EFFECTS OF SCHEDULED PHYSICAL ACTIVITY ON DEPRESSIVE SYMPTOMS AMONG IN-SCHOOL ADOLESCENTS IN ONDO STATE, NIGERIA

BY

TEMITOPE MARY OLAOYE

B.Sc. (Ed.) HEALTH EDUCATION (UNIVERSITY OF ILORIN)

MATRICULATION NO: 217541

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ATTESTATION

I hereby declare that this dissertation is my original research work and has not been submitted for any other diploma, fellowship, degree or any other examination. Information used from the sources were duly acknowledged.

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ACRONYMS

AACAP – American Academy of Child and Adolescent Psychiatry

ACSM – American College of Sports and Medicine

AHRQ – Agency for Health Research and Quality

APA – American Psychiatric Association

BST – Brain Stimulating Therapies

CBT Cognitive Behavioral Therapy

DALYs – Disability-Adjusted Life Years scale

DMS – Deep brain stimulation

ECT – Electroconvulsive therapy

FDA – Food and Drug Administration

GPs – General Practitioners

IPT – Interpersonal Therapy

MAOIs – Monoamine Oxidase Inhibitors

MDD – Major Depressive Disorder

MST – Magnetic seizure therapy

NCDs – Non-Communicable Diseases

NICE – The UK National Institute for Health and Clinical Guidance

NIMH – National Institute of Mental Health

PA – Physical Activity

PAGs- Physical Activity Guidelines

rTMS – Repetitive transcranial magnetic stimulation

SDQ – Socio-Demographic Questionnaire

SMFQ – Short Mood and Feeling Questionnaire

SNRI – Serotonin and Noradrenaline Reuptake Inhibitors

SSRIs – Selective Serotonin Reuptake Inhibitors

TCAs – the Tricyclic Antidepressants

UNICEF – United Nations Children's Fund

VNS – Vagus nerve stimulation

WHO – World Health Organization

ABSTRACT

Introduction

Studies have consistently shown that physical activity has positive implication for various physical health conditions. However, little research has been done concerning physical activity and its effects on mental health in Low- and Middle-Income Countries (LMICs) and especially among adolescents. This study explores the relationship between physical activity in relation to depression and self-esteem among adolescents in Ondo State Nigeria. It also examined the extent of involvement in physical activity within the adolescent population. Success in this will in turn enhance individual's functioning alongside their contribution to the Nation's development.

Methods

This study adopted a combination of cross-sectional survey and an experimental study. A cross-sectional survey involving 277 students in JSS3 to SS2 was done in two selected schools to ascertain the prevalence of significant depressive symptoms and its association with physical activity and self-esteem. The students completed a social demographic questionnaire, the Short Mood and Feelings Questionnaire (measure of depressive symptoms), Rosenberg Self-esteem scale, Physical Activity Questionnaire-Adolescent. For the experimental phase of the study, 20 students who scored 11 and above on the Short Mood and Feelings Questionnaire (SMFQ) from the intervention school and another 20 from the control school were selected. The intervention group took part in a six-week physical activity programme. The control group had no intervention. Both groups completed the outcome measures again after the intervention on the 6th week.

Results

For the cross-sectional part of the study, from the total study sample of 277 students, a total 49 respondents had significant depressive symptoms resulting in a prevalence of 17.7%. Participant's age range was between 10 and 17 years. A total of 167 (60.5%) (39 males and 45 females) participants met the minimum requirement of physical activity for health while 107 (39.8%) (24 males and 31 females) were physically inactive. Seventy (25.7%) reported that they did no physical activity in their leisure time, while only 47.8% participated actively in physical activity classes. There was a significant negative correlation between physical activity and depression (r = - 0.15, p-value = 0. 01) (i.e. more physical activity associated with lower depressive symptoms). There was also a significant negative correlation between self-esteem and depression (r= - 0.49, p-value = 0. 000) (i.e. lower self-esteem associated with higher depressive symptoms).

For the intervention phase, the intervention and control groups were similar in baseline characteristics. After controlling for baseline scores with Analysis of Covariance, the intervention group had significantly lower post-intervention depression scores compared with the control group SMFQ {F (1, 34) = 7.05, p= 0.03}. There was no treatment effect on self-esteem scores. The treatment group rated the intervention highly.

Conclusion

This study showed that depression is common among adolescents in Ondo State. It is also found that higher depression scores are associated with lower levels of physical activity, and a 6-weeks structured programme of physical activity was effective in reducing depressive symptoms. The intervention group rated the programme highly. The study suggests that physical activity is a potentially helpful intervention for depressed adolescents in this region. Larger studies are recommended to confirm the findings.

Keywords

Depression, Physical activity, Self-esteem, Adolescent, Intervention.

CHAPTER ONE

INTRODUCTION

Background to the Study

Physical activity has been defined as any bodily movement that involves the exertion of energy such that hard breathing or sweating occurs (World Health Organization (WHO), 2010; Dishman, 2006). Over the years, the literature has proved its efficacy in the prevention and management of physical as well as mental illnesses, of which depression is a strong component (Friedenreich & Orenstein 2002; CDC, 2000; Hillman et al, 2008). Lisanby, (2007) describes depression as "a complex and heterogeneous disorder that involves three main clinical manifestations which are disorders of mood, cognitive functions and neuro-vegetative functions, including appetite, sleep, energy, and sexual functions". According to the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorder -V (2013), depression is a treatable medical condition that negatively affects an individual's mood and how they feel about themselves. It could have severe effects if not promptly treated, exhibiting major features like flat affect, anhedonia, undue fatigue and sadness that persists for two or more weeks (DSM-5, 2013). In children, the mood symptoms can be characterized by irritability as against depressive mood as seen in adolescents and adults (Luby, 2011; DSM-5, 2013).

Biologically, depression has been shown to be associated with a substantial reduction in the amount of serotonin, a major neurotransmitter that is linked with the regulation of mood and social behavior, some biological dysregulation (appetite and digestion, sexual desire, sleep), memory, among other functions, that is available to the brain (Owens 1994;

Mclntosh, 2018). Some major factors that predispose adolescents to depression include family history of depression and biological changes in adolescence (Tully et al, 2008; Ramchadani & Psychogiou, 2009; Thaper et al, 2012). Goodyer et al, (1990) and Pine et al, (2002) have noted some psychosocial risk factors which include adversities in early life, and poor quality of interpersonal relationship.

Depressive disorders have been seen as a major challenge among adolescents globally with an estimate of 4-5% yearly prevalence in middle and late adolescence that is, between ages 14 and 20 years (Costello & Angold, 2005; Thapar et al, 2012). According to Thapar et al, (2012, depression in adolescence stands a great chance of going unnoticed or being misdiagnosed. This may be the case when individuals present in clinics primarily because of some physical symptoms that are inexplicable e.g. loss of or increased appetite, loss of interest in routines e.g. going to school, etc. It may also result from adolescents excusing depression for biological, psychological and social changes that are prevalent among this population (Patton et al, 2007; Cyranowski et al, 2000; Thaper et al, 2012). However, recovery and functionality can improve if timely and effective treatment is offered for depression (Walser, Sear, Chartier& Karlin, 2012).

Over the years, research has focused on physical activity as part of the treatment of various chronic illnesses including cardiovascular diseases, cancer, and multiple sclerosis (Herring et al, 2010; Saxena et al, 2005). However, recently, research on the benefits of physical activity is shifting from physical health to include its various effects on the mental health of the populace, including depression (Sagatun, 2010). Also, the adult population seem to have benefited more from these studies with very few being carried out among adolescents (Thaper et al, 2012; Maughan et al., 2013; Rice et al, 2019). Majority of these studies

represent the Western population, while Sub–Sahara Africa suffers from paucity of studies in this field (Thaper et al, 2012).

Tkachuk and Martin (1999) and Murri (2019) compared physical activity with various forms of psychotherapy and concluded that physical activity is an effective but under-utilized way of managing mild to moderate depression. Consequently, many studies have shown a positive connection between depression and physical activity (Adeniyi et al, 2011; Hoffman et al, 2009; Smith et al, 2007; Blumenthal, et al, 2007; Josefsson et al, 2014) while few others reported a negative relationship (Krogh et al, 2012). However, few studies have explored the relationship between physical activity and depression in low- and middle-income countries like Nigeria, particularly among adolescents.

Depression is one of the common mental health problems and it has increasingly become recognised as a leading cause of morbidity among adolescents. A decade ago, it was ranked as the third leading cause of disability (Lopez, 2006; Emerson, 2009; Moussavi et al, 2007) but currently, it stands as the second leading cause with a prospective rise to be the second largest contributor to the global disease burden in the incoming decade (Kutcher et al, 2019). It is well recognized that the treatment of depression requires a holistic approach that includes, biological, psychological and social strategies. Despite this, relatively less research has been carried out on evidence-based psychological, social and physical interventions for managing depressive symptoms, especially in adolescents (Adeniyi et al., 2011).

More specific to this study is depression in adolescence which can lead to severe impairments in functioning (Lewinsohn et al., 1988; Fletcher 2008); increased rate of

obesity and has also been a major risk factor for substance use and abuse, including tobacco (Keenan-Miller et al., 2007). Depression can lead to a reduction in the level productivity among affected individuals, even into adulthood. Ultimately, depression contributes about 50% to suicidal rates across all age groups, especially adolescents (Hawton et al. 2009; Windfuhr et al., 2008).

Statement of the Problem

Takahashi (2001) found that of all cases of suicide, 70- 90% are caused by mental illness, of which 60-70% are linked to depression. WHO (2017) reported that about 300 million persons are affected by major depressive disorders worldwide, contributing to the figure of about 1 million people who die by suicide every year. Murray and Lopez (1997) projected that by the years 1990 and 2020 deaths from Non-Communicable Diseases (NCDs) would have risen by about 90% with depressive disorders ranking second among the leading causes of Disability- Adjusted Life Years (DALYs). According to a report by WHO (2017), depression is accountable for a global loss of over 50 million years to disability with 7.9% of this falling within the African region.

Paykel (2008) has identified depression as an illness with high rate of relapse. A meta-analysis carried out by Vittengl et al., (2007) found a relapse rate of 29% within the first year and 54% within first two years of treatment, while Dunn et al., (2006) found a relapse rate of 60-90%within the first year of pharmacotherapy. This high rate of relapse in depressive disorder, particularly first episode depressive disorder (50%), could be as a result of some adverse biopsychosocial effects. Thus, considering the prevalence and costs of relapse in depression, there is need for more research on other non-invasive treatment

options, and or adjuncts to existing treatment models, which could include psychosocial interventions to sustain improvement and reduce relapse (American Psychiatric Association, 2000, Sim et al, 2016).

Despite the large number of people affected by depression in Africa, treatment gap among this population stands at about 70% (Patel, et al, 2007; Cassano & fava, 2002). In a description of the state of mental health services in Sub-Saharan Africa, Woldetsadiq (2015) noted that, compared to more than 5% of health budget that goes to mental health in high- income countries, only about one-tenth of the health budget is allocated to mental health in low- and middle-income countries. Invariably, this has created a wide treatment gap and made adequate treatment inaccessible to about 75% of people with mental illness, including depression. This is despite the fact that depression has a higher prevalence in the low- and middle-income countries of the world (Mendelhall, 2014). Hence, there is a great need for an adjunct or alternative treatment options that are cost-effective and efficient (Thaper et al., 2012). The reality that most adult mental disorders can be traced to either the childhood or adolescence makes it imperative for research to focus on depression in the period of childhood through adolescence (Kim-Cohen et al., 2003) in order to mitigate the resultant negative effects.

Justification for the Study

According to United Nations Children's Fund (UNICEF) (2011), adolescence is a distinct phase of development and a time of transitioning that influences the cognition, emotion, behavior and relationships of persons (Lerner& Castellino, 2002; Curtis, 2015). Studies have shown that for every individual, adolescence is a period of significant physical, psychological and biological changes (Petersen, 1988; Blakemore 2008; Thaper et al,

2012). These changes can bring a number of psychological, physical and/or social maladjustments which can result in depression and other mental health problems. In the last three decades, depression has been the widely reported mental health disorder among young people (Clarke et al, 1990; Emerson, 2012; Knopf, Park & Mulye, 2008). It has equally been reported that the length of a depressive episode is proportional to suicidal thoughts and suicide attempt (Spjker et al. (2010); Bridge et al., (2007). Within the adolescent population, the most productive years of their lives are being lost to depression. The rate of this loss is higher in females than in males, particularly between ages 15 and 19 (Gore et al, 2004). In one of the few studies that has been undertaken on adolescent depression in Sub- Saharan Africa (SSA), Azan Nyundo, Adom Manu, et al. (2020) established a range of 21.1% - 32.5% for depression among 6 SSA countries with the prevalence of suicidal behavior ranging from 1.2% - 12.4% with Ibadan, Nigeria being the site with the largest prevalence. Given the adverse effects of depression on social development (Lloyd, 2005), the period of adolescence is a delicate time when intervention is crucial (Adeniyi et al., 2011).

Furthermore, taking into consideration that a proportion of depressed patients do not respond well to antidepressant medications and experience side effects (Blake, 2012; Machado-Vieira et al, 2010; Peretti, 1999), physical activity can be an adjunct to enhance remission of depressive symptoms in individuals on medication (Radovic 2017; Andreas, 2009; Camacho, 1991; Fetzner & Asmundson, 2014). There is lack of access to treatment for a large proportion of individuals with depression in Sub-Saharan African; hence, physical activity may be a cost- effective and accessible means of managing depression in

adolescents (Busch et al, 2016; Murri et al, 2019) in the region, particularly at the mild and moderate levels.

Considering the fact that depression is associated with biological, psychological and social factors, it becomes necessary to address it from all these standpoints and not just biological. This study investigated the efficacy of physical activities in overcoming depressive symptoms among adolescents as a potential strategy for reducing the treatment gap that is highly prevalent in low- and middle-income countries, such as Nigeria.

Research Questions

In the course of this study, answers were provided to the following questions:

1. What is the prevalence of depressive symptoms among in-school adolescents in Akure South Local Government, Ondo State?
2. What is the association between depressive symptoms and self -esteem?
3. What is the physical activity level of in-school adolescents in Akure South Local Government?
4. Is there a significant difference in the physical activity level of adolescents with significant depressive symptoms and those without?
5. Is there a significant association between level of physical activity and self-esteem?
6. Can physical activity, utilized as a behavioral therapy, improve depressive symptoms among in-school adolescents?
7. Will there be a significant level of satisfaction in the intervention programme post-intervention?

1.5 Aim of the study

This study aimed to investigate the effectiveness of a 6-week physical activity programme on depressive symptoms among secondary school students in Oke-Aro, Akure, Ondo State, Southwest Nigeria.

Objectives of the Study

The objectives of this study included the following among secondary school students in Oke-Aro, Akure:

1. To assess the prevalence of depressive symptoms among in-school adolescents.
2. To determine the association between depressive symptoms and self –esteem.
3. To determine the level of in-school adolescents participation in physical activities.
4. To compare the level of physical activity among adolescents with and without significant depressive symptoms.
5. To determine the association between engagement in physical activity and self-esteem.
6. To determine the effects of scheduled physical activity on depressive symptoms among in-school adolescents.
7. To explore if there will be a significant level of satisfaction in the intervention programme among the intervention group, post intervention.

1.6 Research Null Hypotheses

1. There will be no significant difference in the prevalence of depression between the control and intervention groups post-intervention.
2. There will be no significant difference in the self-esteem of participants in the control and intervention groups pre- and post-intervention.

CHAPTER TWO

LITERATURE REVIEW

2.1 Depressive Disorder: Definitions

The term depression has a Latin origin “deprimere” which literally means to be pressed down with the main feature being dysphoria (Kanter et al. 2008). Clinically, depression is a mental disorder that is characterized by a group of deviations in functioning that mainly affects the mood, feeling and activity of individuals across a range of situations, thereby impairing their functioning (Goodyer and Cooper (1993). The American Psychiatric Association APA (2013) describes it as a disorder that is characterized by drained mood, accompanied by loss of energy for daily activities and lack of interest or pleasure in most or all activities most of the day, nearly every day, all existing for up to two weeks. Some other conditions that characterize depression includes biological symptoms like significant weight loss, loss of energy nearly every day, and insomnia/ hypersomnia.

Krager and Basel (1974) established the easy possibility of missing the diagnosis of depression for other health conditions due to overlap of their symptoms. Depression ranges in severity from mild to severe, depending on the number, type and seriousness of the symptoms observable in an individual (DSM-5; ICD-10).

Similarly, the APA (2013) explains depression as a mood disorder that occurs most of the day for more than two weeks affecting a person’s feeling, thought and body. According to Bhan et al (2008), there are as many variations of depression as there are depressed individuals because each individual’s experience differs from the other’s in the combination of their symptoms and duration of suffering. This is not without the evident

similarity in history of depression and societal factors among individuals. The causes of depression are best explained from the biological, psychological and social approaches (Goldstein & Rosselli, 2003) as opposed to a mere fluctuation of certain brain chemicals. Some of the causal factors established by literature include the physical make- up of the brain, individual's genetic loading, side effects of certain medications, family dysfunction, and other environmental stressors. It is one of the most common mental health disorders (National Institute of Mental Health (1985). Depression is a disorder that is present among all age- groups; childhood (Luby, 2010), early and late adolescence (Adeniyi et al, 2011), early and late adulthood (Moussavi et al, 2007, Gureje et al, 2009).

Adolescence is a term that was conceptualized as a process of renaissance for the physical and psychosocial entities of an individual (Hall, 1883) that is mutually propelled by biology and culture (Curtis, 2015; Greenfield, 20002; Muuss, 1996).

2.2 **Aetiology of Depression**

Addis et al (1995) attempted to get a group of depressed patient's perception on the causes of their condition. Among other things, they found that these perceptions influenced the efficacy of the various treatment modalities that was administered to these patients. Based on the knowledge that depressive disorder is precipitated by an interplay between genetics, societal risk factors, and the peculiarity of the movement of neurotransmitters such as serotonin (Cook et al, 2009; Goldstein & Rosselli, 2003, Sullivan et al, 2000), causes of depression are often categorized as either medical (biological) or non–medical (psychological or social factors) (Goldstein & Rosselli, 2003). According to Birmaher et al., (2004), some biological risk factors of depression include being female, having an associated psychiatric disorder and family history of depression. Lauber et al (2003)

studied the social risk factors of depression and found that family difficulties had the highest association with depression (56%) followed by job stress (32.7%), traumatic events (17.9%), and other illnesses that are unspecified (11.6%). Meanwhile, Horowitz (2006) explored the psychological causes of depression and found that negative cognition and susceptibility to rumination as some of the factors that could lead to depression.

2.3 **Prevalence of Depression**

According to the World Health Organization (2017), depression is a global mental health condition currently affecting more than 300 million people (4.4% of the globe's population) across all ages. At present, it is the third leading cause of disability among young people with an upward projection as the second- leading cause by the year 2020 (Murray &Lopez, 1996). The rate of depression varies across populations but the symptoms largely remain the same. It has been reported to contribute 3.4% to the total number of people suffering from mental disorder. Globally, the prevalence of depression ranges between 2-6%, occurring more in females than males- (4.1% Vs2.7%) (Richie and Max, 2019) while about 50% of suicides occur in people who were depressed (Cheung et al, 2013).

As against the widely held belief that pre- school and school- going children are too immature to experience depression, studies (Stalets and Luby, 2006) have shown that depression does occur in these age groups at a prevalence of 1%. The prevalence increases steadily through pre –pubertal stage (1-2%) with very little difference in boys and girls (Egger and Angold, 2006) but spikes to about 4-5% during puberty with more occurrence in females (Thaper 2012). Depression has a lifetime prevalence that ranges from 10-15%

(Lepine &Briley, 2011; Hasin et al, 2005). Among the various mental health problems that occur in at least 10-20% of adolescents yearly, studies show that unipolar depressive disorder has the highest rate of occurrence (Whiteford et al, 2013; Kieling et al 2011). In a systematic review of the prevalence of mental health problems among children in Sub-Saharan African communities, Cortina et al (2012) found that the presence of mental disorders among this population ranged from 2.7% - 27%.

Depression is one of the major complications that result from stroke; hence studies have shown a prevalence rate of 31- 43% among individuals diagnosed with stroke in Nigeria (Ojagbemi et al, 2017, Rufa'l et al., 2018; Olibamiyo et al., 2019). This is similar to what Cassidy et al, (2009) found in an Irish population of 50 patients who had stroke with 20% of the study population meeting the criterion for major depression.

Likewise, studies have shown a global prevalence of severe depression to be 15.5% among patients with HIV (Starace et al., 2012) while Duko et al., (2018) found a prevalence of 48.6% among 401 HIV- positive patients in Ethiopia. In a recent study carried out in Eastern Nigeria, Onyebuchi-Iwudibia and Brown (2013) found that 33.3% of the study population were depressed. They attributed this to different factors including their medical diagnosis, stigma, and side effects of treatment. However, Richie and Max (2018) have argued that data on the prevalence of mental disorders, including depression remains a challenge as there remains an under-report of cases. This is particularly so in low- income countries of the world. Over the years, a number of evidence-based modalities have been engaged in mitigating depression, and this includes physical activities.

2.4 **Physical Activity**

The differences in individual and organizational perceptions have led to variations in how physical activity is being defined. Tudor-Locke et al (2003) explored the lay definitions of physical activity among a selected group of women in China and found a range of responses. The responses included that physical activity is; going out of their comfort to walk, run, pushing oneself, moving around, working around the house, doing some exercise, running after children, and any activity that involves exerting energy. These authors summarised their opinions and documented that it includes a range of structured activities that are done to improve oneself as required by their everyday tasks and responsibilities (Tudor-Locke et al 2003). However, from a broader perspective, Caspersen et al. (1985) gave a generally accepted definition of physical activity as any bodily movement that is as a result of muscle contraction which results in the exertion of energy above a particular status quo, such that hard breathing or sweating occurs (Dishman, 2006; WHO, 2010; Physical Activity Guidelines (PAG), (2018)). Exercise is described as a structured and planned aspect of physical activity that is aimed at achieving specific physical fitness component (Caspersen et al, 1985; the PAG 2018). According to the American College of Sports and Medicine (ACSM), exercise can either be aerobic or anaerobic. Aerobic exercises refer to those forms of physical activities that use large muscle groups, can be sustained for a long time and are rhythmic in nature with a continuous intake of oxygen (Wahid et al, 2016). Examples include jogging, dancing, cycling, and running. On the other hand, anaerobic exercises or activities are intense physical activities that on average last only a short time and are done at such rate that breathing is difficult and temporarily unattainable (ACSM).

Physical inactivity has become a global public health issue and ranks fourth among the leading causes of global mortality (Wen et al 2011; Lee et al., 2012). This is as a result of its direct influence on major body systems like the cardiovascular, muscular, respiratory and digestive systems which has led to a contribution of 6-10% to non-communicable diseases (Lee, 2012).

Studies have shown that involvement in physical activities can protect individuals from the onset of depression (Adeniyi et al, 2011; Lawlor and Hopker, 2001). To ascertain these effects further on the clinically depressed, Lawlor and Hopker (2001) conducted a review of early literatures on exercise and depression and found an effect size of 1.1 which is large.

However, recent studies have shown that both aerobic and anaerobic activities have the ability to mediate depressive symptoms when carried out consistently. However, a lot of consideration needs to be put into patient's preference after explaining the various choices of physical activity to them (Cohen& Shamus, 2009; Adeniyi, 2011; Nystrom et al 2015; Schuch et al, 2018). It has been noted that clinicians may find it difficult to encourage exercise in people with depression because the patients have anhedonia as a major symptom of their condition (Salmon, 1990). However, even a minimum level of physical activity can be beneficial (PAG, 2010).

Depression and Physical Activity

2.5 Depression and Self-esteem

Cast and Burke (2002) opined that self-esteem, a part of the self-concept is an important tool in the process of accepting oneself as well as enhancing the success of organizations and individuals.

According to Rosenberg (1965), in late adolescence, individuals become somewhat concerned about their self- image; what they look like, what other people might say concerning them and the factors that inform these judgements. This is partly due to the fact that adolescence is a period in which major decisions (e.g. choice of schooling, career, life partner) are made, also a period of rapid physical and psychological changes as well as a period of personality confusion for the adolescent. Hitherto, the ability of individuals to meet their expectation or standards in the different life facets enhances their view about themselves and this translates into good self- esteem while a deficiency in this could result in poor self -esteem.

After a long struggle with the concept of self-esteem, James (1890/1950) came up with description of it as "how we as individuals view our image and whether or not we approve of it" (Leary, 1980). He also described it as "the gap between the ideal self and the self-image."

Sowislo and Orth (2013) & Steiger et al (2005) analyzed the relationship between depression and self -esteem through a review of the vulnerability and the scar models. While the vulnerability model attempts to show how low self- esteem predicts the development of depressive symptoms, the scar model assumes that these symptoms impact individuals by leaving them with scars which includes mental illnesses like depression and

anxiety. Campbell (1981) found that "self–esteem is the strongest predictor of life satisfaction" which is affected in people with depression.

2.6 Justifications for Early Encouragement into Physical Activity

Reiner et al (2013), Dishman et al (2004), Rabel et al (2004), describes non-communicable diseases like coronary heart disease, obesity, type 2 diabetes mellitus as a rising cause of health challenge in adults which could have their root cause from inactivity in childhood and adolescence. WHO (2009) also indicates that despite the greater prevalence of the younger population in the LMICs, the low income countries contribute more than half to the DALYs while the middle income countries contribute about 38% in comparison with only 8% in the high income countries. Recently, the literature has made efforts to analyze the specific causes of increased cases of non-communicable diseases among and have found inadequate engagement in physical activity as one of them. WHO (2009) suggests that more than one- third (44%) of the World's death are caused by a small number (24) of risk factors which includes high blood pressure (HBP), high cholesterol, overweight and obesity, physical inactivity, and low fruit and vegetable intake.

Cook, Peterson & Sheldon (2009) opined that studies on the prevention of depression among the younger population have increased in the past decade although methodology seems to be a hindrance. A study has that general practitioners (GPs) believe that physical activity can reduce depression; hence they support its promotion as an adjunct in treating depression (Searle et al, 2011). The literature also recommends physical activity as a protective factor against the onset of depression among all age groups (Smith et al, 2007). Given the relationship between family history of depression, and risk of depression in offsprings, it has been suggested that closer monitoring of children of depressed parents

may be an effective method of prevention (Cook et al, 2009). Based on the secular trend of depression beginning earlier in life (Uma, 2009), training children on the importance of and how to effectively engage in physical activity could significantly reduce the number of new cases of depression, particularly among children and adolescents (Barnekow-Bergkvist et al, (1994). These authors found that early involvement of individuals in physical activity is associated with decrease in physical inactivity later in life and suggests that adolescents should be given more opportunity to participate in physical activity during leisure which could be carried into adulthood.

2.7 **Review of Treatments for Depression**

Depression is chronic in nature and the possible results of failure to combat it timely and adequately may be enormous including reduced quality of life, functional impairment, increased risk of early pregnancy and increased suicide rate (Ryan, 2005, National Institute of Mental Health (NIMH, 2013). In respect to this, a number of evidence- based strategies have been developed to manage and treat depression. They include various brain stimulation therapies, pharmacotherapy, psychotherapy or a combination of these options, depending on the severity of depressive symptoms. Goldstein & Rosselli (2003) found that the particular approach through which depression is treated may depend on the patient's perceived causes of the condition, ranging from psychosocial causes to biological causes. However, only a fraction (10- 25%) of those affected by depression gets treated at all, (Fournier et al., 2010), particularly in sub-Saharan Africa. Numerous reasons such as unavailability of resources, stigma associated with depression, challenge of staying on medication and incorrect dosage can be responsible for this (Tedeschini, Fava & Papakostas, 2011). In their meta –analysis, Simon & VonKorff (1995) stated that primary

care physicians seem occupied with a number of pressures and demands which affects the identification, diagnosis and treatment of depression. These authors also discussed the duration before the commencement of the therapeutic effects of antidepressants and opined that in order to make up for the delay in remission of symptoms, multiple approaches should be engaged in the treatment of depression. As a result, there is need for further studies to identify wider range of management options for depression (Babyak et al, 2007; Blumenthal et al, 2007; Cabana et al, 2012). Existing management procedures for depression include brain stimulation therapies, pharmacotherapy and psychotherapy. These treatment options will be explained in the paragraphs that follow.

2.7.1 Brain Stimulation Therapies

Brain stimulating therapies (BST) are non-drug therapies that involve activating or inhibiting the brain directly with electricity that could be introduced by applying magnetic fields to the head, through electrodes placed on the scalp to produce seizure-like effect (Sanacora G. et al, 2003; Lisanby S., 2007; NIMH, 2004). The different forms of BST include Electroconvulsive therapy (ECT), Vagus nerve stimulation (VNS), and Repetitive transcranial magnetic stimulation (rTMS). Studies (Rotheneichner et al 2014; Parker et al 1992) have found that electroconvulsive therapy is a safe and standardized procedure for managing depression, especially severe types that have not responded to other management procedures. On the other hand, the VNS involves arousing the vagus nerves (left and right) which are charged with the responsibility of transmitting information between the smooth muscles and the executive circuits of the central nervous system (Browning & Travagli, 2014); Berthoud H et al, 2000). It was initially developed as a therapy for patients with epilepsy. However, studies found that it equally lifted the mood of these patients with

epilepsy as it alters the medial and prefrontal cortical transmission; areas that contain certain neurotransmitters, including serotonin. It thus became approved in managing both epilepsy and chronic depression in patients who are above 18 years of age, although not as a sole treatment option (Yu et al., 2008; Bajbouj et al., 2010; Bonaz et al., 2013). This is not without a range of side effects which include slight paralysis to the vocal cord, lower facial nerve, infections, and cough (Yang &Phi, 2019).

Similarly, repetitive transcranial magnetic stimulation (rTMS) is the interaction of electromagnetic filed that is held to the brain, leading to a sharp release of electric current (about 5000 amps) to the patient's head. This interacts with cortical and subcortical neurons to alter the communication between the cells (George MS, et al, 2002; Bear MF, 1999; Malenka & Nicoll 1999). Although severe adverse effects of this process are rarely reported, the procedure can have adverse effects including headache, pain and burns to the scalp due to the application of electrodes to it, and seizures in the case of high frequency (Mishra et al, 2011).

2.7.2 Antidepressant

Studies have showed that biological dysregulation largely exists in depression. This has led to it being treated with antidepressants which come in different forms. This class of drugs set out to, among other things improve how the brain makes use of certain chemicals that regulates mood and or stress (NIMH, 2013). The main groups of antidepressants are the Selective Serotonin Reuptake Inhibitors (SSRIs) (first-line antidepressants), Serotonin and Noradrenaline Reuptake Inhibitors (e.g. the Tricyclic Antidepressants (TCAs)) and Monoamine Oxidase Inhibitors (MAOIs) (Feighner, 2009; NICE guideline, 2018).

The SSRIs work by targeting one or more brain sites where it increases the level of the brain serotonin by inhibiting its re-uptake in the synaptic cleft (Feighner, 2009; Hetrick et al, 2007, Clark et al, 2012). Usually, initial response to antidepressants could begin at 4-6 weeks after its initiation while the remission of depressive symptoms occurs from 8-12 weeks of medication (Watanabe et al, 2008). In Cipriani A. et al (2018), the efficacy of 13 antidepressant medications was tested and they were all found to have a better than placebo effect, with agomelatine, escitalopram and vortioxetine ranking superior on the list. Donoqhue J. (2001) documented that remaining on an antidepressant medication long enough is necessary before its efficacy can be ensured. However, studies have shown that adherence to medication has been a struggle for many the patients on antidepressants (Cypriani A., et al 2018). The U.S. Food and Drug Administration (FDA) (2014) raised a boxed warning on antidepressants, especially in the first few weeks of use due to risk of suicidal behaviour.

In the last two decades, about 50% of depressed patients on antidepressant therapy discontinued medication use within the first 6 months of use (Cassano &Fava, 2002; Sansone et al, 2012). This leads to almost half of those treated not achieving full remission of their symptoms, and there remains a risk of residual symptoms, relapse and recurrence (Fava and Ruini, 2002; Segal et al, 2012; Nierenberg et al 2010). According to the Agency for Health Research and Quality (AHRQ, 2012), in major depressive disorder (MDD), patients who attain full remission of depressive symptoms on antidepressants find residual depressive symptom a common experience, thereby increasing the risk of relapse. All these make it a necessity for physicians to educate patients and their families on various available management options and their side effects which includes suicidality, increased clinical

manifestation, and hypomania (Olfson et al 2003; Libby et al, 2009). Management of depression with antidepressant is usually continued for 6-12 months after remission of symptoms at the same dosage (Birhamer et al, 2007;

2.7.3 Psychological therapies

The UK National Institute for Health and Clinical Guidance (NICE) Guidelines (2019) recommended psychological treatments in managing depressive disorders. Common examples include Cognitive behavioral therapy (CBT) and Interpersonal Therapy.

2.7.3a Psychotherapy

According to NIMH (2014), psychotherapy refers to a range of treatment methods that aims at helping individuals identify and challenge feelings, thoughts and behaviours. The American Psychiatric Association (APA) and the American Academy of Child and Adolescent Psychiatry (AACAP) regard psychotherapy as a crucial part of managing depression, particularly in children, depending on the severity of the condition (APA &AACAP, 2011).

Studies on the effectiveness of psychotherapy for depression among various populations has been the focus of researchers in medical and social sciences in the past few decades (Sugarman, 2016). Majority of these studies found psychotherapy to be as effective as antidepressants for major depressive disorders (Cuijpers et al., 2008; Spielmans et al., 2011; Huhn et al., 2014) and others found it valid as an adjunct to antidepressant in severe cases of depression and or a treatment option in mild depression (Bella et al, 2014; Cuijpers et al 2008; 2014, Clark et al, 2012; Dinas et al, 2011). In a meta-analysis of studies that compared antidepressants, psychotherapy, a combination of both, and placebo, Cuijpers et

al, (2014) found an effect size of (g=0.74; 95% CI: 0.48-1.01; NNT= 2.50) for combined treatment, g= 0.35 (95% CI:0.21-0.49) for pharmacotherapy and g= 0.37 (95% CI: 0.11-0.64). Although psychotherapy is a major treatment for depression, there is an increase of about 50% in its efficacy when combined with antidepressants.

2.7.3b Cognitive –Behavioral Therapy (CBT)

According to Cheung, Kozloff & Sack (2013), it is a structured form of psychotherapy that is time bound, focused on modifying how patients view themselves, their immediate and extended environments as well as their expectations from all of these. However, Cheung et al, (2013 opined that following through the programme by depressed individuals with an adjunct of cognitive impairment could be an uneasy task while Barbui C., et al (2011) found that psychological management options are effective for depression, especially mild depression. It is seen as an effective option in the treatment of depression in that it changes how the individual processes and interprets situations (Driessen & Hollon, 2010). It has also been explained as a talking therapy that can help manage individual's depressive symptoms by enhancing an adjustment in their thinking, feeling and behavior, as these three components exhibit an explicit form of interplay (Clarke et al., 2003; Muffson et al, 2004). It has been recommended for all levels of severity of depressive symptoms while a combination of it with medication has been found to increase efficacy of antidepressant medications in major depressive disorder (APA, 2011)

The success of CBT sessions on depression can be influenced by various factors like cognitive therapist's competency (Jacobson et al, 1996), demographic factors such as age, gender, severity of symptoms, presence of comorbidity, and dysfunctional attitudes. (Driessen &Hollon, 2010).

A recent study on depressed adolescents in Nigeria (Bella- Awusah et al, 2016) found that CBT was effective in reducing depressive symptoms, with an effect size of 1.06. This is consistent with the result of the meta analysis of psychological treatments that was carried out in non-western countries with an effect size of 0.8 (Cuijipers, et al, 2018).

2.7.3c Act and Commitment Therapy for Depression (ACT-D)

This intervention enhances admittance of internal mental condition by the individual as it is being experienced by them. It does not only accord depressed patients an opportunity to reduce suffering but also focuses on personal values in the process of restoring the individual (Walser et al, 2012). In addition, ACT-D draws a distinction between knowing in the mind (verbal knowledge) and knowing by experience (experiential knowledge) which are two major ways individual explore their world. Individuals are often at risk of exploring the former than the latter as they grow, more especially when they are victims of mental and/ or physical challenges- which is what ACT-D works on.

2.7.3d Interpersonal Therapy (IPT)

According to Blumenthal et al, (2012), IPT involves addressing depressive symptoms from the social perspective thereby enhancing interpersonal communication in a depressed person. A combination of this with CBT has been proved to be effective for depression in adolescents (Brent et al).

2.8 The Mechanism of action of the antidepressant effect of exercise –

As rates of depression and studies on it increases, adjuncts to existing treatment options are being sought in order to reduce its prevalence and the resultant effects (Emerson, 2009). Knowledge of the specific circuit that is involved in depression has promoted studies on

the effect of exercise on depression. Empirically, it is believed that depression affects the hippocampal volumes, (Schweitzer, et al, 2001; Lorenzetti et al, 2009; Kronmuller et al, 2008), cortical regions (Rigucci et al, 2009), and prefrontal cortex (Mayur et al, 2012).

2.8.1 Biological Process

For the purpose of this study, the biological pathway or process refers to the various changes that occur to brain parts in depressed individuals as a result of physical activities that has been introduced to the individual. On the other hand, psychosocial mechanism includes the effects of physical activity and all its components (e.g. its type, mode of engagement, etc.) on how individuals think, feel and behave (King, et al, 2009). According to Faulkner & Taylor, (2009) and Sagatun, (2009), depression is a personal experience which differs from one person to another. This invariably makes it difficult to explain the mechanism that is responsible for the antidepressant effect of physical activity in a single process.

Voss et al (2013) explains that exercise has been found to influence several neuro changes, particularly in various areas known to be sites of action in depression. This variation in brain parts yield a resulting diverse mechanism that could be responsible for the antidepressant effect of physical activity and are explained under two broad groups; biological mechanism and psychosocial mechanism (Voss et al, 2013).

Various studies have supported physical activity as a means of reducing depressive symptoms even at four weeks, compared with six weeks of antidepressant usage before any noticeable remission of symptoms (Legrand et al, 2007; LaFontaine et al, 1992). Nabkasorn et al (2005), compared two groups; the first had 8-week mild group jogging

routine and the other had normal daily routine and found a significant reduction in depression scores in the former group. This was accompanied by lowered rates of urine cortisol and epinephrine that were excreted post intervention.

However, majority of these studies claim that the mechanism behind this relationship still remains unknown (Kandola, et al, 2019). Recently, attempts have been made to explain the effects of physical activity on depression by analyzing its impacts on the brain among the adult population. According to Voss et al, (2010), an existing relationship that could not be clearly explained was found between aerobic exercises and various cognitive functions in the brain including the primary motor and auditory cortices, fronto- parietal network, all of which consistent level of physical activity has been found to improve. Schuch et al, (2016b) explained that exercises enhance hormonal, cortical and endocrine changes in depressed individuals by stimulating many of the same neuroplastic mechanisms that are associated with growth in several brain regions that are adversely affected in people with depression, such as the hippocampus, prefrontal and anterior cingulate cortices (Gujral et al., 2017). Likewise, according to Mayberg et al (2012), the reverse in the decrease of dorsolateral prefrontal cortex (DLPFC) metabolism and blood flow that is responsible for symptom relieve when treating with antidepressants can also be observed with involvement in physical activity (Firth et al, 2018; Voss et al, 2013; Maass et al., 2015; Pereira et al., 2007).

According to recent studies, a number of changes are present in a depressed brain (Kandola, et al 2019) which could be attributed to the malleability response of the brain to some changes that eventually manifests as mental disorders in individuals. Kandola, et al (2019) also stated that these lesions can be corrected through consistent involvement in physical activity by stimulating several biological responses that enhance the functioning of the

brain through the neuroplasticity mechanism. Shaw & McEachern (2001) explained that the term neuroplasticity has no generally acceptable meaning in research but emphasized neural change and adaptation phenomena.

A number of other studies have mentioned possible mechanisms for biological changes in depression as a result of physical activity although none of them is backed up by research yet. Garza et al (2004) and Gujral et al (2017) identified some neural mechanisms that could be responsible for these effects include increasing the Brain- derived neurotrophic factor (BDNF) which is found to be in deficit in depressed individuals. They also hypothesized that the effects of exercise could be similar to that of antidepressants in that it modifies some brain parts that are affected in depression e.g. the volume of the hippocampus, and functionality of the frontal limbic pathway through the neuroplasticity mechanism. It is therefore plausible that exercise could counteract some of the impairments seen in people with depression, hence there is a need for more research to investigate this mechanism.

Psychosocial Effects of Physical Activity on Depression

According to the NICE guideline (2004), physical activity also serves the functions of affording individuals the opportunity to play, enjoy the outdoors, socialize with friends and family, accompanied by a greater sense of feeling energetic.

2.9 Other Benefits of Physical Activity

According to the PAG (2018), the effect size of physical activity on human health is comparable to very few other human activities. Its efficacy in controlling a number of physical and psychological conditions have been established by various research works

over the decades. As a result of these findings, WHO (2009) recommended physical activity as a mediation for cardiovascular diseases, type 2 diabetes, depression and some cancers (Friedreich & Orenstein (2002) while enhancing musculoskeletal health. WHO (2009) also indicated that had these risks factors contribute to about 10 years reduction in life expectancy in the high, middle and low income countries. Furthermore, over the years, studies (CDC, 2000; Hillman et al, 2008; United States Department of Health and Human Services, 2008) have shown that physical activity regulates energy balance in the body to improve brain health, cognition and scholastic performance. According to Searle et al (2012), general practitioners reported that although people with depression seek an alternative means of treatment for their condition, an awareness of the barriers to physical activity which includes lack of access, fatigue and work (Salmon et Al, 2013) stands as discouragement for them. Searle et al (2012) also opined that before GPs recommend physical activity their (patient's) perception about it as treatment and their ability to engage in it should be explored.

Table 2.1 Benefits of Physical Activity on Brain Health across Human Development

Outcome	Population	Benefit	Acute	Habitual
	Children ages 6 to 13 years.	Improved cognition (performance on academic achievement tests, executive function, processing speed, memory)	•	•
Depressed mood and depression	Children ages 6 to 17 years and adults	Reduced risk of depression Reduced depressed mood		•
Cognition	Adults Adults older than age 50 years	Reduced risk of dementia (including Alzheimer's disease) Improved cognition (executive function, attention, memory, crystallized intelligence,* processing speed)		•

Benefits of Physical Activity on Brain Health across Human Development (CONT'D)

Quality of life	**Adults**	**Improved quality of life**		
Sleep	Adults	Improved sleep outcomes (increased sleep efficiency, sleep quality, deep sleep; reduced daytime sleepiness, frequency of use of medication to aid sleep)	•	
	Adults	Improved sleep outcomes that increase with duration of acute episode		
Anxiety	Adults	Reduced short-term feelings of anxiety (state anxiety)	•	
	Adults	Reduced long-term feelings and signs of anxiety (trait anxiety) for people with and without anxiety disorders		

Note: The Advisory Committee rated the evidence of health benefits of physical activity as strong, moderate, limited, or grade not assignable. Only outcomes with strong or moderate evidence of effect are included in this table

Adapted from the Physical Activity Guidelines (2018) (2nd Edition).

2.10 Effective Dose of Physical Activity (PA)

Physical activity has been proved to be effective for a variety of medical and mental health conditions. However, the specific type and amount that is required by individual medical challenge, especially for the adolescent population tends to remain a debate (Nieman, 2002; Rajbar et al, 2014)). In an attempt to solve this, Crews et al (1998) found that due to these peculiarities, an average dose of physical activity that benefits all conditions is reached after a critical analysis of scientific results for each condition. This is particularly so because there is no adverse effect of an overload (doses above this average) as the body adapts to increasing intensity and duration of physical activity (PAG, 2018). Although there is no evidence of causality between depression and inactivity, studies have shown a positive association between these two variables (Biddle, 2000; Blake et al, 2012) hence, the need to explore physical activity. The NICE guidelines (2009), opines that physical activity (aerobic or anaerobic) should be undertaken at least 3 times a week with each session lasting at least 30 minutes for a relative change in depressive symptom to be experienced. While the PAG suggests a baseline of 150 minutes per week (about 22 minutes per day) of moderate intensity physical activity e.g. brisk walking in order to enjoy its effectiveness. Ranjbar et al (2014) opines that certain factors should be considered when considering physical activity as an option for managing depression.

Nevertheless, alongside practicing physical activity, other factors around its engagement that can also determine its effect on depressive symptom include the technical and social aspects of this engagement (Nystrom et al, 2015). Research also shows that physical activity yields more positive result when it is done as a recreational activity as against compulsory physical activity sessions (Chen et al, 2012; Harvey Hotopf et al, 2010 &

Pickett et al. 2012) which may be responsible for why physical education classes have failed to evolve into late adolescence adulthood for many (Barnekow-Bergkvist et al, 2016).

2.11 Determinants of Participation in Physical Activity

Studies (Hein et al, 1994) have shown that moderate to high intensity physical activity can be an effective tool in promoting, preventing and rehabilitating health, including mental health. Nonetheless, Kristjansdottir et al, (2001) found that of the 3,600 students that participated in their study, the vast majority (91%) were physically active with school physical education ranking the highest source and males being more involved than females (Barnekow-Bergkvist et al, 1996). However, the physical education curriculum taken in schools have over time failed to evolve into lifestyle as a decline in participation in physical activity during leisure time, in adolescence and adulthood has been observed in both males and females (Barnekow-Bergkvist et al, 1996). These realities make it imperative to identify the factors that affect adolescent's participation in physical activity and how they can be adjusted in order to enhance physical activeness among this population.

Kristjansdottir et al (2001), and Telford (2016) also found out that girls get involved in less physical activity during leisure when compared with their male counterparts. The study also found that physical activity decreases as adolescents increase in age, from the beginning of late adolescence.

The literature (Hallal et al,2012, Telford et al, 2016) has established a gender-based difference in physical activity between males and females while few studies have explored some factors that are responsible for this which includes demographic and biologic factors

like maternal inactivity, while psychological factors include efficacy, perceived benefits of physical activity, perceived barriers, depressive symptoms, enjoyment of physical activity, perceived behavior control, perceived skill, competence, physical activity preferences, and interest in organized group activities . Behavioral factors that affect adolescent participation in physical activity include smoking, alcohol consumption, and socio-cultural factors include parental support, and peer support. Physical environmental factors involve parents' low socio-economic status, and lack of access to facility (Park &Kim, 2008).

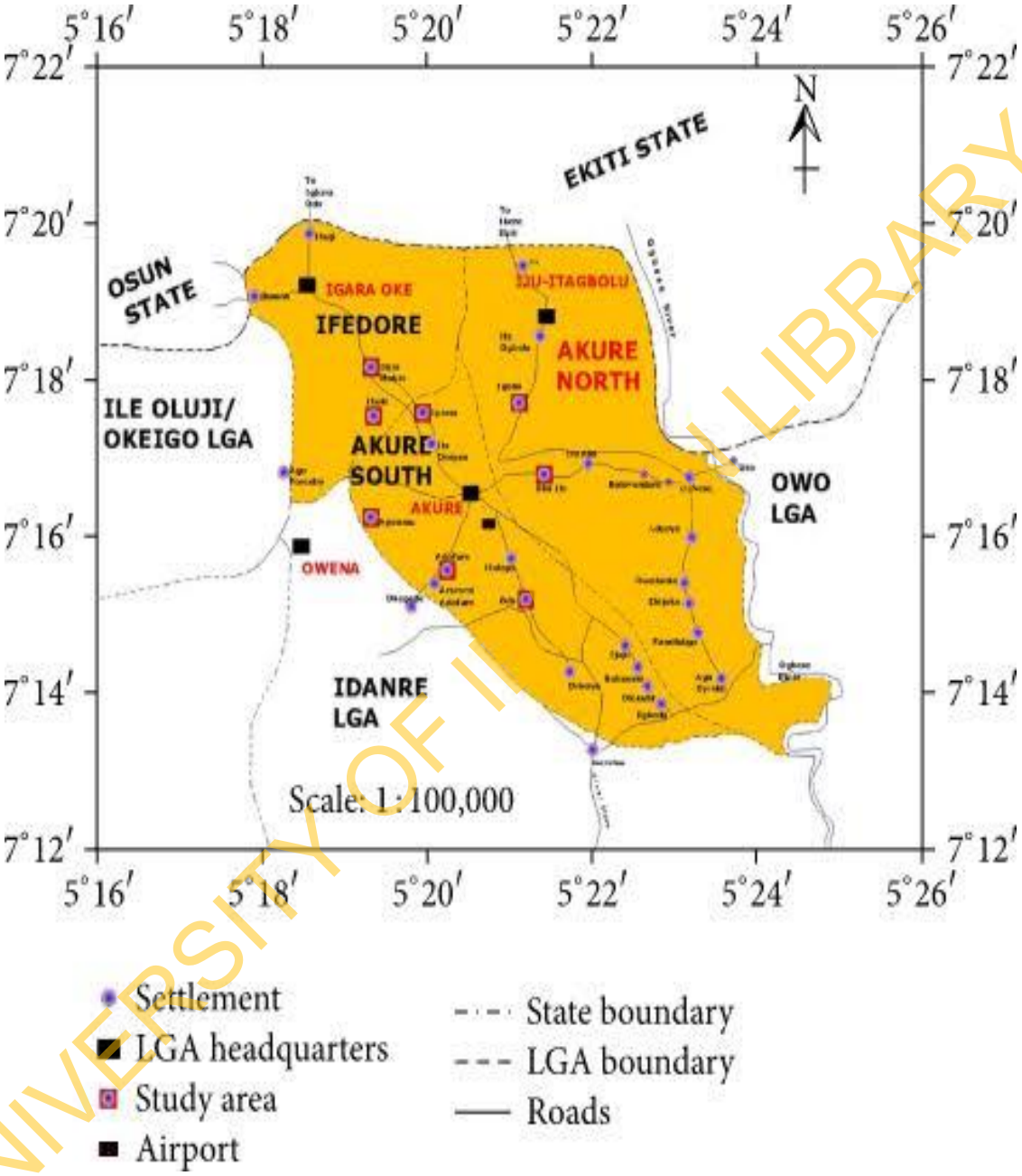
CHAPTER THREE

METHODOLOGY

3.1 Study Location

The study was conducted in Akure which is the largest city and the administrative capital of Ondo State with a total land mass of 991km^2. It is located in the southwestern part of Nigeria and lies within latitude 7^0 15^1 North of the equator and longitude 5^0 15^1 East of the Greenwich Meridian (Oluwadare et al, 2017). According to the 2006 population census, the city had a population of 484,798 which has increased greatly since then due to rural-urban migration (Owoeye et al., 2016). It comprises 1 urban and 2 rural local government areas; Akure South, Ifedore and Akure North local governments respectively. This study was carried out in the urban local government in this region; Akure South Local Government Area. Finding young adolescents, particularly boys along street corners playing football used to be a common phenomenon in this environment. However, in the last decade, a huge decline has been observed in respect to this.

FIGURE 3.1 SHOWING THE DISTRIBUTION OF THE THREE LOCAL GOVERNMENT AREAS IN AKURE, ONDO STATE, NIGERIA



Ministry of Works, Akure; Olamiju & Olujimi (2011).

According to the 2006 National Population Census (NPC), Akure South Local Government Area houses about 360,268 people and covers an area of 5,000 km^2 (Olabode, 2004). A list of all public secondary schools in this region was obtained from the State Ministry of

Education and two of them with similar characteristics based on student type and population, staff strength, neighborhood was chosen from the list and randomly allocated into either the control group or intervention group.

3.2 Study Design

The study is a combination of a cross-sectional survey and an experimental study that was divided into two stages.

Stage 1- a cross-sectional survey of the study population was carried out in order to recruit participants for the second phase of the study.

Stage 2- this involved intervention for individuals who met criteria for clinically significant depressive symptoms by scoring 11 and above on the Short Mood and Feelings Questionnaire.

3.3 Study Population

Akure Secondary Commercial School and C.A.C. Adu Memorial are two public secondary schools with matching characteristics within Akure South Local Government Area. The study population were students in Junior Secondary School 3 to Senior Secondary School 2 classes in these schools while the target population included students who met the inclusion criteria stated below.

Inclusion Criteria (Stage 1)

Students between the ages of 10 and 17 years (Bufferd et al., 2012) who provided assent and whose parents consented for them to take part in the study. These students were recruited from Junior Secondary School 3 to Senior Secondary School 2. Senior Secondary School 3 students did not participate in the intervention, due to their major exit examinations (West African Examination Council; WAEC).

Exclusion Criteria (Stage 2)

1. Students who were identified by their teachers as having learning difficulties.
2. Students who had been diagnosed with Asthma.
3. Students who reported that they participated in regular physical activity (at least 3 days/ week for 30 minutes) as shown in their responses on the physical activity questionnaire.
4. Students who had been treated for a psychiatric condition before as shown by the socio- demographic questionnaire.
5. Students who had severe depressive symptoms.
6. Students with any physical disability that limited their participation in physical activity.

3.4 Sample Size

For the first stage of the study, the sample size was calculated using the formula for estimating single proportions:

$$n = \frac{Z\alpha^2 pq}{d^2}$$

Where:

n = Sample size

Zα = Standard normal deviate corresponding to 5% level of significance= 1.96

p = Prevalence of depression in South- west, Nigeria (Gureje et al, 1994)

q = 1-p= 80%

d = level of precision (5%)

$$n = \frac{1.96^2 \text{ X } 20 \text{ X } 80}{25} = 246$$

Plus 10% non- remission rate was adjusted for using; $\frac{10}{100}$ x 246

$$=24.6$$

$$24.6+ 246 = 270.6$$

Hence, the minimum number of students that were due to be screened for depressive symptoms is approximately 271.

The minimum number of participants in the second stage (students with depression) was calculated using the formula for comparing two or more means

$$n = \frac{2(Z_\alpha + Z_\beta)\,\sigma^2}{(\mu_1 - \mu_2)^2}$$

Where:

n = Sample size

$Z\alpha$ = Standard normal deviate corresponding to 5% level of significance= 1.96

Z_β = Standard normal deviate corresponding to Type II error of 20%= 0.84

σ = standard deviation for Short Mood and Feelings Questionnaire = 4.5 (Bella-Awusah et al, 2016).

$(\mu_1 - \mu_2)^2$= 9 assuming a minimum difference in means of the outcomes between both groups is one-standard deviation (which would be considered clinically important).

$$n = \frac{2(1.96 + 0.84)^2 \text{ X } 4.5^2}{4.5^2}$$

n = 16 in each group. This was increased to 20 in each group to allow for attrition.

3.5 Sampling Technique

For the first stage of the study, a random sampling method was used to select the schools and the students who met the inclusion criteria from both schools. This was done by compiling the name of all the students in JSS3- SS2 from the class registers and assigning a number to each one.

A computer-generated random number sequence was used to select participants until the required sample size was met for each school. Then, the sociodemographic questionnaire (SDQ) (Omigbodun et al, 2008) and Short Mood and Feelings Questionnaire (SMFQ; Angold et al, 1995) were administered to the selected students. Scores above 11 on the SMFQ were used to select participants for the second stage.

3.6 Study Procedure

3.6.1 Intervention

Physical activity intervention

Justification for Content of the Programme

The goal of this programme was to provide an accessible and cost-effective option for managing mild to moderate depression with or without an expert's availability in order to bridge the wide treatment gap that exists particularly in the world of mental health in LMICs. This programme, required no special apparatus and it took place in one of the classrooms in the intervention school. Thirdly, the programme was aimed at encouraging the culture of structured physical activity in the larger population. However, physical

fitness is not a goal in this programme as studies have shown that it is not significant for the remission of depressive symptoms in depressed individuals (Martinsen et al 1989).

Treatment manual

This was a manualised delivery of a 6-week session of physical activity that was employed as a behavioural therapy for reducing depressive symptoms among adolescents in Nigeria. The sessions were on for a period of six weeks at a frequency of 3 times per week (Physical activity guideline (PAG), 2011).

In line with Cheung et al., (2013) who described adolescent and caregiver psychoeducation as an initial component in the management of depression, the intervention commenced with educating the patients on the signs and symptoms of depression, natural progression of the illness including its high risk of recurrence, its impact on different aspects of functioning in such places as the school, home and in religious settings, management options and issues around confidentiality. Behavioural activities have been shown to reduce depressive symptoms alone or in combination with cognitive or pharmacotherapies, especially in mild and moderate depression (Cuijpers et al 2006; Bella-Awusah et al, 2014). Thus, the greater part of the programme focused on behavioural activation through physical activities as a way of mediating depressive symptoms.

Sessions that succeeded the psychoeducation session started with warming up the muscles that were used in the course of the session in order to give room for enjoyment of activities and prevent injury (Sullivan et al, 2009). Thereafter, participants were led and guided through structured aerobic activities. Each exercise bout ended with a cool-off session which allowed for muscle relaxation (Hooren, 2018; Olav Olsen et al,2012). All of these

included age-appropriate and muscle-relaxing activities that promoted social interaction among participants and was guided by an alarm which indicated when to change activity. The activities and music were also directed at distracting adolescents from negative thoughts that could further worsen depressive symptoms in the study participants (Brief Psychosocial Intervention, 2010). A breakdown of the activities for various stages is provided later on in this chapter.

This manual used materials from previous manuals for depression including cognitive behavioural therapy (CBT) intervention manual (Ani, 2014), and Adolescent coping with depression course (Clarke, Lewinsohn, Hops, 1990). The later was adapted in order to suit the Nigerian adolescents while the former served as a guide as it was used in the same setting as the current study.

Background to the intervention programme

In all, there were 18 sessions of activities for the participants. Session one was a psychoeducational programme which was only a one-time event. The remaining 17 sessions were dedicated to the physical activity programmes.

Session 1- Psychoeducation

Duration- 1 hour

The goal of this session was to enhance the knowledge of study participants on depression: its prevalence, signs and symptoms, aetiology, psychopathology and management. This was necessary in order to ensure participants' cooperation and commitment through the course of the programme. After this, a question/answer session followed in order to ensure that the concepts that were taught were well grasped by the study participants.

Ground Rules

1. Endeavour to be punctual at every session.
2. Consistency is key for results; make yourself available at each session.
3. Personal discussions during the programme is confidential, treat it so.
4. Be honest as possible at each stage of the programme.
5. The students were asked to add to the rules if they wished.

Aims of Session

1. The main aim of this session was to form a rapport with the study participants
2. Secondly, it was to set some ground rules that guided the researcher and research participants in the course of the programme.
3. In addition to this was educating them on depression; its prevalence, signs and symptoms, risk factors, consequences and various existing management options for depression. In the course of this session, empirical management options and self-

help mechanisms on how to remain healthy were also discussed. This was not without reiterating the place of consistency ensuring effectiveness of the programme. Due to the nature of this illness, adolescents may be unable to understand or express how they feel nor how to go about it, hence, the need for this session.

Materials that was used for this session included jotters, pens. Provision was made for the students forgot to come with theirs. Snacks and water was also be provided for the students in form of refreshment.

The session started with personal introduction from the Researcher. After this, she educated the study participants on the following headings:

- Definition of the term, 'depression.'
- Signs and symptoms
- Describing its prevalence, in order to especially make them know that they are not alone in the state.
- Risk factors, including biological and psychosocial factors.
- Existing management procedures, including physical activity.

After this, the question and answer phase began in order to clarify participants' misunderstanding.

Sessions 2 to 18: Scheduled Physical Activity

Duration: 40 minutes

Main goal: (i) To introduce to and engage the study participants in physical activity effectively and efficiently. (ii) To encourage participants' acceptance of physical activity as a lifestyle.

Materials needed: Timer/ alarm clock that was used to monitor the duration of each activity, sachets of water in order to prevent dehydration in the course of the programme, snacks, physical education costumes, music player and music which is basically of moderate tempo as studies have proved this speed of music to enhance emotional arousal and activation in individuals (Ying et al, 2018).

The physical activity component of the programme commenced at the second meeting with study participants and ended on the last day of meeting (Session 18). These sessions formed the core of the programme and they were divided into the warm-up, main activity and cool-off sections.

Warm- up

According to Woods et al (2016), this refers to a set of mild activities that are aimed at performing two main functions: (a) improve the muscle functioning thereby making it less prone to injury and (b) preparing individuals for the demands of structured physical activity. Warm–up can either be active or passive. Active warm-up involves non-specific body movements such as stretching, jogging, or cycling, while the passive warm-up

involves the increase of body temperature through external means as saunas and hot showers.

This programme involved active warm- up sessions that lasted for 5minutes for each bout of exercise. The warm-up session comprised basic stretching activities for muscles of the upper and lower limbs, including the trunk of the body. They included movements around the neck, rotating the shoulders, flexing and bending the trunk and the lower limbs.

Main activity

This involved 30 minutes of structured physical activity that was done at moderate intensity throughout the second- sixth sessions (i.e. first two weeks). Subsequent sessions included a blend of moderate and vigorous intensity of physical activities as dictated by the moderato and allegro music tempos. Activities in this category were carried out thus:

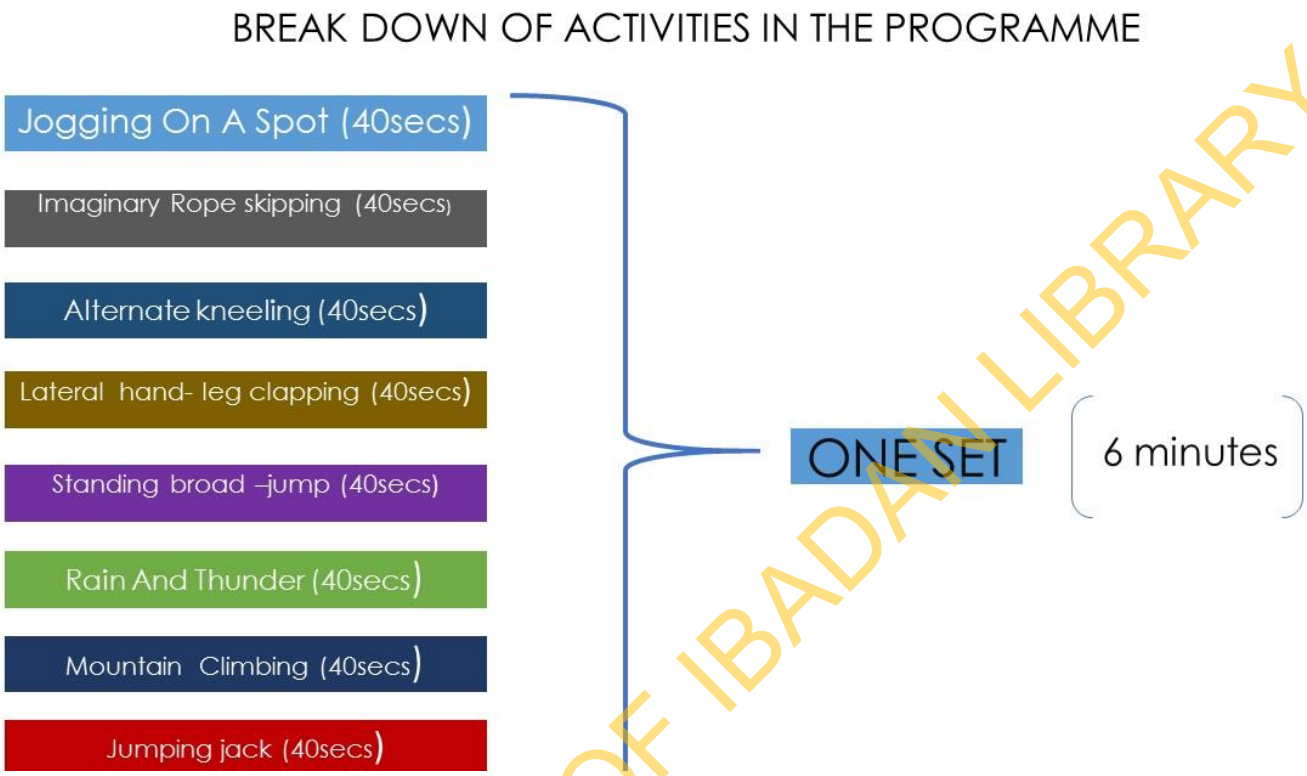


Figure 3.2- A breakdown of activities in the programme.

The combination of all 8 activities at 40 seconds each made a set (which lasted for 6 minutes). This set was repeated 5 times hence, there was a total of 5 sets which lasted for 30 minutes.

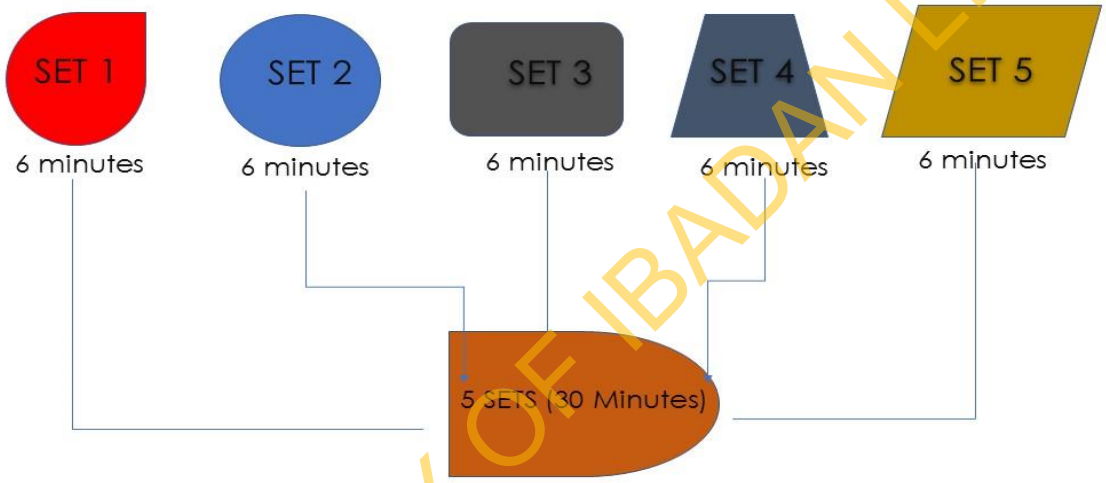


Figure 3.3- Further break-down of activities in the programme.

Cool-off

Cooling off after physical activity is as important as warming up. In the course of physical activity, the heart rate increases. However, cool- off activities enhance the effective and efficient relaxation of the heart after physical activity.

These activities included head-shoulders-knees-toes, jack in the box pose, deep inhalation and exhalation. A combination of all these activities made a set of 80 seconds. Three sets of these activities lasted about 4 minutes. Thereafter was a 1- minute period of "Simon says" where the instructor called out commands for the students to obey including sit down, pick pins, lateral body stretches. All these activities were done alternately. Thus, the end of exercise bout.

Intensity

The intensity of these activities varied as they were determined by the tempo of the music that played in each session. According to Kirby (2015), tempo refers to the speed at which music is being played which helps the singer to convey a feeling of either intensity or relaxation. It is measured in beats per minute and can vary from grave (20 to 40 beats per minute (bpm), to Largo (40-50 bpm) to Lento (40-60 bpm), Adagio (51-60 bpm), to Andante (60-80 bpm) to Moderato (81 to 90 bpm), to Allegretto (91-104 bpm) to allegro (105 -132 bpm to Vivace (132- 167 bpm) to Presto (168-177 bpm and finally Prestissmo (178-208 bpm). For the purpose of this study, the tempi that were used include Andante, Moderato and allegro.

Andante

Andante is a common music tempo that is meant to be at walking pace or near an average resting heart rate and it includes music at 60-80 beats per minute. Examples of music genres in this category include Dub/Reggae, Blues.

Moderato

This is at the middle of the tempo spectrum and is played at a moderate pace of 81-90 bpm e.g. Indie rock, Hip-hop, Rap. The intensity of activities in the first and second weeks of the programme were guided by the pace of Andante and Moderato music. This is in line with Woods et al (2007) who found that medium –tempo music had more arousal significance when compared with the high and low tempo music types.

Allegro

This is slightly quicker than Allegretto with bpm range of -132 bpm and its examples include Pop, Rock, Jazz and Funk, House, Techno. This music tempo decided the pace / intensity of activities from the third-sixth week of the programme.

3.7 Data Collection

The mode of data collection used in this study was the primary data collection technique which involved the use of questionnaire.

3.8 Study Instruments

The choice of instruments used in this study was informed by the aims and specific objectives that it sought to answer.

3.8.1 Socio- demographic Questionnaire

This questionnaire was developed by Omigbodun et al (2008) to assess the characteristics of a study population. It includes variables like age, gender, ethnicity, Parent's level of education, income, etc.

It has been used by a number of adolescent studies in this region (Omigbodun et al, 2008; Bella- Awusah et al, 2016).

3.8.2 Short Mood and Feeling Questionnaire (SMFQ)

This is a short and self- reported version of a 33 item questionnaire designed based on DSM-III criteria for indicating depressive symptoms (Angold et al, (1995). The SMFQ was developed by Angold and Costello (1987) in order to explore subjects' mood and affect, including depressive symptoms over the past two weeks (Kwong, 2019; Wood et al; Daviss et al, 2006). It is used for children between ages 6 and 17 years.

Scoring

The SMFQ contains 13 items scored on a 'Not true', 'Sometimes' and 'True' basis. Scores of 0,1 and 2 marks are allotted to the answers respectively. Thus, the possible scores range from 0-26 with higher scores indicating higher severity of depression in an individual. In this study, a cut off – point of 11 was used to identify clinically significant depression (Kwong, 2019; Turner et al, 2014).

In a study carried out with 521 sixth graders, Rhew et al (2010) assessed the validity of two short screening questionnaires; the SMFQ (Child and parent versions) and one-and-two-item screening instruments for depressive disorders in a sample of school- based

adolescents by matching their responses on these scales with the criterion standard Diagnostic Interview Schedule for Children" (DISC).

The result of the study showed that the child, parent and combined versions of the SMFQ had moderate diagnostic accuracy for depression diagnosis according to DISC. The SMFQ-Child (SMFQ-C) showed an area under the receiver operating characteristic curve (AUC) of 0.73 (955 CI:0.63- 0.84) with sensitivity and specificity levels of 0.66 and 0.61 respectively. The SMFQ has also been used in a number of studies in Sub- Saharan Africa, including Nigeria (Ola and Ani, 2013, Bella- Awusah et al, 2016).

3.8.3 Physical Activity Questionnaire-Adolescent (PAQ-A)

This is a self-administered questionnaire that was created by Kowalski, Crocker and Kowalski (1997) in order to assess the level of physical activity that is engaged in by in –school adolescents between the ages of 14 and 19 years in large –scale studies. The PAQ is a self- administered questionnaire that enhances study participants' recall of their general level of physical activity over the past 7 days although it does not discriminate among the intensity of these activities. For an effective administration of PAQ-A, it is important to emphasize the following:

(i) That PAQ is not a test but a review of participants' **actual activity** in the **past 7 days**.

(ii) Data should be well monitored in order to reduce the occurrence of a missing data to the minimum.

(iii) In the course of monitoring, it is important to inform the students that research assistants are only trying to ensure that no question is left out and not to check their responses.

These will aid the students' responsiveness and effectiveness of the study.

SCORING

For item 1 (Spare time activity)

1- No activity, 5- 7 times or more. The mean of all activity on the checklist is taken to form a composite score for item 1.

For item 2-7

Here, the score for each item starts from the lowest activity response and progress to the highest activity response - Use the reported value that is checked off for each item with the lowest score being 1 and the highest being 5.

For item 8

With "none" being a "1" and "very often" being a "5", the mean of all the week days is taken to give a composite score for item 8.

For item 9

This item can be used to identify students who had unusual activity during the previous week, but this question is NOT used as part of the summary activity score.

Mean Activity Score

The values derived from each of the items 1-8 are added up and divided by 8 in order to arrive at the summary physical activity score (Kowalski K. et al, 1997). Scores from 1.9 below signify an inactive population while scores between 2 and 3.9 represents average participants and scores between 4 and 5 depicts an active population (Adeniyi et al, 2011).

Validity and Reliability

The PAQ-A (a modified version of the PAQ-C) was developed to measure general levels of physical activity in adolescents. Kowalski, Crocker, and Kowalski (1997) administered the PAQA along with other physical activity measures to 85 high school students during the school year. The students consisted of 41 males and 44 females (grades 8 through 12), ages 13 to 20. Two schools were assessed separately (late March-early April and late May-early June). The assessments were scheduled over two-week periods that avoided any special school events. The students were administered the PAQ-A (M = 2.31, SD = 0.63), an activity rating (M = 3.15, SD = 0.93), Leisure Time Exercise Questionnaire ([LTEQ]; M = 54.02, SD = 30.23), Caltrac motion sensor ([Caltrac]; M = 355.88, SD = 126.01), and the 7-day physical activity recall interview ([PAR]; M = 36.21, SD = 3.24). To ensure no carry over effects, the Caltrac and PAR were administered over a different 1-week period than the other measures. The PAQ-A was the only measure sensitive to gender differences, $t(83) = 3.01$, $p < 0.05$.

The version used in this study was adapted by Adeniyi et al (2011) among 1100 Nigerian adolescents in Ibadan, Nigeria. The PAQ-A was significantly correlated to all self-report measures (activity rating, r = 0.73; LTEQ, r = 0.57; and PAR, r = 0.59). The PAQ-A was

also related to the Caltrac (r = 0.33). Although it was recorded that the students tampered with the Caltrac devices which made only 56.47% of the Caltrac data usable. The PAQ-A scores differed significantly between those who had usable Caltrac data and those that did not, t (83) = 2.78, $p < 0.05$. These results provided support for the convergent validity of the PAQ-A.

3.8.4 Client Satisfaction Questionnaire (CSQ)- Short

This is one of the short versions of the standardized client satisfaction questionnaire that have been popularly used in assessing the quality of mental health and human services. The instrument was developed by Attkisson & Greenfield (1996) and it is used to explore direct reports from individuals on their satisfaction across various health and human services at the end of such services. For the purpose of this study, the CSQ sought respondents' opinion and conclusion about the exercise programme. This is necessary in order to sustain the effects of physical activity on the individuals as well as in advocating for a physically active populace.

The version of CSQ used in this study contains 10 items; 7 close ended and 3 open –ended questions. The former data set are all scored on a Likert scale with scores ranging from 0-4 thereby giving a total score of 28 such that higher CSQ scores depict a higher level of satisfaction (Attkisson &Greenfield, 1996). The qualitative open-ended comments were analyzed thematically.

The process of scoring involves calculating total score for each subject and analyzing item and total score distributions across groups of subjects. Interpreting data set on the CSQ

scale involves comparison of results obtained for a given service with external data that can be used as a standard (Nguyen, Attkisson& Stegner (1983).

3.8.5 Rosenberg Self- Esteem Scale (RSES)

This is an affordable and time saving 10 item Likert scale questionnaire that was developed by a sociologist, Morris Rosenberg in 1965. The questionnaire was developed with a standardized sample of 5,024 adolescents from high schools in New York State (Bracken & Mills, 1994). The consists of 5 positive and 5 negative statements about the individual that are mixed together, measuring the way individuals feel generally about themselves. It is answered on a four-point scale from "strongly disagree" to "strongly agree" with scores ranging from 0-3 in the aforementioned order while questions 2, 5, 6, 8 and 9 are scored on the reverse i.e. "strongly disagree" being 3 points while "strongly agree" and 30 representing the highest score possible. Scores between 15 and 25 are regarded as normal while scores below 15 suggests low self-esteem.

Validity of RSES and Reliability for Research

According to Swenson (2003), in her review of the psychometric properties of RSES, she reported a consistently high score for different age groups, including adolescents and adults and populations like students, individuals with mental illnesses, low literacy, etc. Its feasibility, validity and reliability in this setting have been established by a number of studies (Ogunleye, 2012, Ikennegbu, 2015, Dennis& Oluwatelure, 2016).

3.9 Administration of Study Instruments

In order to ease the administration of the study instruments, the researcher employed two trained research assistants to help with administration, guidance of respondents and collection of the study instruments.

3.10 Data Management and Analysis

The questionnaires collected were collated, sorted, coded in accordance to SPSS package numeric coding format version 21. However, prior to copying of data into SPSS interface, data was entered into Microsoft Excel format and validated. While coding in SPSS format, variable names, types, label and values were clearly defined before the data was analysed. The study adopted descriptive statistical method of data analysis in form of frequency count and percentages for categorical data and mean and standard deviation for continuous data. Comparisons between the intervention and control groups were carried out with t test for continuous variables and chi-square for categorical variables. Analysis of covariance (ANCOVA) was used to assess for treatment effect by controlling for baseline scores.

3.11 Ethical Considerations

Ethical approval to carry out this study was received from the University of Ibadan/ University College Hospital (UI/UCH) Ethics Review Committee, Ondo State Ministry of Health, Alagbaka, Akure, Ondo State Ministry of Education and authorities of the selected schools.

Consent from participants' parents and assent from study participants was also obtained.

CHAPTER 4

RESULTS

This chapter has 5 segments, all aiming at explaining the outcome for the various segments of the study. The first part of the chapter provides results on the demographic variables of the study population.

4.1 Sample description and study flow

A total of 277 in-school adolescents were screened for significant depressive symptoms (139 from the intervention school and 138 from the control school). In the intervention school, 23 students as against 26 in the control school met the criteria for significant depressive symptoms but 3 and 6 students respectively were withdrawn from the study in both schools for their inability to fully meet the study requirements due to low academic ability and presence of limb disability. Thus, 20 students were recruited into each of the two groups.

Two of the students in the intervention group had less than 5 attendances, thus were excluded from the analysis. Fifteen of the participants attended 15-18 sessions while 3 attended 10-14 sessions. None of the participants included in the result analysis missed up to 3 consecutive sessions. All 20 participants in the control group completed the baseline and post-intervention measures at the end of the 6th week.

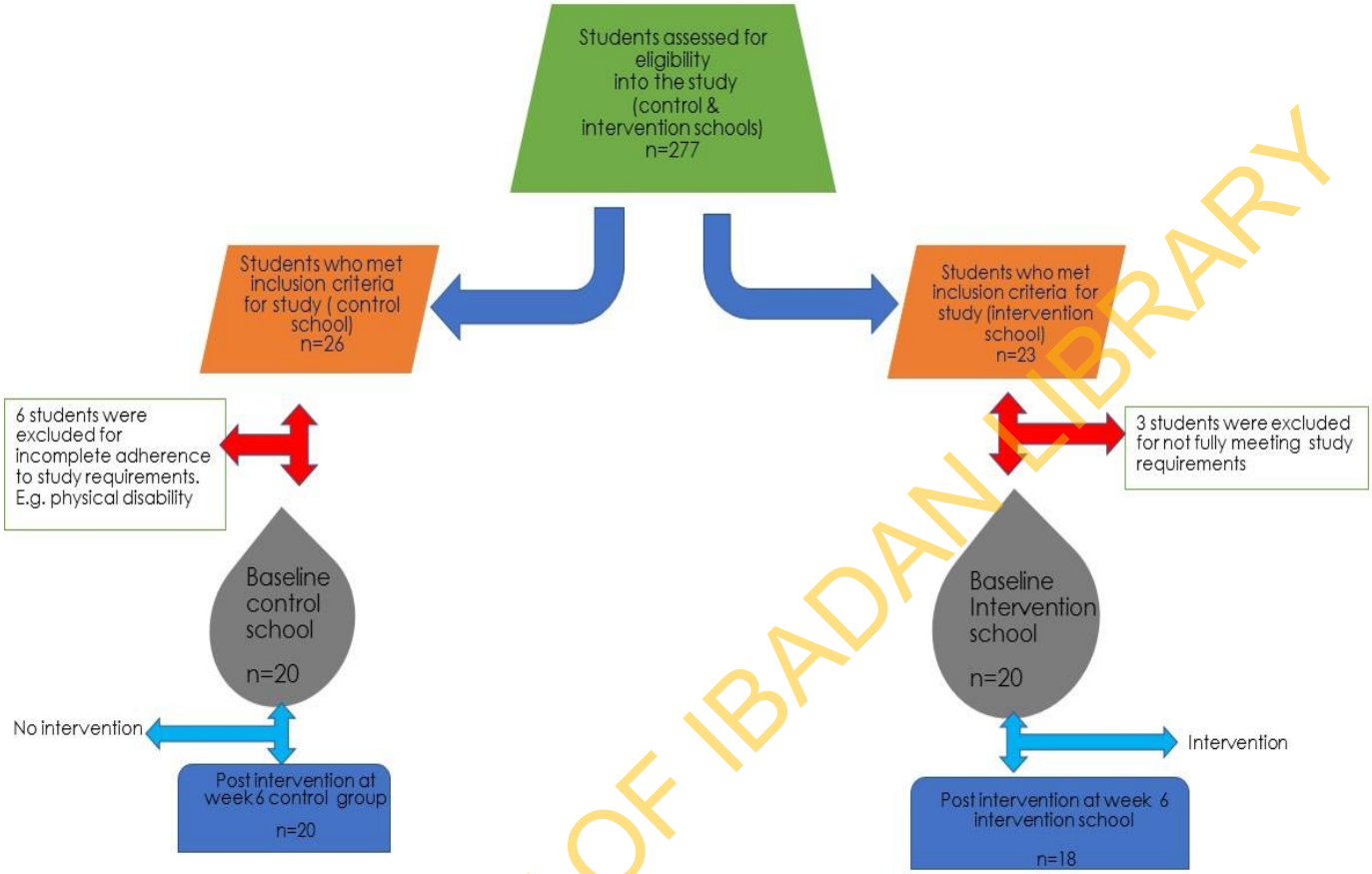


Figure 4.1- An outline of the study procedure

4.3 Socio-demographic characteristics of study participants for the intervention part of the study

Twenty-seven (67.5%) participants were females and 13 were males (32.5%). Out of the 13 males who took part in the study, 5(11.25 %) were in the intervention group while the remaining 8 (21.25%) were in the control group. Eighty-seven percent of respondents were Christians, 7.7% Muslims while 2.9% belonged to religions other than these two. A greater percentage (70%) of respondents lived less than or 1 km away from their respective schools while the remaining 30% lived more than 1 km away. Eighty-two percent of the participants were from monogamous families while 17.5% were from polygamous families. Sixty-seven percent of the respondents' parents were married while 22.5% had parents who were divorced and 10.0% had lost either or both of their parents. Thirteen (32.5%), 18 (45.0%) and 9 (22.5%) of the respondents were in classes JSS3, SS1 and SS2 respectively. Fifteen percent of the respondents were doing some form of work after school in order to earn money. Families of 24 (64.6%) participants belonged to low socio-economic group, 15 (40.4%) belonged to the middle socio- economic status.

Participant's age range was between 10 and 17 years with a mean age of 13.4 years (SD = 4.12) and 14.9 years (SD =1.0) in the control and intervention schools respectively.

Tables 4.1a-d show that the intervention and control groups were similar in baseline characteristics.

Table 4.1A: Socio-demographic characteristics of study participants for the intervention part of the study (Categorical variables)

Characteristics		Intervention group (N=20) N (%)	Control group(N=20) N (%)	df	X^2	p
Gender	Male	5 (11.3)	8 (21.3)	1	1.03	0.31
	Female	15 (39.9)	12 (27.7)			
Class	JSS3	7 (17.5)	6 (15.0)	N/A	1.30*	0.61
	SS1	10 (25.0)	8 (20.0)			
	SS2	3 (7.5)	6(15.0)			
Home location	Close	16 (40.0)	12 (30.0)	1	1.91*	0.30
	Far	4(10.0)	8(20.0)			
Religion	Islam	1 (2.6)	4 (10.3)	1	3.30*	0.10
	Christianity	19 (48.7)	14 (35.9)		4.07	0.25
	Others	0 (0.0)	1 (2.6)			
Family type	Monogamous	18(45.0)	15 (37.5)	N/A	N/A*	0.41
	Polygamous	2 (5.0)	5 (12.5)			
Parents' marital status	Married	15 (37.5)	12 (30.0)	1	1.42*	
	Separated	3 (7.5)	6 (15.0)			
	Others	2 (5.0)	2 (5.0)			
Working after school	Yes	2 (5.0)	4 (10.0)	N/A	N/A*	0.66
	No	18 (45.0)	16 (40.0)			
Father's educational level	No formal education	3 (7.5)	0 (0)	N/A	4.28*	0.23
	Secondary school and below	3 (7.5)	7 (17.5)			
	Post-secondary education	11 (27.5)	10 (25.0)			
	I do not know	3 (7.5)	3 (7.5)			

TABLE 2.1B: CONTINUED: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF STUDY PARTICIPANTS FOR THE INTERVENTION PART OF THE STUDY

Characteristics		Intervention group (N=20) N (%)	Control group(N=20) N (%)	df	X^2	p
Mother's educational level	No formal education	0 (0)	1 (2.5)	3	2.08*	0.66
	Secondary school and below	7 (17.5)	8 (20.0)			
	Post-secondary education	7 (17.5)	8 (20.0)			
	I do not know	6 (15.0)	3 (7.5)			
Socio-economic status	Low	12 (30.8)	12(30.8)	1	0.04	1.00
	Middle	8 (20.5)	7(17.9)			
Likeness for family	Yes	19 (47.5)	17 (42.5)	1	2.57*	0.35
	No	1 (2.5)	3 (7.5)			
Participation in physical activity after school	Yes	6 (15.0)	1 (2.5)	N/A	N/A*	0.09
	No	14 (35.0)	19 (47.5)			
Likeness for school	Yes	18 (46.2)	19 (48.7)	1	N/A*	1.00
	No	1 (2.6)	1 (2.6)			
Academic performance	Good	15 (37.5)	10 (25.0)	1	N/A	0.10
	Poor	5 (12.5)	10 (25.0)			

N.B: * represents Fisher's exact test

4.2 Prevalence of Depression Symptoms among the Control and Intervention Schools (whole sample for stage 1 part of the study N = 276)

In the total study population, 49 (17.7%) of the respondents had significant depressive symptoms. Among these, the intervention school recorded a point prevalence of 16.5% (23) while the control school recorded 18.8% (26), $x^2 = 0.25$ and $p = 0.37$. This indicates that there was no statistically significant difference in depression rate between both schools. See Table 4.2.

Table 4.2- Baseline Depression and Self-esteem Status of Study Population (N=276)

Variables		Intervention group 139 N (%)	Control group 137 N (%)	X^2	p	Total 277 N (%)
Depressed	Yes	23 (16.5)	26 (18.8)	0.25	0.37	49 (17.7)
	No	116 (83.5)	112 (81.2)			228 (82.3)
Self-esteem	High	113 (81.9)	110 (79.7)	0.21	0.65	53 (19.2)
	Low	25 (18.1)	28 (20.3)			223 (80.8)

N.B. the moderate level class also contained 2 study participants who were in the high level category of P.A.

4.3 Association between Depression and Self-esteem (whole sample for stage 1 of the study (N = 277)

In Table 4.3, using the Pearson correlation coefficient, a negative relationship was found to exist between self-esteem and depression (Pearson correlation = - 0.49, p-value = 0. 000). This means that as self-esteem increases, the probability of depression occurring reduces significantly.

TABLE 4.3: ASSOCIATION BETWEEN DEPRESSION AND SELF-ESTEEM. N= (277)

Variables	Pearson's Correlation r	P value
SMFQ Score	**- 0.49**	**0.000**

Correlation is significant at 0.05 level.

4.4 Level of Physical Activity among in- school Adolescents in Akure South Local Government Area.

On the whole, majority of the participants (60.3%) engaged in moderate level of physical activity while (39.7%) did low level of physical activity. Of the male respondents, 47 (38.2%) engaged in low level of physical activity while 76 (61.8%) engaged in moderate level of physical activity. Among the females, 63 (40.9%) had low engagement in physical activity while 91 (59.1%) also fell into the moderate physical activity level. In the intervention school, 55 (39.6%) of the respondents were engaged in low level of physical activity while 84 (60.4%) had moderate level of engagement pre- intervention. On the other hand, among the control school, 55 (39.9%) had low engagement in physical activity while 83 (60.1%) were moderately active.

Only 73 (32%) (52 boys and 21 girls) of total respondents reported participation in sports or physical activity after school hours. Out of the remaining 203 participants, 75 (37%) reported that they had no access to sporting facilities, 71 (35%) reported that they had no time for participation while 57 (28%) reported that their parents gave no consent to their participation.

TABLE 4.4: LEVEL OF PHYSICAL ACTIVITY BETWEEN MALES AND FEMALES ACROSS INTERVENTION AND CONTROL SCHOOLS (N = 277)

Variables			Intervention school 139 N (%)	Control school 138 N (%)	X^2	p	Total 277 N (%)
Level of physical	Moderate	Male	39 (23.4)	37 (22.2)	0.4	0.85	76 (27.5)
activity		Female	45 (26.9)	46 (27.5)			91 (33.0)
	Low	Male	24 (21.8)	23 (20.9)			47 (17.0)
		Female	31(28.2)	32 (29.1)			63 (22.8)
	Total		139 (50.2)	138 (49.8)			277 (100)

4.5 Comparison of Physical Activity level of study participants with and without depression

In the study population, 167 (60.3%) students engaged in moderate level of physical activity. Among these, 22 (13.2%) of these had significant depressive symptoms while 145 (86.8%) were not depressed.

On the other hand, 110 (39.7%) of the total study participants engaged in low level of physical activity. 27 (24.5) of these had significant depressive disorder while 83 (75.5) showed insignificant depressive symptoms.

TABLE 4.5: COMPARISON OF PHYSICAL ACTIVITY LEVEL OF STUDY PARTICIPANTS WITH AND WITHOUT DEPRESSION

Variables		Depressed N (%)	Not depressed N (%)	X^2	p	Total 277 N (%)
Level of physical activity	Moderate	22 (13.2)	145 (86.8)	5.89	0.02	167 (60.3)
	Low	27 (24.5)	83 (75.5)			110 (39.7)
	Total	49 (17.7)	228 (82.3)			277 (100.0)

4.6 Association between physical activity and self- esteem (whole sample for stage 1 of the study N = 277)

The Pearson correlation coefficient showed a positive statistically significant relationship between physical activity and self-esteem. This translates that an increase in one will result in rise in the other (i.e. an increase in physical activity was associated with an increase in self-esteem).

TABLE 4.6: ASSOCIATION BETWEEN PHYSICAL ACTIVITY AND SELF-ESTEEM

Variables	Pearson's Correlation r	P value
SMFQ Score	0.12	0.04

Correlation is significant at 0.05 level.

4.7 Within-group comparison of depression and self-esteem scores of the intervention and control groups pre and post-intervention

In the intervention group, there was a significant change in the mean scores of participants on depression ($t = 6.46$, $p = 0.000$), and a statistically insignificant increase in self- esteem scores ($t = -2.02$, $p = 0.06$). On the other hand, in the control group, a significant reduction in depression scores was also recorded ($t = 2.26$, $p = 0.04$) while there was no significant change in self-esteem score ($t = -2.02$, $p= 0.06$).

TABLE 4.7: WITHIN-GROUP COMPARISON OF DEPRESSION AND SELF-ESTEEM SCORES OF THE INTERVENTION AND CONTROL GROUPS

	Pre-intervention scores Mean (SD)	Post-intervention scores Mean (SD)	t	df	P	Mean difference	CI
Treatment group (n=18)							
SMFQ score	13.5 (1.64)	7.85 (4.00)	6.46	19	0.00	5.65	3.82- 7.48
RSES score	13.2 (3.93)	15.55 (3.60)	-2.02	19	0.06	-2.35	-4.79-0.09
Control group (n=20)							
SMFQ score	14.2 (3.28)	11.72 (3.61)	2.26	17	0.04	2.50	0.17-4.83
RSES score	11.9 (3.48)	12.83 (5.36)	-0.431	17	0.67	-0.56	-3.28-2.16

*****Significant at 5%

4.8 Between-group differences in post intervention depression and self-esteem scores among the intervention and control groups

Independent sample t-test (Table 4.7) showed that after the intervention, the treatment group had significantly lower depression scores compared with control group (t= -4.02, p= 0.000). On the other hand, there was no significant difference in self-esteem scores between intervention and control groups post-intervention (t= 1.58, p= 0.12).

TABLE 4.8: BETWEEN-GROUP DIFFERENCES IN DEPRESSION AND SELF-ESTEEM SCORES AMONG THE INTERVENTION AND CONTROL GROUPS

	Intervention group (n=18) Mean (SD)	Control group (n=20) Mean (SD)	t	df	p	Mean difference	CI
SMFQ score	7.22 (3.70)	11.90 (3.46)	-4.02	36	0.000	-4.68	-7.04-2.32
RSES score	15.50 (3.38)	13.15 (5.41)	1.58	36	0.12	1.45	-0.60-5.36

Significant at 5%

4.9 Physical activity and depression

Using the Pearson correlation coefficient, a positive relationship was found between physical activity and depression (Pearson correlation = 0.15, p-value = 0. 01). This means that a high level of engagement in physical activity was found to be significantly associated with lower depressive symptoms) among participants in the study.

TABLE 4.9: ASSOCIATION BETWEEN PHYSICAL ACTIVITY AND DEPRESSION

Variables	Pearson's Correlation r	P value
PAQ	0.15	0.01

Correlation is significant at 0.05 level.

4.10 Association between physical activity and self- esteem (whole sample for stage 1 of the study N = 277)

The Pearson correlation coefficient showed a positive statistically significant relationship between physical activity and self-esteem. This translates that an increase in one will result in rise in the other (i.e. an increase in physical activity was associated with an increase in self-esteem).

TABLE 4.10: ASSOCIATION BETWEEN PHYSICAL ACTIVITY AND SELF-ESTEEM

Variables	Pearson's Correlation r	P value
SMFQ Score	0.12	0.04

Correlation is significant at 0.05 level.

4.11 Test of treatment effects

Analysis of covariance was conducted on the SMFQ scores to determine the effect of the exercise regimen on the depressive symptoms controlling for baseline depression scores. Physical activity was controlled for as it was significantly different between the two groups pre intervention. The test recorded a significant effect of the treatment on the intervention group as measured by the SMFQ {F (1, 34) = 7.05, p= 0.03}.

TABLE 14.11: TESTS OF BETWEEN-SUBJECT EFFECTS ON THE SMFQ

	Type III Sum of squares	df	Mean square	F	P	Partial Eta Squared
Corrected model	152.09	3	50.70	3.34	0.03	0.23
Intercept	44.85	1	44.85	2.95	0.10	0.08
SMFQ total baseline	9.76	1	9.76	0.64	0.43	0.02
PAQ total baseline	0.36	1	0.36	0.02	0.88	0.00
Intervention group	107.01	1	107.01	7.05	0.01	0.17
Error	516.12	34	15.18			
Total	4232.00	38				
Corrected total	668.21	37				

*Significant at 0.05

Level of satisfaction with the intervention among participants in the treatment group

The satisfaction scores that was obtained from the intervention group ranged from 21 to 27 with a mean score of 24.33 and a standard deviation of 1.85. A higher score indicates a higher level of satisfaction from the respondents. The overall score for participants on this scale is 28. Table 4.12 shows the average ratings of each item on this questionnaire.

TABLE 4.12: EVALUATION OF EXERCISE REGIMEN BY THE INTERVENTION GROUP (N=18)

	Yes	No	I don't know
As students, did this workshop meet your expectations?	16 (88.9%)	0 (0)	2 (11.1)
Was the content of the workshop clearly presented?	17 (94.4%)	0(0)	1(5.6)
Was this workshop of value to you?	17 (94.4%)	0(0)	1(5.6)
Was the timing of this workshop convenient for you?	18 (100%)	0(0)	0(0)
I learnt very little from this workshop.	16(88.9%)	1 (5.6)	1 (5.6)
The location of this workshop was not convenient for me.	16 (88.9%)	2 (11.1)	0(0)
With this workshop, I can confidently work with depressed students.	18 (100.0%)	0 (0)	0(0)

Significant at 5%

Qualitative analysis of the workshop

Nine (25%) of respondents in the intervention group identified that they would have preferred topics on peer pressure to be included in the program. Five (27.8%) suggested topics on psychoactive substance use and 4 (22.2%) gave no response to this question. Fifteen (83.3%) of the respondents identified the exercise aspect of the workshop as their best moment on the workshop while 3 (16.7%) of them acknowledged the psychoeducation part as their most preferred aspect of the program.

Three (16.7%) of the respondents would have preferred a different time for meeting, 2 (11.1%) would have preferred another genre of music while (13) 72.2% of these respondents showed their satisfaction with the entire course of the program.

CHAPTER FIVE

Discussion, Conclusion and Recommendations

5.1 Discussion

In recent times, secondary school studies have become popular, especially in sub-Saharan Africa (Oduguwa et al., 2017) due to the fact that it is one of the sites where adolescents can be readily accessed. This study investigated the changes in depressive symptoms and self-esteem scores after engaging in a six-week exercise programme. It also sought to explore the level of inactivity among adolescents while investigating the relationship between physical activity and self-esteem. A total of 277 in-school adolescents were screened for significant depressive symptoms of which 49 had significant depressive symptoms giving a prevalence of 17.7%. There was a significant negative correlation between physical activity and more depressive symptoms (more physical activity associated with lower depressive symptoms). There was also a significant negative relationship between self-esteem and depressive symptoms (i.e. lower self-esteem associated with higher depressive symptoms). After the intervention, the treatment group had significantly lower depression scores compared with the control group SMFQ. The treatment group rated the intervention highly.

5.1.1 Socio-Demographic Characteristics of the Study Participants

Participants in this study were students from Junior Secondary School 3 (an equivalent of 9 years of formal schooling) through Senior Secondary 2 (an equivalent of 11 years of formal schooling). In a study that investigated the relationship between physical activity and depression among SS1-SSS3 (Year 10-Year 12) students in South- west Nigeria,

Adeniyi et al., (2011) found a mean age of 15.2 (± 1.4.) and Bella et al., (2014) also recorded a mean age of 15.4 (± 1.2) years among a group of students from SSS1-SSS3 classes. The current study found a mean age of 14.8 (± 1.2) among students in JSS3, SSS1, SSS2 classes. This is expected because studies that recruited senior classes only are expected to have a higher mean score than studies that had a combination of junior and senior class students. One of the reasons for this homogeneity in result may be because all these studies recruited public schools (Bella et al., 2014) and or a combination of both public and private secondary schools (Adeniyi et al., 2011). This study also found low socio-economic status to be prevalent among 24 (64.6%) of the study population (Phase 2).

5.1.2 Prevalence of depressive symptoms

The study found a prevalence rate of 17.7% among the students that were recruited for the first phase of the study. This is consistent with similar to studies in Nigeria that have found prevalence between 5-20% among adolescents (Adeniyi et al 2011, Omigbodun et al 2008) but lower than average world prevalence of 6% reported by Thapa et al., (2014).

5.1.3 Self-esteem and physical activity

This study found no significant difference in the self-esteem scores of participants after the physical activity programme. This finding contradicts a number of the existing literature (Fernandz-Bustos et al, 2019; Gilani& Dashipour, 2017; Park, 2016Haugen et al., 2013). Especially is Barton et al., (2012) who found a positive significant association between physical activity and self-esteem and mood after a single session of their physical activity intervention programme. The study by Barton et al (2012) compared the efficacy of two existing group-based methods of enhancing health (swimming and social

clubbing) with a weekly countryside and urban park walks (green exercise programme) in a set of 53 clinical population. Study participants were, at the time of study being managed for a range of mental health challenges including mood disorders, schizophrenia and other psychotic disorders, and substance-related disorders. Similarly, in a randomized control trial, Bigisdottir (2017) found a significant positive relationship between physical activity and self-esteem among a set of 233 adolescents who were divided into 4 different groups, including a wait-list group.

The reason for this difference in results may be attributed to the fact that the current study recruited respondents who had milder depressive symptoms as they were non-clinical respondents. Secondly, due to the fact that self-esteem is a labile concept (Barton, 2011) that changes gradually over a considerable time, the short duration of the programme could have affected this result.

5.1.4 Prevalence of Physical Inactivity among in-school Adolescents in Akure South Local Government Area

The study found that 167 (60.5%) (39 boys and 45 females) of the study participants met the minimum requirement of physical activity for health pre intervention (Physical activity guideline (PAG), 2018) while 107 (39.8%) (24 males and 31 girls) were physically inactive. Seventy (25.7%) reported that they did no physical activity in their leisure time, while only 47.8% participated actively in physical activity classes. This is consistent with Oyeyemi et al., (2016), who in a cross-sectional study carried out in North-eastern part of Nigeria found that the percentage of study participants who participated in moderate level of physical activity was 37% (95% CI: 34%-40%). It was

noted that school based physical activity formed the largest contributor (57.1%) to the source of their physical activity. However, these figures are higher studies in more developed settings. Kumar, Robinson and Till (2015), in a study among children and adolescents in England found a relatively equal proportion in childhood (24% for boys and 23% for girls) but this differed significantly as they approached adolescence, with the boys ranking higher, although with a sharp fall in their own physical activity (14% for boys and 8% for girls).

This difference could be as a result of the difference in socio-economic and cultural settings between Low Income and High-Income countries whereby children in Low Income countries may have more opportunities and space for physical activities.

5.1.5 Comparison of Physical Activity among Depressed and not-depressed participants

This study recorded a significant difference in the level of physical activity between the depressed and not depressed groups (x^2 = 5.89, p= 0.02) which indicates that physical activity was inversely associated with depressive symptoms. Adeniyi et al., (2011), also found that greater percentage of individuals with depressive symptoms were physically inactive when compared with their moderately or vigorously active counterparts. This is consistent with existing literature which shows the bi-directional relationship between depression and inactivity while reporting the difficulty in establishing which one occurred first between the two concepts (Elfrey et al., 2010; Craft & Perna, 2004; Rothon et al., 2010; Adeniyi et al., 2011, Dabana & Gobir, 2018). Some authors suggest that the reduced physical inactivity experienced by depressed individuals may explain the relationship

between depression and risk of cardiovascular diseases (Roshanaei-Moghaddan et al., 2009).

5.1.6 Association between level of physical activity and self-esteem

This study found that a significant association between increase in physical activity and increase in self-esteem (r= 0.12, p= 0.04). This is similar to what Gilani and Pour (2016) found in their eight-weeks intervention study which sought to find the relationship between physical activity and increased self-esteem among a group of adolescent male students in Iran. They reported at baseline that no significant difference existed between the control and intervention groups (0.49) but found a significant difference of <0.0001 post intervention.

5.1.7 Effect of scheduled physical activity on depression

The result of this study is in line with the comment by WHO concerning physical activity which says "The least amount of physical activity is better than none at all". The study found that after the intervention, the treatment group had significantly lower depression scores compared with the control group. In a meta- analysis carried out by Schuch et al., (2016), it was found that there was large effect size for exercise in depression, especially mild depressive disorder. According to Cook et al (2009) & Clark et al, (1993), a set of behavioral and cognitive skills that have proved to be of significant effect in preventing depression include components of physical activity sessions such as "stress management, relaxation, and social interaction (Leith, 2004). Dimeo et al., (2001) suggested that the changes in brain chemicals such as cortisol, Adrenocorticotrophic hormone, Opioid peptides, Cytokines and Catecholamines during exercises may be responsible for the

resultant changes observed in depressive symptoms after bouts of physical activity (Leith, 1994).

5.2 Limitations

The study has a number of limitations including small sample for the intervention phase. This might explain the lack of treatment effect on self-esteem.

Another limitation is the short follow-up, which means that it is not possible to ascertain if the treatment on depression effect is sustained.

A further limitation is the use of self-report questionnaires rather than clinical assessment to assess depression among the participants.

5.3 Conclusion

The study investigated the effects of physical activity on depressive symptoms. It also explored the relationships between depression and self-esteem, alongside physical activity and self-esteem. Furthermore, the study examined the level of physical activity among in - school adolescents. The study found that more physical activity is associated with lower depressive symptoms and that a structured programme of physical activity is effective in reducing depressive symptoms. These findings suggest that encouraging adolescents to engage in physical activity may help to prevent and or reduce their depressive symptoms. The findings should be further examined with larger controlled studies with longer follow-up.

5.4 Recommendation

In view of the findings of this study, the following recommendations are made:

1. Since Physical Education classes form a major source of physical activity in adolescents, the Ministry of Education should be make it compulsory for all secondary students in order to sustain their interest in it.
2. Governmental and Non-Governmental bodies should engage in more public enlightenment on the importance of physical activity.
3. Studies that investigates the sustainability of physical activity as a lifestyle as against a forceful practice among the adolescent population should also be carried out.

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APPENDIX I

Effects of scheduled physical activity on depressive disorder among in- school adolescents in Ondo State, Nigeria.

SCHOOL HEALTH QUESTIONNAIRE

Serial Number: _____

Today's Date: __ __/__ __/__ __

Personal Information

1. Name of School:
2. Class:
3. Where do you live? (Address of Present Abode)
4. What is your date of birth? Date of Birth: _____ _____ _____
   Day Month Year
5. Are you a boy or a girl? (a) boy (b) girl
6. Do you practice any religion? No Yes
7. Please write down the exact place you attend for worship
   _____

   (a) Islam (b) Orthodox Christian (c) Pentecostal Christian (d) Traditional religion (e) Other
8. How much does the teaching of your religion guide your behaviour?

   (a) Very much (b) much (c) Just a little (d) Not at all
9. How much does the teaching of your religion guide your family life?

   (a) Very much (b) much (c) Just a little
   (d) Not at all

Family Information

10. Family Type:

    (a) Monogamous (b) Polygamous
11. Number of Mother's Children:
12. Number of Father's Children:
13. Marital Status of Parents:

    (a) Married (b)Separated/Divorced (c) Father is dead (d) Mother is dead (e) Mother & Father are dead

14. Who do you live with presently?

(a) Parents (b) Mother (c) Father (d) Grandparents (e) Grandmother (f) Grandfather (g) Other [please specify] _____

15. Do you do any kind of work to earn money before or after school? Yes No

16. If yes, please describe what you do _____

17. Level of Father's Education

(a) No Formal Education (b) Koranic School (c) Primary School

(d) Secondary School (e) Post Secondary (Non-University) (f) University Degree and above (g) I do not know

17. Occupation of Father: [Write the exact occupation] _____/ I do not know

18. Level of Mother's Education

(a) No Formal Education (b) Koranic School (c) Primary School (d) Secondary School (e) Post Secondary (Non-University) (f) University Degree and above (g) I do not know

19. Occupation of Mother: [Write in the exact occupation] _____/ I do not know

20. Please indicate if your father or mother or the person you live with owns any of the items listed below:

	Yes	No
a) Mobile phone		
b) Fridge		
c) Color TV		
d) Computer		
e) Motor car		
f) House		

21. Do you like your family? Yes No

22a. If Yes, Why? _____

22b. If No, Why? _____

23. Outside school, I participate in physical activities often. Yes No

24a. If yes, state why. _____

24b. If no, state why. _____

School-Related Questions

25. Do you like your school? Yes/ No

25. How many children are there in your class?___

27. Do you do well academically? Yes No

28a. If Yes, explain_____

28b. If No, explain_____

29. Are you having difficulties with your teachers? Yes No

30. If yes, what sort of difficulties? _____

31. Have you received treatment for a mental disorder in the past? (a) Yes (b) No

If yes, specify _____

32. Do you have any disability (at your limbs) Yes No

33. Do you have any existing medical condition? Asthma Diabetes Others (specify)_____

Short Mood and Feelings Questionnaire

The form below is about how you might have been feeling or acting recently. For each item, please tick how much you have felt or acted this way in the past two weeks.

If a sentence was true about you most of the time, tick true. If it was only sometimes true, tick sometimes. If a sentence was not true about you, tick not true.

	True	Sometimes	Not True
1. I felt miserable or unhappy			
2. I didn't enjoy anything at all			
3. I felt so tired I just sat around and did nothing			
4. I was very restless			
5. I felt I was no good any more			
6. I cried a lot			
7. I found it had to think properly or concentrate			
8. I hated myself			
9. I was a bad person			
10. I felt lonely			
11. I thought nobody really loved me			
12. I thought I could never be as good as other children			
13. I did everything wrong			

Physical Activity Questionnaire (Adolescent)

We are trying to find out about your level of physical activity from the last 7 days (in the last week). This includes sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing, and others.

Remember: There are no right or wrong answers — this is not a test. Please answer all the questions as honestly and accurately as you can — this is very important.

1. Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (Tick only one option per row.)

	No (Zero times)	1-2	3-4	5-6	7 or more
Rope skipping					
Fire on the mountain					
Ten- Ten					
Tinko - Tinko					
Who is In the garden					
Football					
Dance					
Suwe					
Police and thief					
Bread& Butter					
Fire on the mountain					
Bicycling					
Hide and seek					

Thug of war					
S.T.O.P. Stop!					
After round 1					
Table soccer					
Lakanlaka					
Table-tennis					
Street soccer					

2. In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)? (Tick one only.)

I don't do P.E	
Hardly ever	
Sometimes	
Quite often	
Always	

3. In the last 7 days, what did you normally do at lunch (besides eating lunch)? (Tick one only.)

Sat down (talking, reading, doing schoolwork	
Stood around or walked around	
Ran or played a little bit	
Ran around and played quite a bit	
Ran and played hard most of the time	

4. In the last 7 days, on how many days right after school, did you do sports, dance, or play games in which you were very active? (Check one only.)

last 7 days, what did you normally do at lunch (besides eating lunch)? (Tick one only.)

None	
1 time last week	
2 or 3 times last week	
4 times last week	
5 times last week	

5. In the last 7 days, on how many evenings did you do sports, dance, or play games in which you were very active? (Tick one only.)

None	
1 time last week	
2 or 3 times last week	
4 or 5 times last week	
6 or 7 times last week	

6. On the last weekend, how many times did you do sports, dance, or play games in which you were very active? (Tick one only.)

None	
1 time	
2 - 3 times	
4 - 5 times	
6 or more times	

7. Which one of the following describes you best for the last 7 days? Read all five statements before deciding on the one answer that describes you.

All or most of my free time was spent doing things that involve little physical effort	
I sometimes (1 — 2 times last week) did physical things in my free time (e.g. played sports, went running, swimming, bike riding, did aerobics)	
I often (3 — 4 times last week) did physical things in my free time	
I quite often (5 — 6 times last week) did physical things in my free time	
I very often (7 or more times last week) did physical things in my free time	

8. Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week.

	None	Little bit	Medium	Often	Very often
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

9. Were you sick last week, or did anything prevent you from doing your normal physical activities? (Tick one.)

Yes ..... No .....

If Yes, what prevented you? _____

Client Satisfaction Questionnaire

	SA	AGREE	AVERAGE	DISAGREE	SD
1. The workshop met my expectations					
2. The information was clearly presented					
3. Attending this workshop was valuable					
4. The workshop was held at convenient time					
5. I learnt very little from attending the workshop					
6. The workshop was held at a convenient place					
7. This workshop has increased my confidence to work with students with depression					

8. Were there any topics not covered that you would have liked to see included?

_____

_____

9. What was the best aspect of this workshop?

_____

_____

10. Would you change any aspect of this workshop?

_____

_____

Are there any other comments you would like to make about this workshop?

_____

_____

Rosenberg Self Esteem Scale

This section tries to explain how you feel about yourself. Please circle the option appropriately as it applies to you.

S/N		Strongly agree	Agree	Disagree	Strongly disagree
1.	On the whole, I am satisfied with myself				
2.	At times, I think that I am no good at all				
3.	I feel that I have a number of good qualities				
4.	I am able to do things as well as most people				
5.	I feel I do not have much to be proud of				
6.	I feel useless at times				
7.	I feel that I am a person of worth, at least on an equal plane with others.				
8.	I wish I could have more respect for myself				
9.	All in all, I am inclined to feel that I am a failure				
10.	I take a positive attitude towards myself				

APPENDIX II

CONSENT FORM (for parents/guardians)

Title of research: Effects of Physical Activities on Depressive Symptoms among In-School Adolescents in Akure-South Local Government, Akure, South- West Nigeria.

This study will be conducted by Miss. Temitope Olaoye an M.Sc. student at the Centre for Child and Adolescent Mental Health (CCAMH), University of Ibadan, Nigeria. The purpose of the research is to explore the effects of physical activity in modifying the behaviour of depressed adolescents in a bid to manage symptoms of depression and low self -esteem among in-school adolescents

This study will be carried out in two stages. In the first stage, your child will be required to complete some questionnaires; the socio-demographic questionnaire (SDQ), the short mood and feelings questionnaire (SMFQ) and the physical activity questionnaire (PAQ). The SDQ will ask questions on your child's bio -data which includes their age, gender, family and some other basic information about themselves while the SMFQ explores symptoms of depression and stress which affects a number of young people particularly in their intra and interpersonal relationships and functioning. The PAQ delves into their extent of physical activeness in a typical day at work (school), recreation and during leisure. If your child is selected for the second stage, they will be asked few other questions on their level of self –esteem through the Rosenberg self -esteem scale of. They will then be asked to participate in the programme which will be done with other students and issues around depression, self- esteem and physical activeness will be discussed. The programme will take place three times weekly for a duration of 6 weeks and at the end of each week, the

PAQ will be administered to the students. The study participants will be required to fill the PAQ at the end of every week while at the end of the sixth week, they will be required to fill the SMFQ and RSES again while the Client satisfaction questionnaire will be administered in order to assess their view towards the programme.

We expect your child to take part in this research for a total of six weeks. The programme is scheduled to take place three times weekly with each session lasting between 40 minutes to one hour after normal school hours, within the school premises. Your child does not have to answer a question or partake in the programme if they don't feel comfortable doing so. The purpose of this study is to find out the results of physical activity on depressive symptoms among adolescents. We hope the relationship will be a positive one.

All information collected in the course of this study will be coded with no name recorded. This codes will not be traceable to your child's name in any way. During this programme, your child and others on this programme will be encouraged not to discuss the programme with people who are outside of the programme although this may be unavoidable. We will not record your child's name and make sure that none of the information can be traced to them by others.

Your child's participation in this study is entirely voluntary. They may choose to participate or not and their choice will have no effect on them, their education or family and may withdraw from the research at will. Your child will not be given any material or monetary gifts for partaking in this study. However, light refreshment will be given after the sessions.

Statement of the person giving consent:

1. I confirm that I have read and understand the information about this project.

2. I understand that my child's participation is voluntary and that we are free to withdraw at any time, without giving any reason,

3. I agree that my child may take part in the study.

_____	_____	_____
Name of Parent/ guardian	Date	Signature/ Thumbprint

APPENDIX III

INFORMED CONSENT FORM (ADOLESCENT)

Title of research: Effects of Physical Activities on Depressive Symptoms among In-School Adolescents in Akure-South Local Government, Akure, South- West Nigeria.

This study will be conducted by Miss. Temitope Olaoye an M.Sc. student at the Centre for Child and Adolescent Mental Health (CCAMH), University of Ibadan, Nigeria. The purpose of the research is to explore the effects of physical activity in modifying the behaviour of depressed adolescents in a bid to manage symptoms of depression and low self -esteem among in-school adolescents

This study will be carried out in two stages. In the first stage, your child will be required to complete some questionnaires; the socio-demographic questionnaire (SDQ), the short mood and feelings questionnaire (SMFQ) and the physical activity questionnaire (PAQ). The SDQ will ask questions on your child's bio -data which includes their age, gender, family and some other basic information about themselves while the SMFQ explores symptoms of depression and stress which affects a number of young people particularly in their intra and interpersonal relationships and functioning. The PAQ delves into their extent of physical activeness in a typical day at work (school), recreation and during leisure. If your child is selected for the second stage, they will be asked few other questions on their level of self –esteem through the Rosenberg self -esteem scale of. They will then be asked to participate in the programme which will be done with other students and issues around depression, self- esteem and physical activeness will be discussed. The programme will take place three times weekly for a duration of 6 weeks and at the end of each week, the PAQ will be administered to the students. The study participants will be required to fill the

PAQ at the end of every week while at the end of the sixth week, they will be required to fill the SMFQ and the RSES again while the Client satisfaction questionnaire will be administered in order to assess their view towards the programme.

We expect you to take part in this research for a total of six weeks. The study is scheduled to take place three times weekly with each session lasting between 40 minutes to one hour after normal school hours, within the school premises. You do not have to answer a question or partake in the study if you don't feel comfortable doing so. The purpose of this study is to find out the results of physical activity on depressive symptoms among adolescents. We hope the relationship will be a positive one.

All information collected in the course of this study will be coded with no name recorded. This codes will not be traceable to your child's name in any way. During this programme, your child and others on this programme will be encouraged not to discuss the programme with people who are outside of the programme although this may be unavoidable. We will not record your child's name and make sure that none of the information can be traced to them by others.

Your participation in this study is entirely voluntary. You may choose to participate or not and your choice will have no effect on you, your education or family and you may withdraw from the research at will. You will not be given any material or monetary gifts for partaking in this study. However, light refreshment will be given after the sessions.

Statement of the person giving consent:

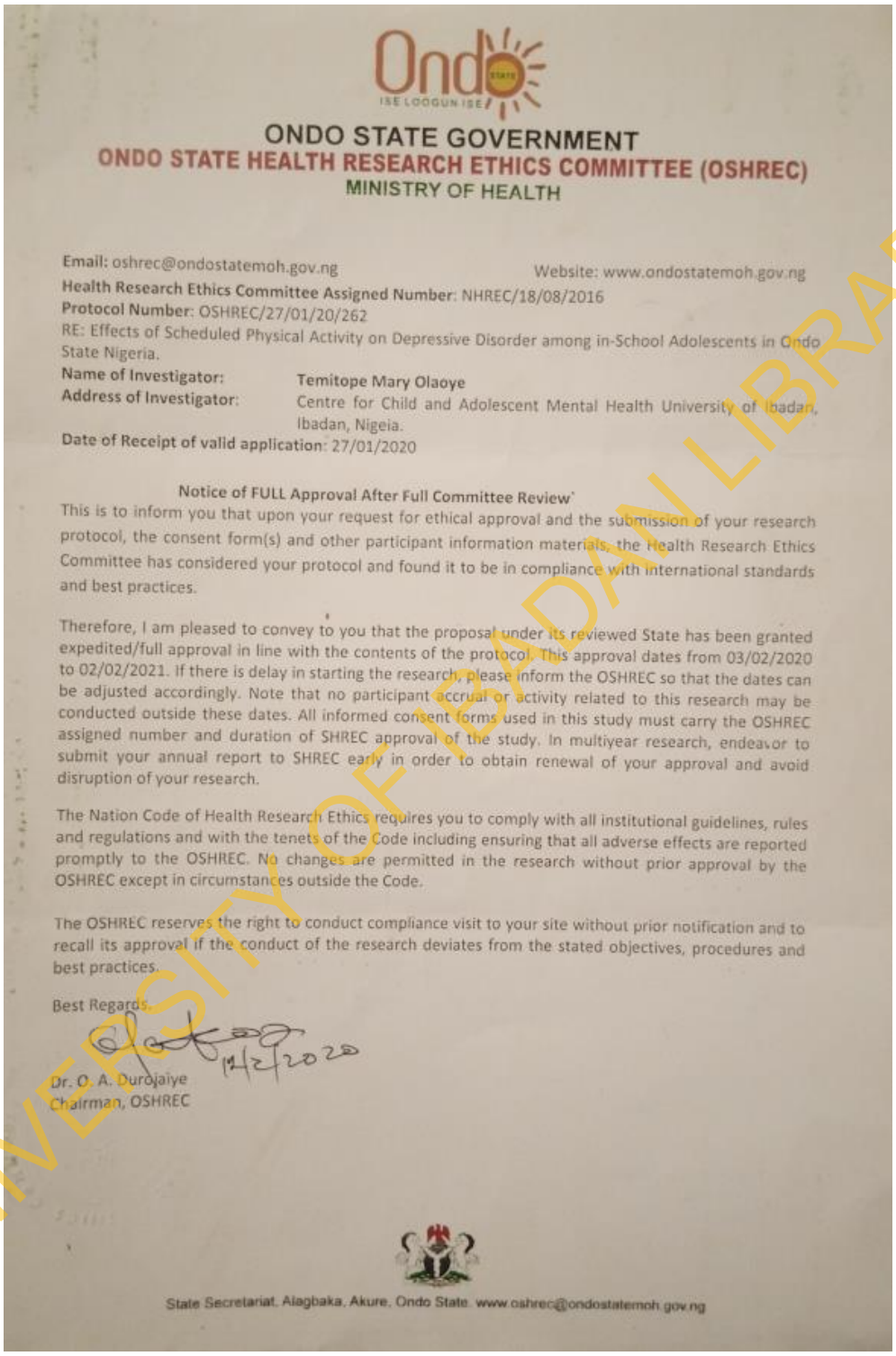
4. I confirm that I have read and understand the information about this project.

5. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason,

3. I agree that I will take part in the study.

_____	_____	_____
Name of Student	Date	Signature/ Thumbprint

APPENDIX IV



ONDO STATE GOVERNMENT
ONDO STATE HEALTH RESEARCH ETHICS COMMITTEE (OSHREC)
MINISTRY OF HEALTH

Email: oshrec@ondostatemoh.gov.ng Website: www.ondostatemoh.gov.ng
Health Research Ethics Committee Assigned Number: NHREC/18/08/2016
Protocol Number: OSHREC/27/01/20/262
RE: Effects of Scheduled Physical Activity on Depressive Disorder among in-School Adolescents in Ondo State Nigeria.
Name of Investigator: Temitope Mary Olaoye
Address of Investigator: Centre for Child and Adolescent Mental Health University of Ibadan, Ibadan, Nigeia.
Date of Receipt of valid application: 27/01/2020

Notice of FULL Approval After Full Committee Review

This is to inform you that upon your request for ethical approval and the submission of your research protocol, the consent form(s) and other participant information materials, the Health Research Ethics Committee has considered your protocol and found it to be in compliance with international standards and best practices.

Therefore, I am pleased to convey to you that the proposal under its reviewed State has been granted expedited/full approval in line with the contents of the protocol. This approval dates from 03/02/2020 to 02/02/2021. If there is delay in starting the research, please inform the OSHREC so that the dates can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside these dates. All informed consent forms used in this study must carry the OSHREC assigned number and duration of SHREC approval of the study. In multiyear research, endeavor to submit your annual report to SHREC early in order to obtain renewal of your approval and avoid disruption of your research.

The Nation Code of Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse effects are reported promptly to the OSHREC. No changes are permitted in the research without prior approval by the OSHREC except in circumstances outside the Code.

The OSHREC reserves the right to conduct compliance visit to your site without prior notification and to recall its approval if the conduct of the research deviates from the stated objectives, procedures and best practices.

Best Regards.

11/2/2020

Dr. O. A. Durojaiye
Chairman, OSHREC

State Secretariat, Alagbaka, Akure, Ondo State. www.oshrec@ondostatemoh.gov.ng