hypertension (≥160 mmHg systolic pressure) in the experimental group at pre-test. However, at mid-test (four weeks), despite the lack of status change in Stage 1 hypertension, there was an improvement in Stage 2 hypertension since there were no observations of Stage 2 hypertension at mid-test. This outcome epitomizes the positive effect of relaxation and sleep environment enhancement advocated by WHO (2011). This observation contrasts with the SBP records made in the control group where four participants had Stage 2 hypertension at pre-test and remained three participants at both mid-test and post-test.

The Joint National Council (JNC) 8 panel set the target blood pressure for the population aged 60 years or older to less than 150/90 mmHg, an improvement from the long-standing practice to treat such patients to a target systolic pressure of less than 140 mmHg (James et al., 2014). In the present experimental study group, there were two participants who had Stage 2 hypertension (≥160 mmHg SBP) and after four weeks of intervention, this category of blood pressure had been alleviated at mid-test. At the same time, the number of participants who had normal blood pressure increased from seven at pre-test to eleven at mid-test. The prehypertension category group with systolic pressure of 120-139 mmHg also had a positive result with a steady decrease in numbers of participants from nine at pre-test to seven at
mid-test following the PMR and sleep enhancement programme. Results of normal blood pressure in the experimental group compared to those of the control group where in the control group the number of participants with normal blood pressure reduced from eight at pre-test to seven at mid-test. In Stage 1 hypertension, the outcome remained unchanged with two participants at both pre-test and mid-test. This suggests the efficacy of relaxation exercises and enhanced sleep hygiene in the experimental group.

There was an increase in the number of experimental participants with normal diastolic pressure of <80 mmHg from 31.8% at pre-test to 50% at mid-test, four weeks after the start of the intervention programme compared to the control group that actually decreased the number of participants recorded in this normal diastolic blood pressure range from 38.1% at pre-test to 33.3% at mid-test. The lifestyle change in the daily routine of these elderly persons in the present study appeared to have been beneficial in controlling blood pressure.

This concurs with findings by James et al., (2014) that positive lifestyle changes are recommended to lower blood pressure even before commencing antihypertensive therapy when hypertension has been confirmed. This opinion is echoed by findings in a meta-analysis of randomized trials of high blood pressure medications where the drugs lowered DBP by a 5 mmHg thus diminishing the vulnerability of old people to heart attack and stroke by 22% and 41% respectively (Calhoun & Harding, 2010). Calhoun and Harding (2010), observed that the notable reduction in DBP was the result of antihypertensive medication, raising the question what would happen if both relaxation exercises and sleep environment enhancement were introduced? In
view of the 4.61 mmHg difference in DBP between experimental and control group in favor of the experimental group after only four week intervention, the combined therapy may have mitigated stress in the experimental group.

In the control group, the two (9.5%) participants who had Stage 1 hypertension at pre-test did not change at mid-test, predicting the unfortunate likelihood of health complications worse than high blood pressure such as stroke, vision loss due to eye problems and even kidney failure as spelt out by Bragg (2015). The first line of treatment for hypertension is identical to the recommended preventive lifestyle changes and includes physical exercise and sleep hygiene. These preventive measures have reduced blood pressure significantly in the elderly with hypertension (Blumenthal et al., 2010; Siebenhofer et al., 2011), potentially giving them similar efficacy to using antihypertensive therapy (Giuseppe, 2013). Calhoun and Harding (2010) suggested that sleep problems create an opportunity for disease processes affecting physiologic events that alter blood pressure responses to flourish. This occurrence in turn, significantly increases cardiovascular complications that would otherwise be controlled with minimal changes in either daytime or nocturnal blood pressure. Researchers in two studies on sleep and hypertension- Sleep Heart Health and Whitehall II - detected that participants who habitually slept ≤ 5 hours a night, demonstrated a heightened incidence of prevalent high blood pressure compared to those sleeping seven hours each night (Cappuccio, Stranges & Kandala, 2007; Gottlieb, Redline & Nieto, 2006). Research on sleep among the elderly concur that observed sleep difficulties increases the vulnerability of hypertension (Lambert et al., 2010; Mitchel, 2014; NPS, 2010; Ruggiero & Redeker, 2013) as may have been the case in the present study.
Also seen in Table 4.13 are the DBP means for experimental group at pre-test as 75.09±9.41 mmHg and 72.73±10.08 mmHg at post-test, a reduction of 2.36 mmHg in DBP. As with SBP, the control group showed a rise in its DBP from 74.90±7.84 mmHg to 80.62±13.20 mmHg. It was apparent that the DBP in the control group rose by 5.72 mmHg from pre-test to post-test. There was a statistically insignificant difference between the experimental and control group in change of DBP before and after intervention.

Previous findings supported PMR exercises as a measure for improving blood pressure for the geriatric population with hypertension (Hamidizadeh et al., 2005; Kumutha et al., 2014 and Sheu et al., 2003). In a study of elderly with essential hypertension, PMR training was given on a daily basis for four weeks. Subsequently, systolic blood pressure dropped by 5.1 mmHg in a sample of elderly in a hypertension outpatient clinic (Sheu et al., 2003). Findings of the current study support findings of Sheu et al., (2003) that there was a drop of 12.18 mmHg in the systolic blood pressure after eight weeks of PMR exercises and modification of sleep environment. The dramatic reduction in SBP among the experimental group could be attributed to relaxation exercises and sleep hygiene. This would be a better option compared to a 10 mmHg reduction due to antihypertensive drugs in a meta-analysis by Law et al., (2003). Grander et al., (2013) and Yang, (2012) while supporting the beneficial effects of increased sleep quality in the elderly, also highlight that, beyond well-known behavioral risk factors such as smoking, alcohol consumption, sedentary lifestyle and unhealthy diet for heart problems, adequate sleep may be a bonus modifiable behavior furthering this propensity.
Since hypertension is a silent killer without obvious symptoms, adherence to antihypertensive medications is of utmost importance to lower SBP (Shinde et al., 2013). However, medication is inclined to side effects. Since the present study has predicted that relaxation exercises and improved sleep hygiene may provide a good management alternative to medication in the long run, they could be worthy alternatives. This study showed that combined use of PMR exercises and the blocking out of light at night during sleep can assist in better control of blood pressure in both hypertensive and non-hypertensive geriatrics in a LTCF. This study showed that the combined therapy of simply relaxing the muscles physically and psychologically; and removing disturbing light during sleep could provide surprising health benefits. In addition to the apparent psychological advantages of relieving physical stress and mental tension, the present findings portray that routine deep relaxation and sleep hygiene can trigger a host of medically valuable physiological changes in the elderly (Bonnet & Arand, 2016; Yang, 2012).

Studies agree that the management of Stage 2 hypertension can lower cases of adverse cardiovascular health issues, particularly stroke and dementia, to a modest degree in geriatrics. A variety of studies suggest that a reduction in SBP in the long run contribute to reduced risk of cardiovascular, cerebrovascular and renal diseases episodes by 22% and stroke by 41% (Law et al., 2003; Mundan et al., 2011). The non-significant improved blood pressure at mid-test in the present study was probably due to the inclusion of elderly persons who had normal systolic blood pressure at pre-test as compared to only the elderly with hypertension in related studies. This fact could have diluted the positive effects of relaxation exercises as well as the use of sleep masks on blood pressure.
Connolly (2014), Kaplan (2007) and Victor and Kaplan (2007) posited that an increase in blood pressure, increases the risk for stroke by 11%, heart disease by 15% and overall mortality by 16%; and therefore, any lifestyle modification that can lower blood pressure would be instrumental in cardiac rehabilitation and management. Blumenthal et al., (2010) and Giuseppe (2013) spell out that relaxation exercises, just like antihypertensive medications, reduced blood pressure in individuals with high blood pressure; and in the event that immediate use of the latter is prescribed, because of their potential efficacy, lifestyle modifications in the wake of relaxation activities should still be recommended. Anderson and Seniscal (2001); Pawlow and Jones (2002), Sheu et al., (2003) and Wilk and Turkoski (2001) all indicate the long-term effects of PMR technique on the parasympathetic nervous system. This includes a decline in blood pressure and heart rate through the conscious sequential contraction and relaxation of muscles with deep breathing. PMR is a natural stress reliever as it counteracts the effects of cortisol in the blood (Bonnet & Arand, 2016; Siebenhofer et al., 2011). Apart from the deep relaxation achieved through PMR, it also decreases systolic blood pressure by 5 mmHg or more over duration of eight weeks hence improving the life quality of the elderly.

5.4 Comparisons of Sleep Quality at Pre-test, Mid-test and Post-test

The pre-test evaluation indicated that 22.7% and 23.8% of the participants scored good sleep in the experimental and control groups respectively while poor sleep was indicated by 77.3% in the experimental group and 76.2% in the control group. This outcome supports sleep research observations that worldwide, inadequate sleep is the most prevalent sleep complaint in the elderly; which tends to be chronic and
recurrent (Engle-Friedman, 2014; Jacobs, Pace-Schott, Stickgold & Otto, 2004; Unbehaun et al., 2010). This scenario is more prevalent in elderly people residing in LTCF’s compared to the community-based elderly (Mihai & Noor, 2010). Martin, Webber and Alam (2006) found that daytime napping was a significant enough problem in LTCF’s to the extent of disrupting their engagement in Activities of Daily Living due to the early onset of fatigue. In the end, this would consequently lead to a vicious cycle of night-time awakenings and daytime sleepiness (Bonnet & Arand, 2016; Mihai & Noor, 2010). The encouraging finding of the present study that relaxation exercises combined with sleep masks induces consolidated night sleep is a significantly safe, practical and cheap contribution to the management of sleep deficiencies.

The reported sleep difficulties in the present study could be attributed to conditions and behaviors that have been repeatedly established in maintaining sleep problems (Leblanc et al., 2015a, 2015b). These include depression, anxiety or mood disorder, diminished social interaction, certain antihypertensive medications, irregular sleep schedules, daytime napping, lack of daytime physical exercise, reading or watching television at bedtime and drinking coffee in the late evenings (Gehrman, Marler & Martin, 2005; Leblanc et al., 2015a, 2015b). Furthermore, environmental factors like unnecessary bedroom lighting during sleeping time and limited circadian light exposure during daytime do interfere with sleep efficiency (Figueiro, 2015) as the seniors with medical illnesses and impairments spend more time in their bedrooms hardly venturing outdoors where they would be exposed to natural light (Mihai & Noor, 2010). As emphasized by Figueiro (2015) and Gehrman et al., (2005), reduced light exposure interferes with the regulation of circadian rhythm with the
consequences of early-morning awakenings as well as fragmented sleep in the elderly. Such chronic sleep impairment is concomitant with diminished cognitive ability and physiological functioning among the elderly contributing to increased risk of distress and the resultant disease incidences (Mezey, Fulmer, Abraham & Zwicker, 2003). This may have been the scenario in the present study.

Research indicates that unnecessary night lighting from bedside lamps, overhead lighting or security lights interfere with the synthesis of the sleep hormone, melatonin. Melatonin, an important factor in sleep restoration promotes sleep quality particularly in the elderly populace. This hormone can be increased by improving sleep hygiene to include the use of sleep masks to reduce or eliminate the detrimental effects of night lighting. As non-pharmacological interventions, physical activity and sleep hygiene have repeatedly been identified as effective measures in managing sleep impairment, elevated blood pressure and stressful events that lower the quality of life in the elderly (Bonnet & Arand, 2016; Engle-Friedman, 2014; Jacobs et al., 2004; Shinde et al., 2013; Stone, Ewing & Ancoli-Israeli, 2009). Poor sleep quality of a score of > 5 on PSQI is associated with detrimental outcomes such as inability to enjoy social relationships, diminished power to achieve daily tasks, heightened prevalence of pain and chronic diseases including cancer, poor self-rated health, cumulatively leading to amplified consumption of health care resources (Ancoli-Israel & Cooke, 2005; Grander et al., 2013). The positive beneficial outcome of relaxation exercise and sleep masks as strategies for overcoming sleep issues in the current study, warrant special attention for managing poor sleep health among the elderly.
In the present study, there were noted improvements in sleep quality in the experimental group both at mid-test and post-test. In the control group the participants had poor sleep throughout the study period risking detrimental health consequences. Stone et al., (2009) established that elderly have low sleep quality which contributes towards a deprived quality of life in terms of stress, cardiovascular morbidity and mortality (Bonnet & Arand, 2016; Engle-Friedman, 2014).

The individuals who suffer from inadequate sleep appear to use greater cardiac effort when performing Activities of Daily Living hence incurring a higher systolic blood pressure (Calhoun & Harding, 2010; Engle-Friedman, 2014). At the same time, due to inadequate sleep at night the elderly tend to suffer daytime consequences ranging from increased susceptibility to falls, deprived concentration and memory, deterioration of other medical conditions, diminished quality of life and progressive mortality (Ancoli-Israel & Cooke, 2005; Bonnet & Arand, 2016; Mezey et al., 2003).

The observations in the present study suggest that there were improvements in the quality of sleep in the experimental group over the two month treatment period, in contrast to the control group. Thus suggesting that engagement in PMR exercises and the use of sleep masks during sleep contributed to a good night’s sleep. These results support other research that has established that relaxation exercises enhances sleep quality in the elderly closely linked to a decrease in stress levels (Bonnet & Arand, 2016; Jacobs et al., 2004; Johansson et al., 2011; Leblanc et al., 2015a, 2015b). Leblanc et al., (2015a, 2015b) caution that the engagement of physical
activity close to bedtime may result in anxiety and stress and thus impair the sleep quality of the elderly. In the present study, PMR was engaged in during the morning hours and this possibly assisted in the stress relief avoiding any anxiety and stress prior to bedtime.

5.4.1 Differences Between Sleep Quality at Pre-test, Mid-test and Post-test

After four weeks of intervention, there were positive results observed in the experimental group in comparison to the control group. These results indicate that the sleep quality in the experimental group improved by a score of 5.32 while that of the control group deteriorated by one score as measured by the global score on the PSQI at mid-test. This verdict indicates that there was an improvement in the sleep quality of the respondents in the experimental group after four weeks of intervention compared to the participants in the control group who had experienced further inadequate sleep. This may be explained by the observation that lack of physical exercise and unnecessary bedroom lighting as some of the factors that maintain sleep difficulties (Figueiro, 2015) in the elderly which have been associated with their mental states (Beaulieu, 2006; Foley, Ancoli-Israel, Britz & Walsh, 2003).

It is argued that sleep becomes more and more disrupted with age due to the decline in physical health (e.g. high blood pressure) with a strong connection identified between mental health (e.g. distress) and disrupted sleep (Foley et al., 2003). Calhoun and Harding (2010), highlighted that the lack of or diminished drop in nocturnal blood pressure heightens cardiovascular risks as normally, blood pressure is expected to decrease during sleep. Such presence of poor sleep over time is linked
with a diminished quality of life and weakened psychosocial functioning (Bonnet & Arand, 2016; Engle-Friedman, 2014; NIH, 2005) encompassing cognitive impairments, physical discomfort, fatigue, mood swings and a heightened utilization of medical services (Unbehaun et al., 2010).

The use of PMR programmes and sleep masks are inexpensive and simple measures which can be followed without major cost implications (Bonnet & Arand, 2016; Shinde et al., 2013). The challenges that might encounter the intervention of sleep inadequacies using relaxation programs and sleep hygiene may include potential problems with participants’ cognitive dispensation, level of motivation, physical limitations and compliance (Benca, 2005). However, it is noted that practitioners and scientists persistently probe fresh and less-expansive methods of managing sleep disturbances (Unbehaun et al., 2010).

The decline in sleep quality as seen in the control group is a great disadvantage for the elderly since unmanaged sleep problems intensify the risk for emerging psychiatric disorders of depression, anxiety, substance abuse and/or dependency (Leblanc et al., 2015a; Necklemann, Mykletun & Dahl, 2007; Riemann & Voderholzer, 2003). Apart from psychiatric disorders, Vgontzas, Liao, Bixler, Chrousos and Vela-Bueno (2009) also established a relationship between short sleep duration (<5hours) and an increased risk of high blood pressure (Unbehaun et al., 2010). In view of such findings, there is need to focus on the management of sleep problems among the elderly so as to reduce or reverse the prevalence of medical and mental conditions associated with poor sleep quality (Engle-Friedman, 2014; Leblanc et al., 2015b).
Leblanc et al., (2015b) concluded that physical exercise before sleeping reduced the chances of the elderly suffering from depression or anxiety thus promoting the quality of life of persons in this population. In as much as the present study delved into the effect of exercises and sleep quality on blood pressure, Grander et al., (2013) advice that further research is necessitated to establish the extent to which the risk factors for cardiovascular diseases are influenced by sleep duration in terms of short and long hours of sleep in the elderly.

In reference to the detected improvement in the sleep quality of the elderly in the experimental group, it is evident that the PMR exercises and the use of the sleep masks had a positive influence. This supports literature that found that active geriatrics awaken less often at night and report longer and better sleep quality compared to their sedentary counterparts (Guimaraes, Carvalho, Yanaguibashi & Prado, 2008). This can be attributed to the neurochemical changes through the secretion of hormones such as serotonin, oxytocin, endorphins, melatonin and prolactin that are triggered by daytime exercise and the inducement of pitch darkness in the bedroom that influence wake-sleep cycles and efficiency of sleep (Figueiro, 2015; Fulghum, 2007; Leblanc et al., 2015a, 2015b; Mercola, 2012; Muriungi & Ndetei, 2013).

At bedtime, the use of sleep masks helps in blocking out unwanted light that hinders the onset of melatonin hormone secretion that would otherwise cause difficulties in falling asleep (Figueiro, 2015). It is recognized that sleep hygiene education is crucial to the elderly population because adherence to those instructions will lead to positive effects in the long run (Engle-Friedman, 2014). However, in as much as
Sleep hygiene education is an indispensable part of therapy, it is not sufficient by itself (Bonnet & Arand, 2016; Unbehaun et al., 2010). In addition, physical and psychological engagement of old persons is crucial in managing the sleep problems.

Sleep disturbances can be remedied by relaxation techniques, the aims of which are to consciously bring about natural body relaxation, lower blood pressure, and breathing rate, as well as boost calmness to induce sleep (Bonnet & Arand, 2016). Bonnet and Arand (2016), Gooneratne et al., (2011) and Shinde et al., (2013) draw our attention to complementary and alternative medicine that has been encouraged as further treatment options for hypertension and poor sleep quality, highlighting the positive effects of relaxation and sleep hygiene education. For geriatrics who tend to rely on sleep medications, research cautions that use of medications solely may not be effective and there is always the possibility of the drugs losing their efficacy overtime (Mihai & Noor, 2010).

Although the present study focused on the use of Progressive Muscle Relaxation exercises and sleep masks in managing sleep problems in the elderly, it is good to note that poor sleep has other contributing factors beyond lack of relaxation and night-time light exposure. These factors include preexisting medical conditions, mental disorders, other sleep disorders, use of certain medication and age-related changes in sleep architecture which can all interplay and contribute to poor sleep (Mihai & Noor, 2010) as observed in the present study. Therefore, for clinical purposes and especially where pharmacological interventions are prescribed, a thorough evaluation is required to decipher the precise elements contributing to inadequate sleep in each senior adult (Mihai & Noor, 2010).
Sleep research recommends that for better management of sleep inefficiency in LTCF’s as found in the present study, long term effects are better realized through behavior therapy. This is usually the first choice and includes sleep hygiene and relaxation techniques (Bonnet & Arand, 2016; Figueiro, 2015; Jacobs et al., 2004; Leblanc et al., 2015b; Unbehaun et al., 2010).

After eight weeks of intervention, the experimental group had made positive changes from poor sleep at pre-test to good sleep at post-test. The control group however had maintained poor sleep throughout the intervention period. These observations indicate that the two months of intervention had a positive effect in managing the poor sleep quality at a score of 11.18 reported at pre-test by the respondents in the experimental group who scored a mean of 4.27 denoting good sleep qualities at post-test. The non-pharmacological interventions of relaxation exercises and sleep masks appear to have jointly contributed to sleep efficiency in the geriatric population in Mji wa Huruma. In Bonnet and Arand (2016) and Mihai and Noor (2010) relaxation exercises and the use of sleep masks are identified as behavioral techniques of managing sleep deficiency in older adults. These interventions have not only minimal side effects but also a high efficacy. Hence, the intervention is highly recommended in dealing with sleep related problems in the elderly.

Support for such collaboration of sleep management techniques is echoed by Unbehaun et al., (2010) who state that ideally, relaxation exercises need to be combined with sleep hygiene education including the removal of sleep interfering objects like bedside lamps, electronics or electrical gadgets and light sources.
through the window that should be well blocked out by thick curtains or drapes. This opinion is in agreement with Figueiro (2015), who categorically states that exposure to evening light during bedtime will actually cause sleep-onset latency resulting in delayed sleep. This is because the sleep hormone, melatonin signals the body that it is time to sleep and it is synthesized under the conditions of darkness at night (Figueiro, 2015). Therefore, light emanating from sources like table clocks, bedside lamps, overhead lamps and or even security lights, delays the onset of melatonin secretion thus creating, invoking sleep difficulties in the elderly.

Sleep impairment observed at pre-test in this study reflects findings of studies in America, Brazil and Canada which established that the elderly incur sleep difficulties in LTCF’s (Engle-Friedman, 2014; Jaussent et al., 2011; Leblanc et al., 2015a). Constant sleep impairment complaints by the elderly have been attributed to myriad of stressful risk factors and events that not only cause sleep difficulties but also elevate blood pressure (BBC News, 2013; Bruno, 2013; Engle-Friedman, 2014; Fulghum, 2007; Hamidizadeh et al., 2005; NFK, 2014; Ward, 2013) all of whom were acknowledged in the present study at baseline evaluation. With documented presence of sleep impairment in the elderly, the individuals themselves have accepted the use of non-pharmacological therapeutic measures to treat the said problems compared to the pharmacological ones (Bonnet & Arand, 2016; Jacobs et al., 2004).

Similar findings were reported by Unbehaun et al., (2010) whose insomniac patients recognized cognitive behavior treatment as more satisfactory than pharmacological remedy (76% vs 31%). In addition, behavior treatment was predicted to be more
productive in the long-term (70% vs 25%) generating less side effects and more benefits for daytime functioning (Bonnet & Arand, 2016; Jacobs et al., 2004; Unbehaun et al., 2010). Mihai and Noor (2010) associated routine practice of sleep hygiene with overall sleep quality among the elderly. However, Bonnet and Arand (2016) and McCrae, Rowe and Dautovich (2006) all warn that sleep hygiene as a sole therapy for sleep inadequacies may not be as effective as combining it with behavioral treatment measures such as relaxation exercise. Therefore, the present study is unique in that a combined therapy was used involving relaxation exercises and sleep hygiene that possibly led to the improvements of sleep quality during the intervention period.

Leblanc et al., (2015a, 2015b) emphasize that the quality of sleep should be continued by promoting nonpharmacological interventions particularly sleep hygiene and relaxation habits among the elderly citizens to upgrade their quality of life. Furthermore, a seven-year longitudinal study found distinct association between relaxation exercises and longevity (Leblanc et al., 2015a, 2015b). Despite physical activity diminishing with age, it is worth noting that relaxation exercise has benefits on the quality, quantity and sleep efficiency. This is because physical exercise reduces time spent awake at night as well as daytime napping (Leblanc et al., 2015a, 2015b). Gerontologists encourage the elderly to seek professional assistance over the management of stress related issues such as sleep impairment and elevated blood pressure (Mundan et al., 2011; NFK, 2014). Bonnet and Arand (2016) and Unbehaun et al., (2010) affirm that the use of sedative antidepressants to manage sleep difficulties, especially in the elderly, is an issue of grave concern mainly due to their adverse side effects. The serious concern is not only because of
serious risk of excessive sedation on the part of the elderly person but also because most sleep medicines are likely to cause cardiovascular, urogenital or gastrointestinal side effects (Bonnet & Arand, 2016; Unbehaun et al., 2010). Worse still, sleep medications, particularly in the elderly, cause impaired cognitive ability, delirium, sleep walking, agitation, balance difficulties and poor performance of activities of daily living (Bonnet & Arand, 2016).

A word of caution to the elderly residents in the home for the aged and their caregivers is that, to achieve long-term benefits in sleep management, legally available substances like caffeine, nicotine and alcohol that interfere with sleep should be avoided (Ebrahim et al., 2013; Unbehaun et al., 2010). In addition, the elderly should avoid intermittent naps and avoid sleeping with a lit up bedside lamp. These habits increase sleep-onset latency and awakenings, thereby, reducing the sleep quality of the old people (Leblanc et al., 2015b) and in turn, leads to poorer psychological and social well-being, culminating in deplorable quality of life (Hidalgo, Gras & Garcia, 2007).
CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of Findings

The study set out to establish the efficacy of Progressive Muscle Relaxation exercises and the modification of the sleep environment on stress levels, blood pressure and sleep quality of the institutionalized elderly. An experimental design was employed, in which, the experimental group underwent an eight week intervention comprising Progressive Muscle Relaxation exercises, three times a week and concurrent use of sleep masks at night during sleeping time. The control group did not participate in the treatment but followed their regular routine activities. The study evaluated the psychological and physiological variables of both, the experimental and control groups during three testing phases of before start of intervention, half-way through intervention and completion of the intervention. The results of all the three test phases were compared between the two groups.

6.1.1 Stress Level of the Elderly

The level of stress at pre-test was recorded in terms of global stress scores which described the level as 0-13 average stress, 14-20 high stress and > 20 as very high stress. The records of stress levels showed that there were significant changes between the experimental and control group after four weeks of programme intervention. At pre-test, none of the elderly persons in the experimental group scored average stress. This changed at four weeks when there were 36.4% of them. The high stress level at mid-test registered 31.8%, a decline from 36.4% at pre-test. In addition, there were 63.6% individuals who were documented as having very high stress at pre-test but declined to 31.8% at mid-test.
These results contrasted with those of the control group who, despite having a higher population (14.3%) of individuals with an average stress at pre-test, there was an increase to very high stress (42.9%) level after four weeks. In addition, the control group recorded 47.6% in the high stress category and at pre-test 38.1% in the very high stress levels. In the experimental group, the stress level global score after four weeks stood at a mean of 16.41 whereas that of the control group was 20.19 where both entities denoted high stress. These observations were compared with the very high stress scores at pre-test of 24.32 and 21.12 for the two groups respectively. The Repeated Measures ANOVA and Post-Hoc tests showed that these results were significantly different at $p \leq 0.05$ at mid-test.

After the end of eight weeks intervention period, there were more significant changes in global stress scores between the experimental and control groups. In the experimental group, the pooled mean stress level had reduced to 12, indicating that average stress declined from very high stress level of 24.32 at pre-test. The stress level mean score in the control group remained in the high stress level at 18.48 having declined from 21.12 at pre-test.

The repeated measures ANOVA and Post-Hoc tests showed that these results were significantly different at $p \leq 0.05$ at post-test. The results were interpreted in light of changes observed between the pre-test and post-test where the experimental group had demonstrated an average level of stress, high stress and very high stress by a population of 72.7%, 18.2% and 9.1% respectively whereas the control group documented the same levels of stress by 23.8%, 42.9% and 33.3% respectively.
6.1.2 Systolic and Diastolic Blood Pressure Measures of the Elderly

At pre-test evaluation, it was observed that 31.8% of the participants in the experimental group had a normal blood pressure against 38.1% in the control group. In the pre-hypertension category, 40.9% were in the experimental group while the control group had 28.6%. A total of 18.2% and 9.5% had Stage 1 hypertension while 9.1% and 19.1% had Stage 2 hypertension in the experimental and control groups respectively. The mean of systolic blood pressure for the experimental group at pre-test was 129.95±19.57 mmHg and that of the control group was 127.86±25.14 mmHg.

After four weeks of intervention, there was no significant difference in the systolic blood pressure between the experimental and control groups despite a decrease in the systolic blood pressure of 5 mmHg in the experimental group compared to a rise in the control group of 1.52 mmHg. The mean systolic blood pressure at mid-test was 124.95±16.40 mmHg and 129.38±20.32 mmHg for the experimental and control groups compared to pre-test which was 129.95 ± 19.57 mmHg and 127.86±25.14 mmHg for the same groups respectively.

At post-test, the systolic blood pressure had decreased by 7mmHg in the experimental group unlike in the control group whose measure had increased by 2.24 mmHg. The mean systolic blood pressure for the experimental and control groups at post-test was 122.95±14.42 mmHg and 130.10±20.16 mmHg compared to 129.95±19.57 mmHg and 127.86±25.14 mmHg at pre-test respectively.
In diastolic blood pressure, there was no significant difference at mid-test between the experimental and control groups despite there being a decrease in DBP. The experimental group had a mean decrease in DBP of 2.64 mmHg while the control group had an increase in the same by 0.81 mmHg. At this testing phase, the mean diastolic blood pressure for the experimental group was 72.45±12.28 mmHg and that of the control group was 75.71±8.98 mmHg as compared to 75.09±9.41 mmHg and 74.90±7.84 mmHg at pre-test for the two groups respectively.

In light of these results, at mid-test, 50% in the experimental group recorded normal blood pressure compared to 33.3% in the control group. A total of 31.8% and 42.9% were found to be prehypertensive in the experimental and control groups respectively. Stage 1 hypertension had 18.2% in the experimental group and 9.5% in the control group while Stage 2 hypertension had 14.3% individuals in the control group.

At post-test, eight weeks into the study, 54.5% of the participants in the experimental group had normal blood pressure whereas the control group had 28.6%. In the prehypertension range, the experimental group recorded 45.5% while the control group had 47.6% of the elderly individuals. There were no participants with Stage 1 or Stage 2 hypertension in the experimental group against the 9.5% and 14.3% in the control group respectively. These results were interpreted in light of changes noted in both systolic and diastolic blood pressure measures between experimental and control groups at post-test. The observed decrease in systolic blood pressure in the experimental group as compared to pre-test concluded that the change was statistically insignificant at $p \leq 0.05$. 
Similarly at post-test, there were statistically insignificant differences in the diastolic blood pressure in the decrease between the experimental and control groups \((p \leq 0.05)\). In the experimental group diastolic blood pressure had decreased by 4.73 mmHg compared to an increase in the control group of 3.86 mmHg. The mean diastolic blood pressure at post-test was \(70.36 \pm 11.60\) mmHg and \(78.76 \pm 13.96\) mmHg for the experimental and control groups in comparison to \(75.09 \pm 9.41\) mmHg and \(74.90 \pm 7.84\) mmHg at pre-test respectively.

### 6.1.3 Sleep Quality of the Elderly

In terms of sleep quality, good sleep was described by a global score of \(\leq 5\) while that of poor sleep by \(> 5\). At pre-test, it was noted that 22.7% and 77.3% of the elderly persons in the experimental group had good and poor sleep respectively whereas in the control group there were 23.8% and 76.2% with good and poor sleep respectively.

At mid-test, four weeks of programme intervention, there were significant changes at \(p \leq 0.05\) in the sleep quality between the experimental and control groups. There was an improvement in the sleep quality of the individuals in the experimental group from a mean of 11.18 at pre-test to 5.86 at mid-test having decreased by 5.32. This mean of 5.86 stood slightly above good sleep as compared to that of the control group that was 10.67 displaying poor sleep having increased by one score from 9.67 at pre-test. At this point, 45.5% of individuals in the experimental group had good sleep and 54.5% were poor sleepers showing an improvement in sleep quality at 4 weeks of intervention. In the control group, 14.3% were good sleepers and 85.7%
had poor sleep exhibiting worsened sleep quality at 4 weeks of intervention. After the intervention period at post-test, there were further significant changes at $p \leq 0.05$ in the sleep quality between the experimental and control groups. There were 81.8% of the experimental elderly having good sleep quality compared to 4.8% in the control group. The elderly people with poor sleep at post-test were 18.2% and 95.2% in the experimental and control groups respectively. The sleep quality at post-test had improved by a count of 6.91 in the experimental group from a mean of 11.18 at pre-test to 4.27 displaying good sleep in comparison to that of control group that was at 10.90 showing poor sleep having deteriorated by 1.23 at post-test from 9.67 at pre-test.

6.2 Conclusions

This investigation concludes that Progressive Muscle Relaxation exercises and the use of sleep masks when sleeping was effective in lowering stress levels, blood pressure as well as in improving the sleep quality of the elderly in Mji wa Huruma home for the aged. However, for significant changes in blood pressure and based on the insignificant changes found in the study in Mji wa Huruma, it was concluded that the intervention should take longer than eight weeks. In relation to stress level and sleep quality, the study concludes that the respective psychological and physiological adaptations were noticed after just four weeks of intervention.

The prevalence of high stress, high blood pressure and poor sleep quality at pre-test in this study concurs with other worldwide studies that have established that these ill health conditions are a true picture of the elderly, particularly in those residing in
homes for the aged. The lifestyle modification in the elderly living in Mji wa Huruma involving PMR exercises and habitual use of sleep masks were established as helpful in the management of high blood pressure, distress and poor sleep quality. This is because these interventions and practices serve as educative channels that add onto the old adult’s knowledge, skills and motivation paramount to mitigation of the detrimental effects of those physiological and psychological variables.

It is widely established that sleep environment contributes significantly to sleep problems especially because the elderly are disturbed by LAN that hinders melatonin secretion. Inadequate sleep at night which is very common in the elderly due to poor sleep environment becomes a stressor that can lead to stress related health conditions. The development of consistent and satisfying relaxation practices and avoidance of light at night, promotes rest and relaxation which, in turn moderates systolic and diastolic blood pressure. This could either decrease the amount of or need for drug therapy in the elderly.

Similarly, relaxation exercises boost relaxation response which assists the body in confronting stress and hence, curtail mood disorders such as depression which are common in the elderly. Research indicates that, this intervention generates calmness in the body’s muscles, not only during the day, but also when the elderly are resting at night, inducing restful sleep. These relaxation exercises appeared to promote a more regular sleep pattern and stress relief in the elderly living in Mji wa Huruma. These non-pharmacological interventions have been recognized in the current study as being effective in the management of high stress levels, high blood pressure and sleep disturbances in the elderly.
Sleep is considered a basic ingredient for conserving energy. This helps in averting fatigue consequently providing rest for organ repair and stress relief. The combined stress management and coping skills employed in the study were beneficial interventions in enhancing sleep for the elderly in this home for the aged. The relief from stress prevents stressors like worries and anxieties from initiating muscular contractions with tension throughout the body, thereby, facilitating physical and mental relaxation. This relaxation, together with blocked out light at night, were found to promote rest during sustained sleep as compared to the effect of sleep disturbances in the presence of unnecessary light in the bedroom and with resultant muscle tension. It was determined that practices involving attention to the sleep environment of the elderly in the institution promoted better rest and sleep. Not only can these lifestyle changes help these elderly in Mji wa Huruma recover from poor health conditions, thereby minimizing medication, but they also assist in maintaining or promoting good health.

This programme involving relaxation training and use of sleep masks can further result in clinically significant benefits for these institutionalized elderly with high blood pressure, poor sleep and leading a life of distress. Habitual physical and psychological relaxation in terms of adequate sleep and rest can improve function, mood and relieve stress in the elderly.

Finally, since the PMR programme and use of sleep masks are simple and easy to apply in this home for the aged, they can be easily adopted by the elderly. They can also be combined with medication and any other therapeutic interventions for treating and or managing other medical conditions.
6.3 Recommendations for Practice

Sleep disturbances in the elderly have been identified as causative agents of hypertension and chronic stress. To help counteract this vicious cycle, it seems that efforts by an inter-disciplinary geriatric team of caregivers, nurses, physicians, psychologists and sleep therapists may prove more productive than the traditional routine care of the elderly in the homes for the aged. In view of this statement, the following recommendations for practice and policy are made based on the findings from this study:

1. Counselling and motivation on lifestyle modifications with particular emphasis on PMR exercises and sleep hygiene may be beneficial to hypertensive and prehypertensive old adults living in institutions. This is essential because the elderly on antihypertensive therapy may be sensitized to other beneficial non-pharmacological therapies like relaxation exercises. These can either complement or replace conventional therapies in lowering blood pressure. This involvement of the old adults in their treatment regimen will increase the likelihood of improved blood pressure control and adherence with minimal adverse reactions.

2. In reference to the very high stress levels and poor sleep quality noted at pre-test, the elderly living in homes for the aged should be educated on stress and sleep management techniques. This education should also include the detrimental effects of high stress, poor sleep and high blood pressure with every effort put in place to maximize relaxation and rules of sleep hygiene. Particular attention should be placed on the sleep environment in the institutions so as to limit light at night while also encouraging daylight exposure in order to promote better sleep. These behavioral strategies may
help the institutions to offer better comfort, functional independence and overall quality of life among the elderly.

3. It is recommended that caregivers and policy makers consider incorporating non-pharmacological therapies such as PMR exercises and sleep hygiene in the routine programme of the elderly living in institutions in a bid to providing new avenues for preventing and managing health conditions like high stress, high blood pressure and inadequate sleep. Relaxation exercises will enhance a good night’s sleep as well as create an environment conducive for mental and physical relaxation hence promote sleep quality.

4. Considering the usefulness and reliability of the instruments used in data collection, the Pittsburgh Sleep Quality Index, sleep diary and Perceived Stress Scale questionnaires could frequently be used by primary caregivers and physicians in Kenyan homes for the aged to examine the status of the respective psychological variables to accurately target relevant management of stress levels, blood pressure and sleep quality.

6.4 Recommendations for Further Research

There is evidence of efficacy of PMR exercises and the use of sleep masks in promoting good health in relation to stress level, blood pressure and sleep quality. However, considering the labyrinth of the relationships amongst the above mentioned variables, further research is paramount to address the following areas:

1. The current study in Mji wa Huruma focused on the sleep quality of the elderly having combined the spectrum of chronic sleep complaints. There is further need to dissect these specific sleep disturbances, for example,
medical conditions, medications, psychiatric conditions and use of substances; for every institutionalized individual in order to identify appropriate intervention for both the quality and quantity of sleep in a Kenyan situation.

2. The association between stress, high blood pressure and inadequate sleep, in foreign countries is widely documented and therefore, further extensive experimental studies are imperative to give a clear picture of this in Kenyan homes for the aged.

3. The findings at pre-test in the current study established that the elderly in these institutions have very high stress levels, high blood pressure and poor sleep quality. These multifaceted threats to good health and functional independence of the elderly demands prompt and aggressive management in order to promote the quality of life for this population. Therefore, more experimental studies would likely be helpful throughout the country utilizing PMR exercises and reduced light at night during sleeping.

4. The study investigated the effect of PMR exercises and the modification of the sleep environment on stress levels, blood pressure and sleep quality of the elderly in Mji wa Huruma home for the aged. Similar study on a larger sample and for a longer duration or higher frequency may be helpful in the long term management of high stress, hypertension and poor sleep quality.

5. In relation to the findings on predicted positive effect of PMR exercises and use of sleep masks on achieving normalcy on stress level, blood pressure and sleep quality; further research covering these durations are recommended to ascertain their validity and efficacy in the elderly people living in these institutions.
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APPENDIX A: RESEARCH AUTHORIZATION FROM KENYATTA UNIVERSITY

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke
P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530

Our Ref: H87/20016/2010

DATE: 15th November 2014

The Principal Secretary,
Higher Education, Science & Technology,
P.O. Box 30040,
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION GITHANG’A JULIAH WAMBUI—REG. NO. H87/20016/2010

I write to introduce Ms. Githang’a Juliah Wambui who is a Postgraduate Student of this University. She is registered for Ph.D degree programme in the Department of Physical and Health Education.

Ms. Githang’a intends to conduct research for a Ph.D Proposal entitled, “Effects of Progressive Muscle Relaxation and Sleep Environment Modification on Stress and Blood Pressure among Institutionalized Elderly in Nairobi, Kenya”.

Any assistance given will be highly appreciated.

Yours faithfully,

MRS. LUCY N. MBAABU
FOR: DEAN, GRADUATE SCHOOL

[Signature]

[Stamp: KENYATTA UNIVERSITY OFFICE OF DEAN]
APPENDIX B: KENYATTA UNIVERSITY ETHICAL APPROVAL

KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE

Email:  chairman.kuercc@ku.ac.ke
        secretary.kuercc@ku.ac.ke
        erckua2008@gmail.com
Website: www.ku.ac.ke

Our Ref: KU/R/COMM/51/627
Date:  19th February, 2015

Githang’a Juliah Wambui,
Kenyatta University,
P.O Box 43844,
Nairobi

Dear Wambui

APPLICATION NUMBER PKU/438/1347 – “EFFECTS OF PROGRESSIVE MUSCLE RELAXATION AND SLEEP ENVIRONMENT MODIFICATION ON STRESS AND BLOOD PRESSURE AMONG INSTITUTIONALIZED ELDERLY IN NAIROBI, KENYA”.

1. IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic “Effects of progressive muscle relaxation and sleep environment modification on stress and blood pressure among Institutionalized Elderly in Nairobi, Kenya”.

2. APPLICANT
Githang’a Juliah Wambui

3. STUDY SITE
Nairobi County, Kenya.

4. DECISION
The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines AND APPROVED that the research may proceed for a period of ONE year from 19th February 2015.

5. ADVICE/CONDITIONS
   i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
   ii. Serious and unexpected adverse events related to the conduct of the study are reported to this board immediately they occur.
   iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
   iv. Submit an electronic copy of the protocol to KUERC.

When replying, kindly quote the application number above.
If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.

DR. TITUS KAHIGA
CHAIRMAN ETHICS REVIEW COMMITTEE

I ……………………………………….. accept the advice given and will fulfill the conditions therein.

Signature……………………………… Dated this day of ……………………………………… 2015.

cc: Vice-Chancellor
    DVC-Research Innovation and outreach
APPENDIX C: RESEARCH AUTHORIZATION FROM NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471, 2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacostl.go.ke
Website: www.nacostl.go.ke
When replying please quote

Ref. No. 11th February, 2015

NACOSTI/P/15/0923/4914

Juliah Wambui Githanga
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “Effects of progressive muscle relaxation and sleep environment modification on stress and blood pressure among institutionalized elderly in Nairobi, Kenya” I am pleased to inform you that you have been authorized to undertake research in Nairobi County for a period ending 31st December, 2015.

You are advised to report to the County Commissioner and the County Director of Education, Nairobi County before embarking on the research project.

On completion of the research, you are required to submit two hard copies and one soft copy in pdf of the research report/thesis to our office.

DR. S. K. LANGAT, OGW
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.
APPENDIX D: RESEARCH PERMIT FROM NACOSTI

CONDITIONS:

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do so may lead to the cancellation of your permit.
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice.

RESEARCH CLEARANCE PERMIT

REPUBLIC OF KENYA

National Commission for Science, Technology and Innovation

This is to certify that

Ms. JULIATH WAMBU GITANGA
of KENYATTA UNIVERSITY, 4941-200,
Nairobi, has been permitted to conduct research in Nairobi County on the topic: EFFECTS OF PROGRESSIVE MUSCLE RELAXATION AND SLEEP ENVIRONMENT MODIFICATION ON STRESS AND BLOOD PRESSURE AMONG INSTITUTIONALIZED ELDERLY IN NAIROBI, KENYA
for the period ending: 31st December, 2015

Applicant's Signature

Date: 11th February, 2015

Secretary, National Commission for Science, Technology & Innovation

Serial No. A 4932

Date of Issue: 11th February, 2015

roduced: 29th February, 2015

Fee Received: Ksh. 2000

Permit No.: NACOSTI/P/15/0923/4914
APPENDIX E: RESEARCH AUTHORIZATION FROM NAIROBI CITY COUNTY

NAIROBI CITY COUNTY

DEPARTMENT OF HUMAN RESOURCES DEVELOPMENT

Ref: HRD/22/HO/VOL.111/1150/2015/Iwn

Date: 8th MAY, 2015

JULIAH WAMBUI GITHANG`A
DEPARTMENT OF PHYSICAL AND HEALTH EDUCATION
KENYATTA UNIVERSITY

Dear Madam,

RE: RESEARCH AUTHORIZATION

Reference is hereby made to your application letter dated 18th March, 2015, on the above subject;

Nairobi City County has approved your request subject to the following;

1. The period of research will be two (2) Months with effect from 11th May, 2015 to 10th July, 2015.
2. That during your research there will be no costs devolving on the County.
3. The research will be used for academic purposes only
4. That you undertake to indemnify the County against any claim that may arise from your research.
5. You are not authorized to release any information without vetting and authority from this office.
6. You are expected to submit to the undersigned a copy of the final research document for the county's retention (within one month after completion of the research study).
7. You are expected to pay research fee of thousand shillings Ksh. (5,000/=).

You will be attached to Social Services department Mji wa Huruma home for the aged. Please report to the Chief Administrative Officer - Social Services

HENRY OMIDO

FOR: DIRECTOR HUMAN RESOURCES DEVELOPMENT.
APPENDIX F: PROGRESSIVE MUSCLE RELAXATION PROTOCOL

Instructions:

Step 1. Assume a comfortable position. You may lie down or sit down; loosen any tight clothing, close your eyes and be quiet.

Step 2. Assume a passive attitude. Focus on yourself and on achieving relaxation in muscles in the order shown below. Tune out all other thoughts.

Step 3. Inhale and tense each muscle group (hard but not to the point of cramping) for 4 to 10 seconds, then exhale and suddenly and completely relax the muscle group (not gradually). Give yourself 10 to 20 seconds to relax.

Step 4. Tense and relax each muscle group as follows:

<table>
<thead>
<tr>
<th>Muscle Groups</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forehead</td>
<td>Wrinkle your forehead; try to make your eyebrows touch your hairline for five seconds. Relax.</td>
</tr>
<tr>
<td>Eyes and nose</td>
<td>Close your eyes as tightly as you can for five seconds. Relax.</td>
</tr>
<tr>
<td>Lips, Cheeks and Jaw</td>
<td>Open your mouth wide for five seconds. Relax. Feel the warmth and calmness in your face.</td>
</tr>
<tr>
<td>Fingers and hands</td>
<td>Extend your arms in front of you. Clench your fists tightly for five seconds. Relax. Feel the warmth and calmness in your hands.</td>
</tr>
<tr>
<td>Forearms</td>
<td>Bend your wrists up and down for five seconds. Relax.</td>
</tr>
<tr>
<td>Upper arms</td>
<td>Bend your elbows. Tense your biceps for five seconds. Relax. Feel the tension leave your arms.</td>
</tr>
<tr>
<td>Shoulders</td>
<td>Lift your shoulders up to your ears for five seconds. Relax.</td>
</tr>
<tr>
<td>Neck</td>
<td>Bend your head to the right then left for five seconds. Relax.</td>
</tr>
<tr>
<td>Neck and Upper back</td>
<td>Tuck your chin to your chest for five seconds. Relax.</td>
</tr>
<tr>
<td>Upper back</td>
<td>Bring your shoulder blades together for five seconds. Relax.</td>
</tr>
<tr>
<td><strong>Chest</strong></td>
<td>Take a deep breath that pushes out the chest for five seconds. Relax.</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Stomach</strong></td>
<td>Tighten your stomach muscles for five seconds. Relax.</td>
</tr>
<tr>
<td><strong>Back</strong></td>
<td>Arch your back for five seconds without straining. Relax. Feel the anxiety and tension disappearing.</td>
</tr>
<tr>
<td><strong>Buttock and Thighs</strong></td>
<td>Tighten your buttock and thigh muscles by pressing your legs together as tightly as you can for five seconds. Relax.</td>
</tr>
<tr>
<td><strong>Legs</strong></td>
<td>Straighten and tense your legs for five seconds. Relax.</td>
</tr>
<tr>
<td><strong>Feet and Toes</strong></td>
<td>Bend your ankles toward your body as far as you can and curl your toes as tightly as you can for five seconds. Relax.</td>
</tr>
</tbody>
</table>

**Step 5.** Focus on any muscles which may still be tense. If any muscle remains tense, tighten and relax that specific muscle three or four times.

**Step 6.** Fix the feeling of relaxation in your mind. Resolve to repeat the process again.

**Step 7.** When you are finished, return to alertness by counting backwards from 5 to 1.

**Note:** People respond differently to various activities. Some feel pleasant or refreshed, and others feel calm and relaxed. Some people notice little change the first time, but with practice, their control increases - as well as the benefits. If you practice this activity, your relaxation should increase.
APPENDIX G: PERCEIVED STRESS SCALE

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.

Name _________________________________________ Date _________

Age _______ Gender (Circle): M / F

0 = Never  1 = Almost Never  2 = Sometimes  3 = Fairly Often  4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly? ........................................... 0 1 2 3 4

2. In the last month, how often have you felt that you were unable to control the important things in your life? .................................................. 0 1 2 3 4

3. In the last month, how often have you felt nervous and “stressed”? .......................................................... 0 1 2 3 4

4. In the last month, how often have you felt confident about your ability to handle your personal problems? ........................................... 0 1 2 3 4

5. In the last month, how often have you felt that things were going your way? .......................................................... 0 1 2 3 4

6. In the last month, how often have you found that you could not cope with all the things that you had to do? ........................................... 0 1 2 3 4

7. In the last month, how often have you been able to control irritations in your life? .......................................................... 0 1 2 3 4

8. In the last month, how often have you felt that you were on top of things? .......................................................... 0 1 2 3 4
9. In the last month, how often have you been angered because of things that were outside of your control? ..............................0 1 2 3 4

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? ..........................................................0 1 2 3 4

**Scoring:** PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items.
MTAZAMO WA KIWANGO CHA MSONGO WA AKILI.

Maswali katika kiwango hiki yanahusu kwa kipindi cha mwezi moja uliopita. Katika kila swali utahitajika kujibu kwakekuweka mviringo katika jibu ili kuonyesha ni mara ngapi ulihisi au kwa kawaza kwa namna fulani.

Jina_________________________________________Tarehe
________________________________________

Umri________ Jinsia(Weka mviringo): Kiume/Kike

0 = Sijawahi  1 = Kidogo sana  2 = Wakati mwingine  3 = Mara kwa mara 4 = Kila wakati

1. Katika kipindi cha mwezi moja uliopita, umekasirika mara ngapi kutokana na kitu kilichofanyika bila matarajio yakato?.................................0 1 2 3 4

2. Katika kipindi cha mwezi moja uliopita, ni mara ngapi ulihisi kuwa hauna uwezo wa kudhibiti au kukabiliana na mambo muhimu katika maisha yako? .........................

0 1 2 3 4

3. Kwa kipindi cha mwezi moja uliopita, ni mara ngapi ulishikwa na uoga au kuwa na msongo wa akili. ......................................................... 0 1 2 3 4

4. Katika kipindi cha mwezi moja uliopita, ni mara ngapi ulihisi kuwa na ujasiri wa kukabiliana na matatizo yake ya kibinafsi?.................................0 1 2 3 4

5. Katika kipindi cha mwezi moja uliopita, ni mara ngapi ulihisi kuwa mambo yanakwenda sawa katika maisha yako?.................................0 1 2 3 4

6. Katika kipindi cha mwezi moja uliopita, ni mara ngapi ulijipata katika hali ya kushindwa kukabiliana na shughuli zote ulizofaa kufanya? .................................

0 1 2 3 4

7. Katika kipindi cha mwezi moja uliopita, ni mara ngapi umeweza kukabiliana na mambo yanayokuchukiza katika maisha yako?......................0 1 2 3 4
8. Katika kipindi cha mwezi moja uliopita, ni mara ngapi umehisi kwamba unaweza kudhibiti au kukabiliana na hali yako? ..........................01 2 3 4
9. Katika kipindi cha mwezi moja uliopita, ni mara ngapi umekasirishwa na mambo ambayo hukuweza kuyadhibiti au kukabiliana nayo?...........0 1 2 3 4
10. Katika kipindi cha mwezi moja uliopita, ni mara ngapi ulihisi kwamba unalemewa na ugumu wa maisha kiwango kwamba uliona unashindwa kukabiliana na hali hiyo? ............................0 1 2 3 4

**Kujumlisha:** Jumla ya alama za mtazamo wa msongo wa akili zinapatikana kwa kugeuza majibu (kwa mfano 0 = 4, 1 = 3, 2 = 2, 3 = 1 na 4 = 0) kwa vipengele vinne vilivyotajwa (kipengele cha 4, 5, 7 na 8) na kisha kujumlisha kwa viwango vya vipengele vyote.
APPENDIX H: BLOOD PRESSURE ASSESSMENT PROTOCOL

Instructions on how to use a blood pressure monitor

1. Make sure he/she does not need to use the toilet, and that he/she has not just eaten a big meal. Do not measure blood pressure within 30 minutes of drinking caffeine or smoking.

2. Ensure the client has worn loose-fitting clothes like a short sleeved t-shirt so that you can push the sleeve up comfortably.

3. Always use the same arm for blood pressure readings, as each arm will give you a slightly different reading. If possible, use the arm that the client’s doctor or nurse uses when measuring his/her blood pressure.

4. Before you take the readings, let the client rest for five minutes. He/she should be sitting down in a quiet place, preferably at a desk or table, with the arm resting on a firm surface and feet flat on the floor.

5. Make sure the arm is supported and that the cuff around his/her arm is at the same level as the heart. You may need to support the arm with a cushion to be sure it is at the correct height. The arm should be relaxed, not tensed.

How to take blood pressure using a home blood pressure monitor

1. Put the cuff on following the instructions that came with the monitor.

2. Make sure the client is relaxed and comfortable. If anxious or uncomfortable, this will make blood pressure rise temporarily.

3. When you are taking readings, ensure the client is still and silent. Moving and talking can affect the reading.

4. Take two or three readings, each about two minutes apart, and then work out the average.
## APPENDIX I: BLOOD PRESSURE RECORD

Name…………………… Age………… Residence……………………

<table>
<thead>
<tr>
<th>Pre-Testing</th>
<th>Post-Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date ………..</td>
<td>Date ………..</td>
</tr>
<tr>
<td>Location</td>
<td>Location</td>
</tr>
<tr>
<td>Tester’s name ………..</td>
<td>Tester’s name ………..</td>
</tr>
</tbody>
</table>

### First Reading
- **Systolic Pressure**
  - Right Arm…….
  - Left Arm…….
- **Diastolic Pressure**
  - Right Arm…….
  - Left Arm…….
- **Heart Rate**

### Second Reading
- **Systolic Pressure**
  - Right Arm…….
  - Left Arm…….
- **Diastolic Pressure**
  - Right Arm…….
  - Left Arm…….
- **Heart Rate**

### Average Reading
- **Systolic Pressure**
  - Right Arm…….
  - Left Arm…….
- **Diastolic Pressure**
  - Right Arm…….
  - Left Arm…….
- **Heart Rate**
- **Medication if any?……………….**
APPENDIX J: PITTSBURGH SLEEP QUALITY INDEX (PSQI)

Instructions: The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

During the past month,

1. When (at what time) do you usually go to bed? ___________________

2. How long (in minutes) has it taken you to fall asleep each night? ___________________

3. When (at what time) have you usually gotten up in the morning? ___________________

4. How many hours of actual sleep do you get at night? (This may be different than the number of hours you spend in bed) ___________________

5. During the past month, how often have you had trouble sleeping because you…

<table>
<thead>
<tr>
<th>a. Cannot get to sleep within 30 minutes</th>
<th>Not during the past month (0)</th>
<th>Less than once a week (1)</th>
<th>Once or twice a week (2)</th>
<th>Three or more times week (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Wake up in the middle of the night or early morning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Have to get up to use the bathroom</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Cannot breathe comfortably</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Cough or snore loudly</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Feel too cold</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Feel too hot</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Have bad dreams</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Have pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Other reason(s), please describe, including how often you have had trouble sleeping because of this</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. During the past month, how often have you taken medicine (prescribed or “over the counter”) to help you sleep?

7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?

9. During the past month, how would you rate your sleep quality overall?

<table>
<thead>
<tr>
<th>Very good (0)</th>
<th>Fairly good (1)</th>
<th>Fairly bad (2)</th>
<th>Very bad (3)</th>
</tr>
</thead>
</table>

**Scoring:**

Add the seven component scores together ________ **Global PSQI Score ________**
**KIPIMO CHA UBORA WA USINGIZI CHA PITTSBURGH (PSQI)**

**Maagizo:** Maswali yafuatayo yanahusu tabia zako za kawaida za kulala kwa kipindi cha mwezi moja uliopita. Majibu yako sharti yawe sahihi kwa mchana na usiku wa mwezi moja uliopita pekee. Tafadhali jibu maswali yote.

Kwa kipindi cha mwezi moja uliopita,

1. Umekuwa ukilala wakati gani(saa ngapi)?

2. Umekuwa ukichukua muda gani (dakika ngapi) ili kushikwa na usingizi kila usiku?

3. Ni wakati gani (saa ngapi) umekuwa ukiamka asubuhi?

4. Wewe hupata saa ngapi za kulala usiku? (Hii inaweza kuwa tofauti na idadi ya saa unazokuwa kitandani)

<table>
<thead>
<tr>
<th>5. Kwa kipindi cha mwezi moja uliopita, ni mara ngapi umekuwa na matatizo ya usingizi au kulala kwa sababu…</th>
<th>Sio katika mwezi moja uliopita (0)</th>
<th>Chini ya mara moja kwa wiki (1)</th>
<th>Mara moja au mbili kwa wiki (2)</th>
<th>Mara tatu au zaidi kwa wiki (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Huwezi kushikwa na usingizi kwa muda wa dakika 30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Unagutuka usiku wa manane au unaamka mapema sana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Unafaa kuantika uoge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Huwezi kupumua vizuri</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Unakohoa au kukoroma kwa sauti</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Unahisi baridi sana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Unahisi joto</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Unaota ndoto mbaya</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Una maumivu</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Sababu nyinge au zingine. Tafadhali zifafanue, ikiwa ni pamoja na mara ngapi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
umeshindwa kulala kutokana na sababu hizi.

6. Kwa kipindi cha mwezi moja uliopita, umemeza dawa za kukusaidia kulala ulizopewa na daktari au kununua madukani mara ngapi?

7. Kwa kipindi cha mwezi moja uliopita, ni mara ngapi umekuwa na tatizo la kuwa macho bila kulala unapoendesha gari, kula chakula, au kushiriki katika shughuli za kijamii?

8. Kwa kipindi cha mwezi moja uliopita, umetatatizika vipi katika kuendelea kuwa na hamu au shauku ya kuona mambo yakifanyika

<table>
<thead>
<tr>
<th>Mzuri sana (0)</th>
<th>Mzuri (1)</th>
<th>Mbaya(2)</th>
<th>Mbaya sana (3)</th>
</tr>
</thead>
</table>

9. Kwa kipindi cha mwezi moja uliopita, unaweza kudhiria vipi kwa ujumla ubora wa usingizi au kulala kwako?

**Kujumlisha:**

Weka vipengele vyote saba vya kujumlisha pamoja. _____Global PSQI Score _____


APPENDIX K: SLEEP DIARY

Name: ___________________________ Residence: _______________________

Week Beginning: _____________________________

Month: __________________

Measuring the pattern of your sleep

<table>
<thead>
<tr>
<th></th>
<th>DAY 1</th>
<th>DAY 2</th>
<th>DAY 3</th>
<th>DAY 4</th>
<th>DAY 5</th>
<th>DAY 6</th>
<th>DAY 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>What time did you rise from bed this morning?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At what time did you get to bed last night?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How many times did you wake up during the night?</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>How long were you awake during the night (in total)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>About how long did you sleep altogether (hours/minutes)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How much alcohol did you take last night?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How many sleeping pills did you take to help you sleep?</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MEASURING THE QUALITY OF YOUR SLEEP

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>How well do you feel this morning?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Not at all</td>
<td>1 2 3</td>
<td>4</td>
<td>Moderately</td>
<td></td>
<td></td>
<td>Very</td>
<td></td>
</tr>
<tr>
<td>How enjoyable was your sleep last night?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Not at all</td>
<td>1 2 3</td>
<td>4</td>
<td>Moderately</td>
<td></td>
<td></td>
<td>Very</td>
<td></td>
</tr>
<tr>
<td>How much sun exposure did you get between 10am to 3 pm?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 mins</td>
<td>5-30 mins</td>
<td>&gt;30 mins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**SHAJARA YA USINGIZI**

<table>
<thead>
<tr>
<th></th>
<th>SIKU 1</th>
<th>SIKU 2</th>
<th>SIKU 3</th>
<th>SIKU 4</th>
<th>SIKU 5</th>
<th>SIKU 6</th>
<th>SIKU 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uliamka saa ngapi asubuhi?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulilala saa ngapi jana jioni?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uligutuka mara ngapi usiku wa jana ulipokuwa ukilala?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulikuwa macho kwa muda gani (kwa jumla) ulipogutuka usingizini jana jioni?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulilala kwa muda gani jana usiku (saa/dakika)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulikunywa pombe kiwango gani jana usiku?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulimenza tembe ngapi za kukufanya ulele?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## KUPIMA UBORA WA USINGIZI WAKO

<table>
<thead>
<tr>
<th>Unahisi vizuri kwa kiwango kipi asubuhi ya leo?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibaya sana</td>
<td>Vizuri</td>
<td>Vizuri sana</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Usingizi wako ulikuwa wa kupendeza kiwango gani usiku wa kuamkia leo</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haukupendeza</td>
<td>Kiasi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulipendeza Zaidi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Uliota jua kwa muda gani kati ya saa nne asubuhi na saa tisa alasiri kila siku?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kati ya dakika 0-5, 5-30, Zaidi ya dakika 30.</td>
</tr>
</tbody>
</table>
APPENDIX L: INTRODUCTORY LETTER

Juliah Wambui Githang’a,
Department of Physical and Health Education
1st May, 2015

THROUGH:
The Chairman-Department of Physical and Health Education,
Kenyatta University.

TO:
CEO-National Commission for Science, Technology and Innovation,

Dear Sir/Madam,

RE: REQUEST FOR RESEARCH PERMIT

I am a post-graduate student at Kenyatta University, conducting a research study on the elderly for my PhD. The study is aimed at investigating the effectiveness of Progressive Muscle Relaxation therapy and Sleep Environment Modification on stress, blood pressure and sleep among elderly persons residing in the homes for the aged in Nairobi County between June and August, 2015.

The researcher, with adequate measures taken, will visit the home of residence to conduct an assessment and training whose procedures will not pose any risk to participants’ health. Data on stress levels and sleep quality will be collected by researcher using questionnaires while blood pressure will be measured from the upper arm by a doctor using a blood pressure monitor.
Participants in the experimental group will be issued with a sleeping mask for use every night during sleeping time. Relaxation exercises will be professionally conducted three times a week, for 20 -30 minutes in a therapy room for two consecutive months by the researcher. For the control group, the intervention will be conducted subsequent to the treatment period. After the intervention, all the research variables namely stress, sleep quality and blood pressure will be tested using the same procedures.

This exploration will enrich the database on ways of ameliorating the quality of living of the elderly citizens in the wake of managing hypertension and other stress related disorders. The information obtained will be treated with utmost confidentiality. The product of the examination will be employed to determine feasible and effective measures of service delivery strategies to the elderly populace. For this reason, your invaluable assistance will go a long way towards the achievement of this objective.

Thank you in advance and God bless.

Yours Faithfully,

Juliah Wambui Githang’a
APPENDIX M: INTRODUCTORY LETTER

Juliah Wambui Githang’a, - Department of Physical and Health Education

1st May, 2015

THROUGH:

The Chairman-Department of Physical and Health Education,
Kenyatta University.

TO:

The Administrator- Home for the Aged,

Dear Sir/Madam,

**RE: REQUEST FOR RESEARCH ASSISTANCE**

I am a post-graduate student at Kenyatta University, conducting a research study on the elderly. The study is aimed at investigating the effectiveness of Progressive Relaxation Therapy and Sleep Environment Modification on stress, blood pressure and sleep among elderly persons residing in your home between June and August, 2015.

The researcher, with adequate measures taken, will visit the home of residence to conduct an assessment and training whose procedures will not pose any risk to participants’ health. Data on stress levels and sleep quality will be collected by the researcher using questionnaires while blood pressure will be measured from the upper arm by the doctor on call in the home using a blood pressure monitor.
Participants in the experimental group will be issued with a sleeping mask for use every night during sleeping time under the supervision of the enlisted caregiver. Relaxation exercises will be professionally conducted three times a week, for 20-30 minutes between 2 and 3pm in a relaxing room for two consecutive months by the researcher. For the control group, the intervention will be conducted subsequent to the treatment period. After the intervention, all the research variables namely stress, sleep quality and blood pressure will be tested using the same procedures.

This exploration will enrich the database on ways of ameliorating the quality of living of the elderly citizens in the wake of managing hypertension and other stress related disorders. The information obtained will be treated with utmost confidentiality. The product of the examination will be employed to determine feasible and effective measures of service delivery strategies to the elderly populace. For this reason, your invaluable assistance will go a long way towards the achievement of this objective.

Thank you in advance and God bless

Yours Faithfully,

Juliah Wambui Githang’a
Dear Respondent,

I am a post-graduate student in the department of Physical and Health Education, Kenyatta University. I invite you to participate in an investigation that I believe to be of importance to the health of elderly persons. The title of the study is: **Effects of Progressive Muscle Relaxation and Sleep Environment Modification on Stress, Blood Pressure and Sleep Among Institutionalized Elderly in Nairobi County, Kenya.**

The researcher will visit your home of residence to conduct an assessment and training that will not pose any risk to your health. Data on stress levels and sleep quality will be collected by researcher using questionnaires while blood pressure will be measured from the upper arm by a doctor using a blood pressure monitor.

As a participant you may be assigned to an experimental or control group. In the former, you will be issued with a sleeping mask for use every night during sleeping time. Relaxation exercises will be professionally conducted on you three times weekly, 20 -30 minutes in a therapy room for two consecutive months by the researcher. If in the latter group, the intervention will be conducted on you after two months. After the intervention period, all the research variables namely stress, sleep quality and blood pressure will be tested using the same procedures.

The study is aimed at improving the database on ways of ameliorating the quality of living of the elderly citizens in the wake of managing hypertension and other stress related disorders. The researcher will provide some compensation supplies.
The information that will be collected will be treated with confidentiality and will be subject to the Data Protection Act. It will not be used for any other purpose other than the one stipulated above. Kindly feel free to make any inquiries regarding the study. I will do my best to provide any further information that you may require. I would respect your reservations and your decision should you not wish to participate in this study.

If you have concerns about the above procedure, please contact:

Juliah Wambui Githang’a (Mobile Phone No. 0725-919-107)
Department of Physical and Health Education,
P.O Box 43844-00100,
Kenyatta University.
Nairobi.
Consent Form: Participant Statement

As the undersigned respondent, I give my consent to the research exploration outlined above, the aim, procedure and possible consequences of which have been explained to me.

Name………………………………………………

Signature/thumb print………………………Date…………………………

Investigator’s Statement

I, the undersigned, have explained to the volunteer in a language s/he understands the procedures to be followed in the study, risks and benefits involved.

Name………………………………………………

Signature……………………………………Date…………………………
HABARI KUHUSU SUALA LA UTAFITI NA FOMU YA KUOMBA IDHINI

Kwa mtafitiwa,

Ninakuomba ushiriki katika utafiti ambao ninaamini kuwa utakuwa wa manufaa kwa afya ya wakongwe. Mada ya utafiti ni: **Ufaafu wa kupumzisha misuli kila mara na kuboreshwa kwa mazingira ya kulala kwa wakongwe wenye kiwango cha juu cha msongo wa akili katika makaazi ya wakongwe katika kaunti ya Nairobi, Kenya.**

Utafiti huu unalenga kuboresha rekodi za njia ya kuwezesha ubora wa maisha ya wakongwe katika juhudi za kupunguza shinikizo la damu na matatizo mengine ya msongo wa akili.

Mtafiti atazuru nyumbani kwako ili kutathmini na kutoa mafunzo ambayo hayatahatarisha afya yako. Data kuhusu kiwango cha msongo wa akili na ubora wa usingizi itakusanywa na mtafiti huku shinikizo la damu likichunguzwa katika sehemu ya juu ya mkono na daktari atakayetumia kifaa cha kupima shinikizo la damu.

Kama mshiriki, unaweza kuwekwana kwenye kundi la majaribio au lile la kudhibiti majaribio. Katika kundi la majaribio, utapewa kifaa cha kujifunika wakati wa kulala kila siku. Mtafiti atakufanya mazoezi ya kupumzisha misuli mara tatu kwa wiki kitaalamu kati ya dakika 20-30 katika chumba cha matibabu kwa miezi miwili mfuluulizo. Ikiwa utakuwa katika kundi la kudhibiti majaribio, utashughulikiwa baada ya miezi miwili. Baada ya kipindi cha kushughulikiwa, vigezo vyote vya utafiti, yaani, msongo wa akili, ubora wa usingizi na shinikizo la damu
vitachunguzwa kwa kuzingatia utaratibu sawa. Habari itakayokuswa itawekwa kuwa siri na itathitiwa na sheria ya kulinda data. Haitatumika kwa madhumuni mengine isipokuwa kwa yale yaliyotwa hapo juu. Tafadhali kuwa na uhuru wa kuuliza maswali yanayohusu utafiti huu. Nitajitahidi kutoa habari za ziada ambazo utahitaji. Nitaheshimu yale yote ambayo hayatakuridhisha pamoja na uamuzi wako iwapo utakataa kushiriki katika utafiti huu. Ukiwa na lolote kuhusu utaratibu huu, tafadhali wasiliana na:

**Juliah Wambui Githang’a (Nambari ya simu, 0725-919-107)**

**Idara ya mazoezi ya Kimwili na elimu ya Afya.**

**Sanduku la Posta 43844-00100,**

**Chuo Kikuu cha Kenyatta.**

**Nairobi.**

**Idhini ya kukubali kushiriki**

Kama mshiriki aliyetia sahihi, nimekubali kushiriki katika utafiti huu. Nimefanuliwa malengo, utaratibu na matokeo ya utafiti huu.

Sahihi/Alama ya kidole……………………………………Tarehe………………
APPENDIX O: MAP OF THE HOME FOR THE AGED
APPENDIX P: ESTIMATED RESEARCH BUDGET

i). Research materials

<table>
<thead>
<tr>
<th>Research Equipment, instruments and Supplies/materials</th>
<th>Blood pressure monitors, First Aid Kit, Sleeping masks, Tape measure, Stop watches</th>
<th>150,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printing and Photocopying charges</td>
<td>Proposal</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td>Research documents</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td>Thesis production and binding</td>
<td>40,000</td>
</tr>
<tr>
<td>Stationery</td>
<td>Printing paper (20 reams)</td>
<td>12,000</td>
</tr>
<tr>
<td></td>
<td>Pens (100)</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Pocket files (10)</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td>Writing pads (10)</td>
<td>2,000</td>
</tr>
<tr>
<td></td>
<td>Paper punch (1)</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Stapler(1)</td>
<td>300</td>
</tr>
</tbody>
</table>

ii.) Budget for Training and Research Logistics

<table>
<thead>
<tr>
<th></th>
<th>Data Collection and Training cost</th>
<th>Travelling Lunch and tea (10x5daysx200x8wks)</th>
<th>30,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Research permit</td>
<td></td>
<td>15,000</td>
</tr>
<tr>
<td>3</td>
<td>Pre –testing research tool</td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>4</td>
<td>Allowances</td>
<td>For research assistant (9x15,000)</td>
<td>135,000</td>
</tr>
<tr>
<td>5</td>
<td>Contingencies</td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>6</td>
<td>Motivation supplies</td>
<td>Groceries, Cloth wear, Footwear and Walking aids</td>
<td>145,000</td>
</tr>
</tbody>
</table>

Grand Total | 660,100 |
### APPENDIX Q: ESTIMATED WORK SCHEDULE

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing proposal</td>
<td>May 2013 to May 2014</td>
</tr>
<tr>
<td>Proposal presentation and defense at Department and submission to the school</td>
<td>July to August 2014</td>
</tr>
<tr>
<td>Graduate School processing</td>
<td>January to February 2015</td>
</tr>
<tr>
<td>Ethical committee review the proposal</td>
<td>February 2015</td>
</tr>
<tr>
<td>Data collection</td>
<td>May to August 2015</td>
</tr>
<tr>
<td>Data organization and coding</td>
<td>September to October 2015</td>
</tr>
<tr>
<td>Data analysis and interpretation</td>
<td>November, 2015 to January 2016</td>
</tr>
<tr>
<td>Presentation of results</td>
<td>February and March 2016</td>
</tr>
<tr>
<td>Writing draft theses</td>
<td>April to June 2016</td>
</tr>
<tr>
<td>Writing final thesis and notice of submission</td>
<td>August to November 2016</td>
</tr>
<tr>
<td>Defense</td>
<td>April 2017</td>
</tr>
<tr>
<td>Corrections, binding and forwarding final thesis.</td>
<td>May to October 2017</td>
</tr>
<tr>
<td>Graduation</td>
<td>December 2017</td>
</tr>
</tbody>
</table>