SPORTS PARTICIPATION AND EXAMINATION-RELATED STRESS AMONG SELECTED KENYAN SECONDARY SCHOOL STUDENTS

By

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DECLARATION

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

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Supervisors' Approval

This thesis has been submitted in its present form with our approval as University Supervisors

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To my mother Rhoda Wanjiku, and my children Charles, Olivia, Evelyn and Cynthia.

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ABBREVIATIONS

1.	ACTN	-	Adrenocotrophic harmone
2.	CRF	-	Corticotrophin Releasing Factor
3.	FSN	-	Follicle stimulating hormone
4.	HCMV	-	Human cytomegalovirus
5.	LH	-	Leutenizing hormone
6.	TABP	-	Type A behaviour pattern
7.	TBBP	-	Type B behaviour pattern
8.	TSN	-	Thyroid stimulating hormone
9.	VO_2 max	-	Maximum volume of oxygen consumed by the tissues

ABSTRACT

The purpose of the study was to investigate the relationship between sports participation and examination related stress in selected National Secondary Schools in Kenya. The study was guided by the null hypothesis that there are no significant differences in stress levels between subjects participating in sports and those who did not in their Form Three second term and just before they sat for the mock examinations in Form Four. The study was longitudinal involving a quasi experimental design. Through random sampling two stratified samples of sports and non-sports participants were obtained. Independent variables were participation, non participation and gender. The dependant variable was stress which was measured through questionnaires and physiological measures. In total, there were 469 subjects, of which 254 were sports active while 215 were non-sport active. Of this 224 were girls and 245 were boys. A pretest was conducted in Form Three and a post-test in Form Four. Data was analyzed using a one-way ANOVA, an independent T-Test and Chi Square. Findings indicate that all the students had the same level of stress in Form Three and Form Four ($p<0.05$), male students had less examination related stress than female students ($p<0.05$). The sports active students suffered fewer ailments than the non sports active ones ($p<0.05$). All physiological measures did not yield any significant differences between the groups. Academically the non-sports active students performed better ($p <0.05$). In conclusion, the sport active students perceived less examination related stress than the non-sports active students. Sports active male students perceived less examination stress than the sports active females. Non sports active males perceived less stress than non sports active female students. The activities undertaken by the sports active students were not vigorous enough to produce any significant physiological change. From this study, sports participation can be used to moderate examination related stress. This however should be more vigorous to produce desired physiological changes. More emphasis should be placed on regular participation from Form One to Form Four. The Ministry of Education insists on mass participation with particular emphasis on girls schools. It should also provide qualified teachers and facilities to the school. There is need to sensitize administrators, teachers and students on the therapeutic nature of exercise and sports participation.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Problem

According to the Functionalist Approach, games and sports are best viewed as a social institution (Coakley, 2001). For a social institution to continue existing, it must satisfy the following criteria; need for pattern maintenance and tension management, the need for integration and unity, the need for goal attainment and the need for adaptation. Coakley, (2001) very explicitly shows that sports and games meet all these needs hence justifying itself as a social institution and whose continued existence over time and space is thus assured.

Exercise through sports and games helps to alleviate stress, depression and anxiety (Weiten, 2004). According to Burges and Richardson (1992), a physically fit person has a greater ability to tolerate challenges in life, reacting to crises with reduced stress response than a physically unfit person. They go further to state that participation in physical activities not only leads to physical fitness but also plays a role in stress management and tension reduction. Turner and Helme (1990) state that physically fit people are better equipped to deal with emotionally stressful events than sedentary people. This is an aspect of adaptation as explained by Coakley (2001).

Stress manifests itself both psychologically and physiologically. In the former, it causes anxiety which leads to loss of attention and concentration, feelings of loneliness, anger, disgust, sadness or disappointment (Papalia and Olds, 1988). Production of stress hormones leads to physiological changes in the body. These include an increase in heart rate, blood pressure, breathing rate, skin conductance, stomach acidity, muscle tension, mental alertness, sweating and a reduction in skin temperature (Selye, 1983). Prolonged presence of stress leads to a depressed immunity system which leads to common colds, indigestion, fatigue, skin rashes, chronic pain and insomnia (Huffmean *et al.*, 1987).

Stress is present in day-to-day activities providing motivation for living (Hasset and White, 1989). This form of stress does not bother a majority of people since through experience they have learnt to cope with it. However, major events in people's lives occur that bring about a great change in a person's level of stress (Kalat, 1993). For instance, among those undergoing courses in an education system, examinations take the form of a major life event (Insel and Roth, 1991). In Kenya, examinations play a major role in the determination of an individual's future. In the year 2005, two hundred fifty eight thousand seven hundred and seven (258,707) students sat for the Kenya Certificate of Secondary Education Examination (KCSE). Out of these, sixty-eight thousand and thirty (68,030) achieved a mean grade of C+ required to qualify for university

entry. This represented twenty-six point three zero (26.30%) % of the total. Due to the limited places available in public universities for government-sponsored programmes, the cut-off point was set at a B+ of 67 marks. Those attaining this comprised twelve thousand and eighty one (12,081) students representing a mere four point eight two four (4.824%) % of all the candidates that sat for the examinations that year (Kenya National Examinations Council, 2006).

Due to limited chances for either jobs or training after secondary school, examinations are important in determining a candidate's future. Overall performance determines the chances of a prosperous life or a miserable future (Sitati, 1987). This has provided the glorification of good examination performance into a national culture since the society therefore measures one's worth by the number and quality of academic certificates (Kamuyu, 2000). This results in pressure on the schools, teachers, parents as well as the student for an even better performance (Moraa, 1998). The above description shows the student at the end of the chain bearing the most pressure (Kithure, 2000). This leads to accumulation of excessive stress amongst students as they make preparations for examinations. This is a harrowing experience that raises greater tension amongst the students as the day nears (Ochieng', 1997).

In Kenya's secondary schools, sports are part of the co- curricular activities that students are expected to participate in. Time is set aside at

least three times a week for sports. As shown earlier, participation in sports should lead to a state of relaxation that implies the absence of stress. Those who excel in a particular sport are chosen to represent the school at the inter- school sports competitions and thus receive greater exposure through practice and competition (Ministry of Education, Science and Technology, 2000). This group should therefore show a lesser degree of the examination stress response.

1.2 Statement of The Problem

Findings in the literature review show that an examination is a major life experience and therefore, a potential source of stress (Insel and Roth, 1991). In Kenya, examinations play a major role in determining an individual's future. The Kenya Certificate of Secondary School Examination (KCSE) determines the few who are to gain entry into the university and the limited training areas in other sectors while the rest who are perceived as failures are condemned to an undefined informal sector. The candidates therefore face considerable pressure from their parents, teachers and school administrations to produce the best performance. This leads to stress making the preparation for the examinations a threatening experience (Ochieng', 1997).

National schools are considered to excel both in sports competitions and academic performance. In the year 2005, four of the schools emerged among the top ten schools in the Kenya Certificate of Secondary School

Examination. Twelve of the schools emerged among the best fifty schools and all seventeen emerged among the best one hundred schools (Kenya National Examinations Council, 2006). This can be considered a good performance considering four thousand one hundred and eleven (4, 011) schools in the country entered their students for the examinations (Central Bureau of Statistics, 2005). Records available from the year 2000 to 2005 suggest that these schools also performed well in such games as hockey, swimming, rugby, badminton and basketball in national games competitions (Njenga, 2000).

While all secondary school students face stress as the final examinations approach, traditions set in national schools demand that the students maintain excellent performances in both academics and sports competitions. As literature review indicates, sports participation helps reduce a person's stress response. This could be termed as stress inoculation. The study therefore, aimed at finding out the relationship between sports participation and levels of examination-related stress among Form Four students in selected secondary schools in Kenya. The independent variables for the study were participation, non-participation in sports and gender while the dependent variable was stress. The selected schools comprised national schools.

1.3 Purpose of The Study

The purpose of the study was to assess the relationship between sports participation and examination related stress levels among secondary school students. It also aimed at analysing the ways in which stress manifests itself among the set population and whether it affected consistency in examinations performance.

1.4 Objectives of The Study

The main objective of the study was to find out the relationship between sports participation and examination related stress in selected secondary schools in Kenya. Preparation for the Kenya Certificate of Secondary Examinations starts in Form Three and culminates in Form Four. The following specific objectives were set:

(i) To determine the difference in the perceived stress levels of all students during their Form Three second term and just before they sat for their mock examinations in Form Four.

(ii) To find out the differences in perceived stress levels between students who were active in sports and those who were not active in sports in their Form Three second term and just before they sat for their mock examinations in Form Four between the following:

(a) Sports active and non-sports active boys.

(b) Sports active and non-sports active girls.

(c) Sports active boys and girls.

(d) Non-sports active boys and girls.

(e) All sports active and all non-sports active students.

(f) All male students and all female students

(iii) To determine any difference in academic performance between all sports active and all non-sports active students in their Form Three second term and just before they sat for their mock examinations.

(iv) To establish the difference in the occurrence of minor ailments between all sports active and all non-sports active students in the period starting second term Form Three and ending just before mock examinations in Form Four.

(v) To determine the differences in skin temperature between sports active and all non-sports active students in the period between their Forms Three second term and just before they sat for the mock examinations in Form Four.

(vi) To determine the differences in resting heart rates between all sports active and non-sports active students in their Form Three second term and just before they sit for their mock examinations in Form Four.

(vii) To find out differences in blood pressure measures between all sports active and all non-sports active in their Form Three

second term and just before they sit for their mock examinations in Form Four.

1.5 Null Hypotheses

The main hypothesis of the study was that there is no significant difference in levels of examination related stress between sports active students and non-sports active students in selected secondary schools in Kenya. The following were the null hypotheses of the study:

HO_1: There is no significant difference in perceived stress level among all students during their Form Three second term and just before they sat for their mock examination in Form Four.

HO_2: There is no significant difference in perceived stress levels between students who are active in sports and those who are not active in sports in their Form Three second term and just before they sat for their mock examinations in Form Four between:

(i) Boys who are active in sports and those who are not,

(ii) Girls who are active in sports and those who are not,

(iii) Boys who are active in sports and girls who are active in sports,

(iv) Boys who are not active in sports and girls who are not active in sports,

(v) All students who are active in sports and all students who are not active in sports.

(vi) All male students and all female students

HO_3: There is no significant difference in academic performance between students who are active in sports and those who are not during their Form Three-second term and just before they sit for their mock examinations in Form Four.

HO_4: There is no significant difference in the occurrence of minor ailments between students who are active in sports and those who are not in the period between Form Three-second term and just before they sit for the mock examinations.

HO_5: There is no significant difference in skin temperatures between students who are active in sports and those who are not during their Form Three second term and just before they sit for the mock examinations.

HO_6: There is no significant difference in the resting heart rates of students who were active in sports and those who are not during their Form Three second term and just before mock examinations in Form Four.

HO_7: There is no significant difference in blood pressure measurements between students who are active in sports and those who are not in their Form Three second term and just before they sit for mock examination in Form Four.

1.6 Conceptual Framework

Meichenbaum and Cameron (1983) observe that a person's resistance to stress could be enhanced by exposure to a stimulus strong enough to arouse their defenses but without being so powerful as to overcome them. They call this stress innoculation training. Selye (1980) observes that during or immediately after an alarm reaction is produced by one stressor, the same individual could at times develop resistance against the damaging effects of another. He concludes that there are many endogenous and exogenous factors that selectively enhance or inhibit the stress response.

Sklar and Ariisman (1981) report that acute stress leads to the depletion of catecholamines and a rise in ACTH production leading to immunosuppression. They note that acute stress enhanced tumor growth while chronic stress discouraged growth. They postulate that it appears as if previous stress experience innoculates the organism against subsequent stress making its adverse effects on the person to be significantly reduced and reversing changes produced earlier. In studies done during the Second World War (Bandura, 1988), a group of soldiers were given information on the dangers involved in combat. During training, they were taken through simulation in near actual conditions. This led to an improved self-efficacy, compared to groups that did not undergo this training, termed as battle inoculation. Successful ingredients of stress inoculation were those

that induced a person to reconceptualize the threat in non-threatening terms.

Eysenck (1983) views the reaction to stress as being similar to metals subjected to a load as described by Hooke's law of elasticity as shown on figure 1.1 (a and b).

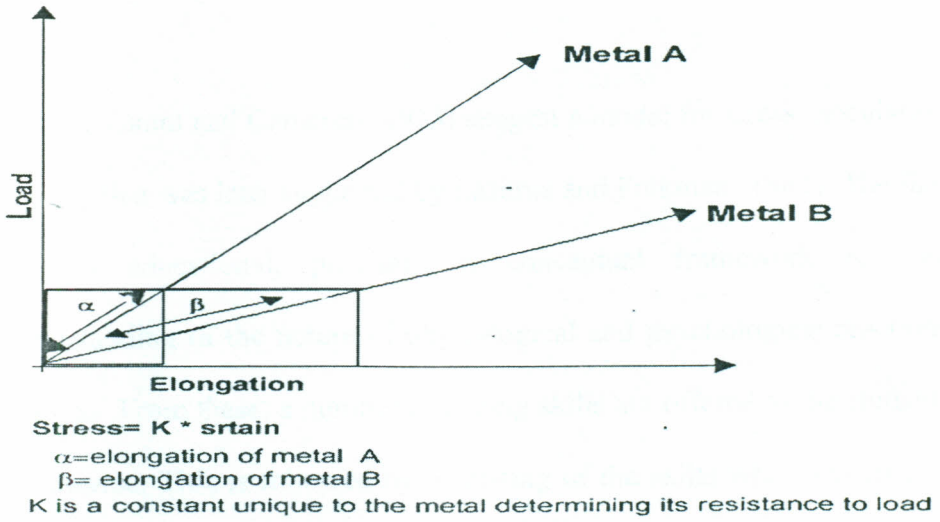


Figure 1.1(a) Hooke's Law of Elasticity

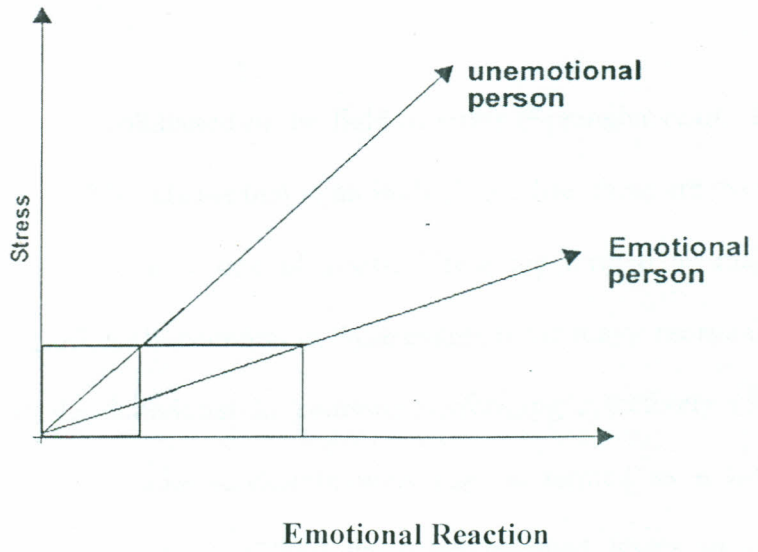


Figure 1.1(b) Interpretations of Hooke's Law (Adopted from Eysenck, 1983)

According to Eysenck (1983), the stress inoculation effect is related to its perception and those who perceive it as a less harmful do experience less emotional effects (figure 1.1(b)). Sports participation produces both psychological and physiological stress leading to relaxation after the event. This should have an inoculation effect on other forms of stress.

Meichenbaum and Cameron (1973) suggest a model for stress inoculation training that was later supported by Lazarus and Folkman (1984). The first step is educational, providing a conceptual framework for the understanding of the nature of physiological and psychological reactions to stress. From these, a number of coping skills are offered to the students to rehearse. This is followed by practising of the skills while exposed to stressors.

Studies conducted in the field of stress (Sprangler *et al.*, 2002; Gloger *et al.*, 1997) indicate that in an individual's life, there are events that act as a considerable source of stress. These are termed as major life events. Significantly common in these events is the major reorganization required by the individual to continue performing effectively (Saccuzo, 1987). Among students, examinations can be termed as a major life event. Sprangler *et al.*, (2002) measured elevated levels in stress hormones among college students during examinations. They further reported the

heightened levels of self-reported stress during this period. Gloger *et al.*, (1997) reported a lowered immune response due to intense intellectual stress. All these studies noted a drop in the stress measure parameters after the examination period.

During participation in physical activity and sports, the psychological and physiological reactions are similar to non-activity induced stress. These range from the production of stress hormones to the resultant physiological arousal (Gretchell *et al.* 1998). Sports involve competition which produces elevated stress levels due to anxiety elicit the mental tension at play (Sachs and Buffone, 1997). Payne and Hahn (2000) views sports as an ideal way of utilizing energy produced by stress-related responses.

The study conceptualized that participation in exercise and sports does inoculate an individual against stress from other sources. While other stress innoculation models suggest the use of cognitive awareness and provision of coping skills, participation provides this through physiological and psychological changes though unconsciously. Participation in exercise and sports creates psychological and physiological changes in a person similar to those found in stressful situations. Indeed, individual participation can be viewed as stressful and

depending on the situation could either cause ustress or distress. It is against this background that the study was designed to establish whether sports participation prepared students to face stress caused by examination, hence innoculating them against stress. Therefore, the study anticipated that non-participants would react to examination related stress with greater levels of psychological and physiological stress as postulated by Eysenck (1983) using Hooke's law.

1.7 Significance of The Study

a. The study bridges a research gap that exists in identifying the therapeutic nature of sports and their possible effects on academic performance
b. The result of this study will sensitize teachers on the relationship between academics and stress so that they may moderate the academic workload for the students.
c. The findings will be used by the school authorities to use physical education and sports as tools of managing stress among students.

1.8 Assumptions of The Study

The study made the following assumptions:

a. Students aspire to participate in sports since they find the action enjoyable. In doing this, they are able to experience relaxation after the event.

b. Participation in sports has an effect on stress. Sports participation and gender were treated as the independent variables while perceived levels of stress were treated as the dependent variables.

c. The rise in stress levels monitored between Form Three, second term and just before the mock examinations in Form Four was caused by examinations.

1.9 Delimitations of The study

Sports participation and gender were treated as the independent variables while perceived levels of stress were treated as the dependent variables.

The study was delimited to the following:

a) Generalizations of the research were restricted to Kenya national schools.

b) Though there are many stress indicators in the questionnaire, only three physical measurements were carried out. These were: skin temperature, resting heart rate and blood pressure.

c) The study used four hundred and eighty students.

1.10 Limitations of The study

a) The study relied on the games master / mistress for the selection of students who were active in sports.

b) The researcher had no control over the choice of activities performed by the students, duration, intensity, or frequency per week.

c) The researcher had no control over other factors such as the diet of the students.

1.11 Operational Definition of Terms

Active Sports Participant:

A student who had represented his/her school in at least one sport or had represented their house in at least two sports prior to the study and during the period of data collection. On average, they participated in sports at least three hours every week.

Examination

Tests administered to the students to measure their knowledge or skills in particular students in secondary schools.

Exercise

Physical activity performed regularly to maintain and improve a person's physical fitness.

Distress

Perception of a stress or as being harmful causing discomfort in the organism resulting in reactions such as fear, sadness and minor ailments.

Mock examinations

Examinations administered just before the Kenya certificate of secondary education final examinations. These are meant to gauge a candidate's expected performance

Minor Ailment

This is sickness caused by a drop in the body's immune systems due to stress. They are not caused by specific pathogens and include stomach upsets, tension headaches, rashes and common colds.

Non-Active Participant

A student who had not or was not representing his or her school in any sport, did not belong to any of the house teams, and got less than three hours of sport participation per week.

Perceived Stress

The interpretation of an event as being a stressor or not. This is a cognitive event determining the extent of the reaction both psychologically and physiology

Sports

Games played for competition requiring physical effort and governed by rules of fair play.

Sports Participant

A student who represented their school in at least one sport Or their house into two sports.

Stress

A non-specific response by an organism to any demand. It requires adjustments in homeostasis and manifests itself physiologically and psychologically.

Ustress

Perception of a stress as being beneficial producing feelings of well being manifesting themselves of joy and happiness.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature review is organized under a number of subheadings, namely, Stress: a general overview, Hans Selye's general adaptation syndrome model, sources of stress, physiological responses to stress, psychological responses to stress, examinations as a source of stress, physiological and psychological changes during exercise, sports as a stress inoculant and gender differences in sports participation. Thereafter a summary of the reviewed literature is given.

2.2 Stress: A General Overview

Anecdotal sources depict stress as a term that is used by everyone in their day-to-day conversation. It is used to describe a wide range of phenomena such as fatigue, fear, overload, boredom, pain, humiliation or even unexpected success that may require adjustment. Compounded in this wide usage is that every culture or profession is capable of coming up with their own definition. This is demonstrated in the different use of the term by physicists, chemists, teachers, bankers and students to name but a few. Cooper (1983), while reviewing literature on stress identified several approaches in the use of the term. Thus, it can be used, as an environmental demand, as a response to a situation or as a form of

relationship between environmental demands and the personal ability to meet the demand.

Notable in all these approaches is the fact that, stress is capable of producing extreme changes in a person (Cox, 1978). These may range from behavioural and physiological changes to interference with the thought processes (Coon, 1994). This renders any study on stress to be a multidisciplinary task. According to Lazarus and Forkman (1984), stress occurs when an individual appraises his available resources as being less than the demands of the situation or where failure to meet the demands is perceived to have negative consequences. Carlson and Carlson (1990) stipulate that stress occurs when a person's routine is disrupted by change caused by the threats, frustration, conflict, or when a person's self esteem is perceived to be under attack within these broad categories, there existed many other sub definitions. (Selye, 1983). From these definitions, we can identify events, internal or external, which cause change in the person internally. For the purpose of our study, the events will be referred to as stressors. These will be viewed as occurrences capable of provoking a patterned response, the latter being defined as stress. These responses may be positive or negative. Insel and Roth (1991) point out that stress could manifest itself as extreme happiness which they term as eustress or extreme unpleasantness which they term as distress.

2:3 Hans Selye's General Adaptation Syndrome Model

Every demand that is placed on an organism produces a reaction. This could be physical such as heat and cold, biological such as thirst and hunger or psychological such as joy and sadness. Common to all these demands is the need to adjust in order to continue functioning normally. This rise in requirements is independent of the specific cause. After many years of observations, Hans Selye (1974) defined stress as a non-specific response to any demand. Observations made on people suffering from a variety of physical and mental conditions led him to conclude that the body reacted in the same way physiologically irrespective of the disturbance. What varied was the degree of response that was dependent on the intensity of the need to adjust (Selye, 1980). To explain this phenomenon, he came up with the general adaptation syndrome model as shown as in figure 1.

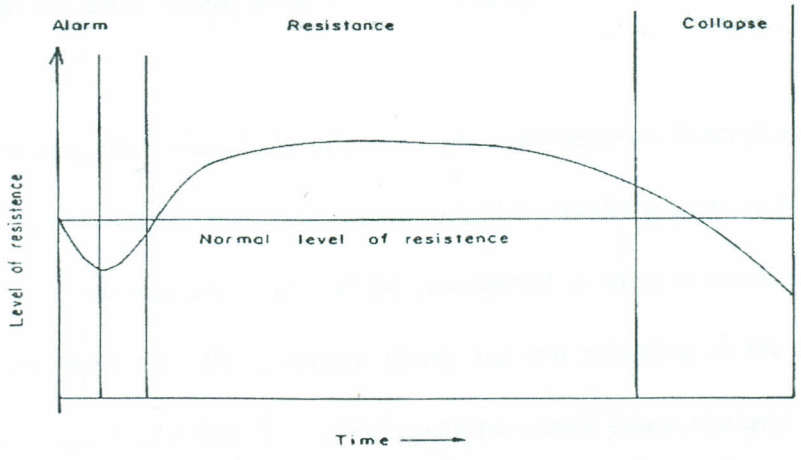


Figure 2.1 The General adaptation syndrome model (Anspaugh, 1991)

When individual are exposed to stimuli that they are not adapted to, they react with shock. The perception of these noxious stimuli may be by the nervous system, the vascular system or both. The initial and immediate reactions are the signs of injury, tachycardia, and loss of muscle tone, decreased temperature and blood pressure. Shock triggers the body's defense and the organism goes into counter shock, which is characterized by the enlargement of the adrenal cortex and secretion of corticoid hormones. These two actions constitute the alarm stage and they signify the mobilization of resources to fight the stressor. However, the body cannot be maintained continuously in a state of alarm. If the stressor is very drastic, conditioned exposure becomes incompatible with life and the organism dies within hours or days. As stress continues affecting the organism, the resources available for copying eventually run out. This leads to exhaustion stage whereby the initial symptoms of stress appear in more servere form leading to death (Selye, 1983).

In most cases, the organism is able to adapt to the stressor. It achieves this by raising the body's resistance above normal by availing more resources to deal with the stressor. This will be maintained as long as the situation continues. With time the glycogen stores run out resulting in the break down of proteins and fats. These biological processes cause tear and wear, leaving irreversible scars that accumulate to constitute a sign of aging. The resistance stage may run for hours, days to a lifetime (Selye, 1983).

In response to stress, the organism may act directly to control the source or produce internal responses that may cause tissue surrender by inhibiting unnecessary or excessive defense. In the former, catatoxic agents are produced that aggressively attack the stressor with the aim of destroying them. This involves raising the basal metabolic rate above normal. However, the by-products of this process are at times toxic to the organism causing more damage than the original stressor. Alternatively, the organism could mobilize a protective mechanism that aims at containing rather than destroying the stressor. This is achieved by either tolerating the presence of the stressor or by production of isolation agents. The body at the same time continues actively promoting repair of the damaged tissue. With continued stress, this mechanism reaches a plateau and cannot be sustained any more (Selye, 1983).

2.4 Sources of Stress

2.4.1 Overload

Stimulus overload may be either quantitative or qualitative. In the former, one may be expected to perform a task within a period of time perceived as being inadequate. They may be under pressure to complete the given task as per the conditions. It may also be caused by environmental parameters such as extremes of heat, cold, light, noise, altitude, wetness or humidity. These conditions produce acute discomfort on the individual

which creates stress (Kosslyn, 2001). Qualitative stress occurs when one's ability and competence are inadequate to deal with the task. Being asked to perform a task beyond one's training, making decisions beyond one's responsibility and being exposed to certain frequencies of sound may create qualitative overload. All forms of overload if sustained eventually lead to burn out in which the person suffers from both psychological and physical exhaustion (Kosslyn, 2001).

2.4.2 Conflicts

In day-to-day life, individuals are continually confronted with choices. Depending on the need, the process of decision making may lead to a conflict. In approach- approach conflict one is forced to make a choice between two equally appealing choices. Choice of one automatically means loss of another (Atkinson *et al.,* 1990). This could arise out of simple tasks such as joining a discussion group to more complex tasks as career choices.

In avoidance –avoidance conflict the individual has to make a choice between two equally unpleasant choices. One may wish to avoid sitting for an examination they have not prepared for, which could mean automatic failure. On the other hand sitting for the examination may lead to failure, which may affect their self-esteem (Saccuzo, 1987). In approach – avoidance conflict, a choice contains both positive and negative stimuli.

An individual may want to pursue a certain career in life, which will be well paying in future. However, pursuing it may need many years of study while foregoing some necessities to meet the financial obligations (Carlson and Carlson, 1990).

2.4.3 Frustration

Individuals experience frustration whenever there is a barrier between them and the desired goals. Stress due to frustration occurs from such varied situations as inability to secure a certain grade or being delayed for an appointment, to poor relations with the people around them. Frustrations are at times linked with major life events that bring about stress (Huffman *et al.*, 1987). Any occurrence that demands a major or permanent reorganization of one's life ranks as a major life event. These vary from such events as being injured to cases of death in the family. Their stress value depends on the level of coping required (Huffman *et al.*, 1987).

2.4.4 Culture

Contact between two cultures that results in negative consequences produces acculturative stress. Due to immigration, individuals may find themselves living among people with a different culture and therefore requiring adaptation. Depending on the circumstances individuals may assimilate, integrate or live separately. Assimilation involves relinquishing

their identity in favor of the host. Integration requires one to absorb elements of the host culture while maintaining major elements of their own culture. In separation, an individual voluntarily withdraws from the host culture. Where the dominant culture deliberately excludes the individual then segregation occurs. All these adaptive methods cause stress to the individual, the amount varying with the degree of change that is expected (Myer, 1992).

2.4.5 Poverty

Poverty is a great source of stress to individuals, family and culture groups. It involves the inability to mobilize adequate resources to meet an individual's responsibilities. This leads to living in inhospitable environments such as slums. The individual is overly dependent on an overburdened and hostile bureaucracy for their welfare. The struggle to meet their daily needs and the stress involved creates conditions that may be a precursor to crime. These contribute to feelings of insecurity and helplessness (Darley *et al.*, 1991).

2.5 Physiological Responses to Stress

For an organism to experience stress, it must be able to detect it. Selye (1974) was among the first researchers to suggest investigation into what he called the first mediator or the system that identifies the source of alarm. On observing that individuals in a coma could still experience

shock, he questioned whether it was just the senses that were responsible for detection or, could it also be triggered by the metabolic by-products released during the activity or injury. Experiments done on innervated organisms seem to suggest that both the nervous and the vascular systems are involved (Selye, 1974).

Literature suggests that most of the stressors are detected through sight, sound and touch. However, Acker *et al.,* (2002), in their studies, propose that the sense of smell may play a bigger role than has been acknowledged. In their studies on fear, they found that certain smells elicit stress in individuals. They suggest that organisms could release pheromones into the environment that could induce stress in others coming within the given area. These could spread over a large area and last a long time (Acker *et al.*, 2002).

On perception of the stressor, the central nervous system processes information on the potential threat. This information is sent to the limbic system which contains centers for awareness, memory, emotion, learning relay and hormone production (Aspaugh *et al.*, 1991). Through the hypothalamus, a chain reaction is activated as shown in Figure 2.2.

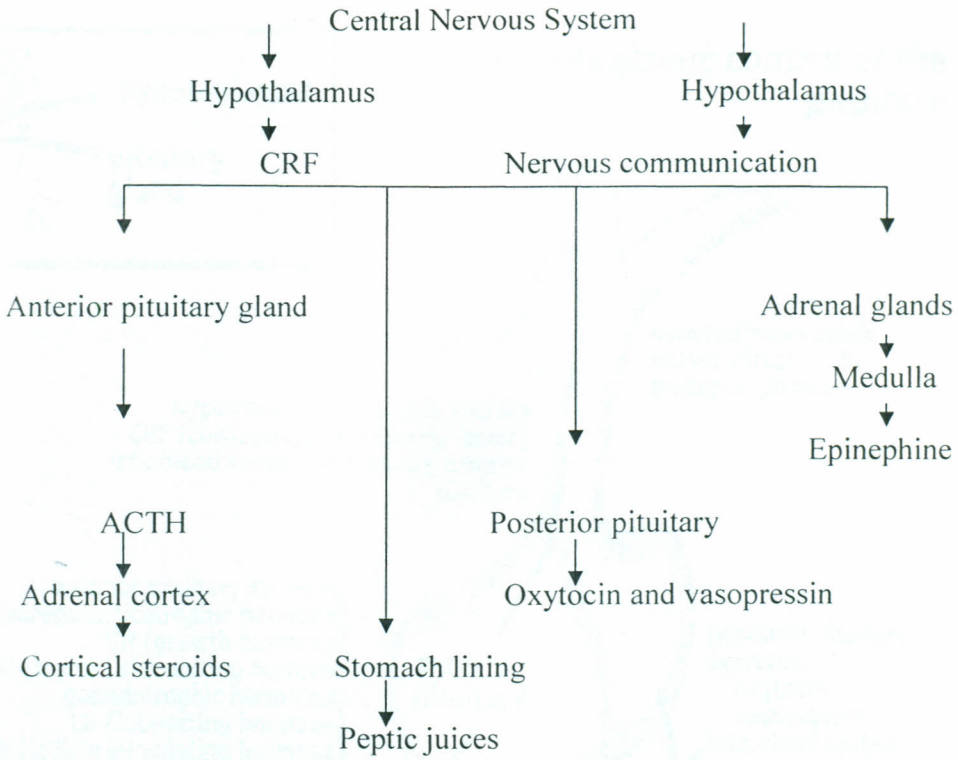


Figure. 2.2: Control and release of stress hormones (Source Crider *et al.*, 1986)

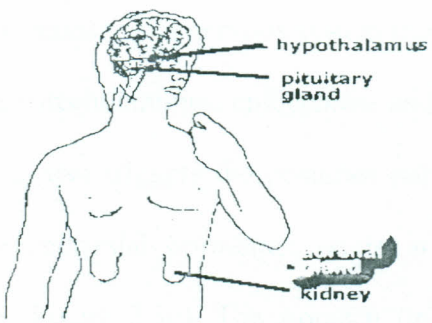


Figure 2.3a Stress response glands

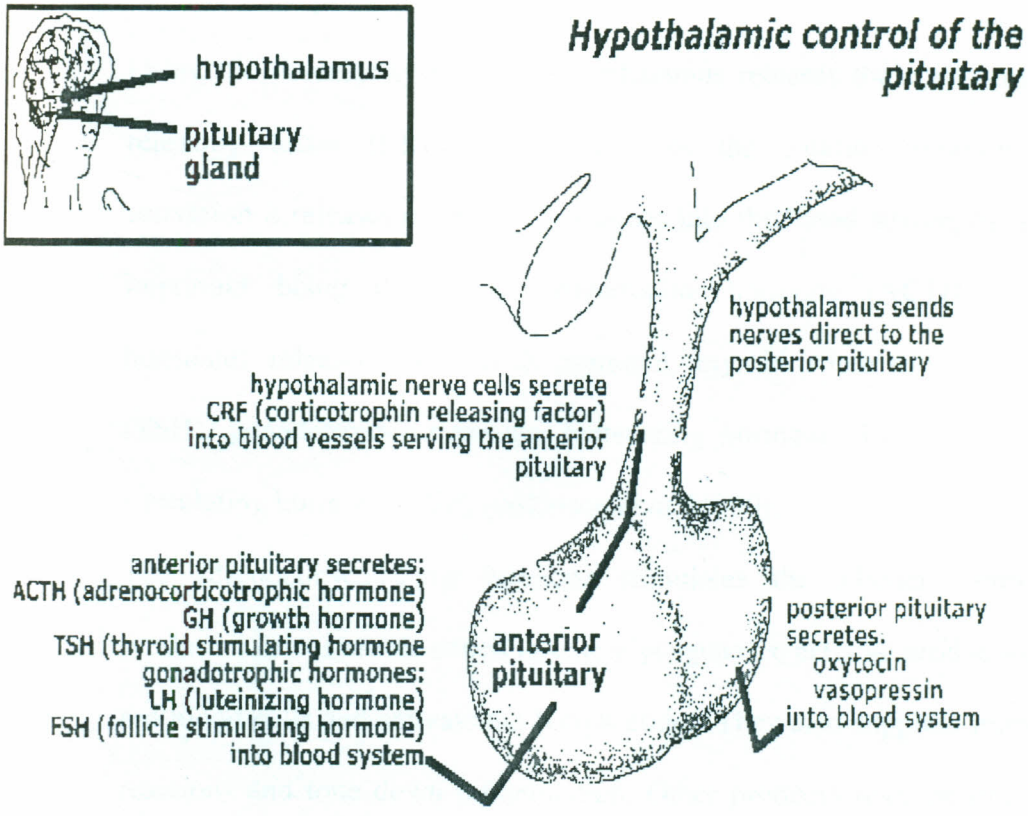


Figure. 2.3b –Hypothalamic Control of the Pituary (Mackena and Collander, 2001)

The hypothalamus uses both the nervous and vascular system to initiate a stress response. The nervous system triggers the medulla of the adrenals to secrete catecholamines, epinephrine and norepinephrine (Figures. 2.3a and 2.3b). It also triggers the posterior part of the pituitary gland to secrete neurohypophysial hormones, oxytocin and vasopressin into the blood stream (Figure 2.3c). The stomach lining is also stimulated to produce peptic juice which is responsible for high acidity during times of stress (Crider *et al.*, 1988).

Using the vascular system, the hypothalamus releases the corticotrophin releasing factor (CRF), which activates the anterior pituitary. On activation it releases a series of hormones into the blood stream, the most important being the adrenocorticotrophic hormone (ACTH). Other hormones released are growth hormone, thyroid stimulating hormone (TSH), gonadotrophic hormone, leutenizing hormone (LH) and follicle stimulating hormone (FSH) (Atkinson *et al.,* 1990).

The adrenocorticotrophic hormone stimulates the adrenal cortex to produce corticosteroids which initiate glycogenesis, activate production of red blood cells and activate the lymph nodes. They also suppress immune reactions and tone down inflammation. Other products released in small concentrations are mineralcorticoids which stimulate the removal of sodium ions from the urine, and pro-inflammatory steroids. Thus, the hypothalamus initiates two distinct pathways which protect the body from stress. These have been classified as the sympathetic adrenal medullary axis (SAM) and the hypothalamic pituitary axis (HPA) (Cohen and Robi nson, 2001). While the former is controlled by nervous communication, the latter is controlled via negative feedback system (Figure 2.4).

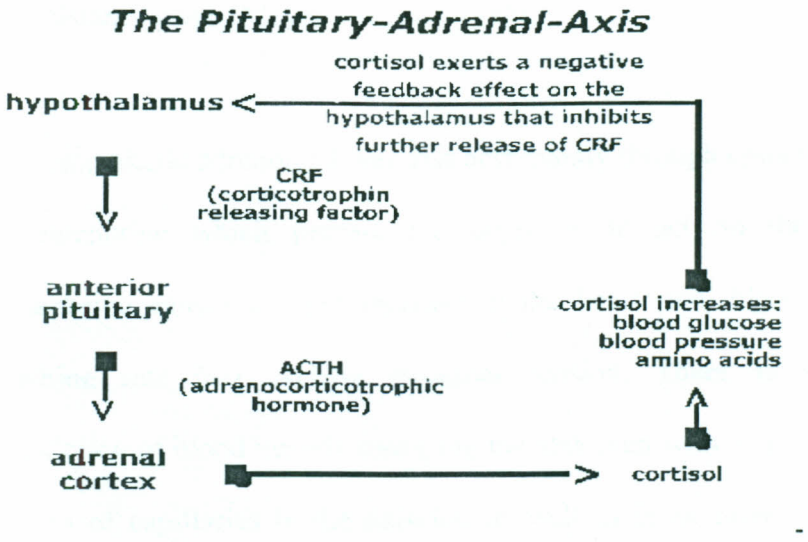


Figure 2.4 Feed back loop involving the Pituitary –Adrenal Axis source (Davis *et al*, 2001)

Excessive production of ACTH leads to a high concentration of cortisol in the blood stream which triggers the hypothalamus where production of CRF is reduced or stopped leading to lower levels of ACTH. This feedback mechanism therefore, controls hormonal levels during the stress reaction (Selye, 1974) as shown on Figure. 2.4.

Prior to the stressor the organism is in a state of homeostasis. Introduction of the stressor forces it into heterostasis as it adjusts to accommodate the disturbance. During alarm, the sympathetic adrenomedullar system goes into action. It is responsible for arousing the organism to meet their immediate demand of the situation. The hypothalamus pituitary axis is

slower in reaction and is responsible for sustaining the responses during the resistance stage (Meyerhoff *et al.* 1988).

The sympathetic adrenomedullar axis acts mainly through epinephrine and norepinephrine which prepare the organism to act on the stressor. Epinephrine causes a rapid increase in the heart rate, blood pressure, breathing rate and skeletal muscular tension. There is a general constriction of blood vessels supplying the abdomen with a corresponding dilation of capillaries in the muscles, as well as is an increased rate of glycogen conversion to glucose, accompanied by a sharp increase in the basal metabolic rate. (Tanaka and Ide 2008). Accompanying these changes is increased central nervous system activity (Greenberg, 1999).

The hormonal system, the hypothalamic- pituitary - adrenocortical system, sustains the resistance to the stressor. Production of the Thyroid Stimulating Hormone (TSH) by the anterior pituitary hormone activates the thyroid glands to produce triodothyromine and thyroxine with cortisol, the two hormones helps sustain the higher levels of blood pressure, heart rate, breathing rates, glucose conversion and basal metabolic rate. In addition, there is increased level of fatty acids in the blood as by-products of adipose metabolism. An increase in gastro intestinal motility. There is also an increase in anxiety and reduction of feelings of fatigue. Release of glucocorticoids especially cortisone helps in the control of the water

balance, maintenance of blood pressure and production of red blood cells. Mineralocorticoids stimulate recovery of sodium ions, which are important in nervous communication. At higher levels of stress, they block the anti inflammatory response, interfere with the manufacture of proteins and cause loss of calcium and phosphate ions from the kidney. They also raise blood serum glucose level, which is particularly important in the resistance stage (Wein, 2006).

Glucose is the most immediate source of energy during stress. Though there are other sources, they take longer to mobilize. It produces the energy needed for brain and muscle function in addition to tissue repair and regeneration after damage. During normal function presence of high levels provoke the production of insulin which in turn converts it back to glycogen. During shock, the catecholamines raise blood glucose levels. In the resistance stage the glucose levels are maintained by glucocorticoids which convert liver and muscle glycogen to glucose. As the stressor continues glucose is obtained from protein breakdown leading to tissue wasting. Exhaustion of supplies leads to hypoglycemia and collapse of the system (Dworetzky, 1985). The stress response is a tripartite mechanism that involves the direct effect of the stressor, internal responses that stimulate tissue defense or help destroy the toxin and internal responses that cause tissue surrender by inhibiting unnecessary or excessive defense (Zimbardo and Weber, 1994).

Studies over the last thirty years show that stress is capable of modifying various features of the immune system. Presence of the catecholamines and glucocorticoids suppress the action of both natural and specific immunity. On perceiving a stressor, the natural immunity reacts by production of granulocytes, neutrophils and macrophages which eat up their targets. They also congregate at the sight of infection or injury to neutralize the toxins causing inflammation. Macrophages also release cytokines which also cause inflammation and fever while promoting wound healing. There is also an increase in production of natural killer cells (Segerstorm and Miller, 2002).

Specific immunity is slower and takes a number of days before it is effective. Until then the organism is heavily dependent on natural immunity. Once it is activated there is clonal proliferation of the T helper cells that also produce cytokines, cytotoxic cells that attack antigens and B cells that produce antibody proteins. The effect of these factors is to promote both cellular and humoral immune response (Segerstorm and Miller, 2002). Chronic stress is associated with conditions caused by inadequate immunity and others caused by excess immunity. To resolve this, researchers have suggested that stress metabolites influence cytokine secretion. These activate cellular immunity providing defense for many types of diseases and neoplasts. The suppression of Th I has a permissive

effect on the production Th II whose presence activates humoral immunity and exacerbates allergy and many kinds of autoimmune diseases (Miller, *et al,* 2002).

Prolonged stress leads to excess cortisol production to which white blood cells may mount a counter regulatory response by down-regulating the cortisol receptors. This down regulation in turn reduces the cells' capacity to respond to anti inflammatory signals allowing cytokine mediated inflammatory processes to flourish (Miller *et al.*, 2002). The immune system is extremely flexible to changes and most of the time returns to homeostasis even after a major stressor. However, this ability falls with age as a consequence of which older populations respond less to vaccines, at times mounting cellular responses which may contribute to early mortality.

Loss of self-regulation is a characteristic of disease states. Stress-induced autoimmune responses create a condition where self-tissue is treated as an invader. This occurs in such conditions as asthma, multiple sclerosis, Chorn's disease, rheumatoid arthritis and lupus (Segerstorm and Miller, 2002). Conditions associated with a depressed immune system include common colds, indigestion, fatigue, skin rashes, ulcers, cancer, chronic pain and insomnia (Huffman *et al.,* 1987). In addition, stress has been linked to backaches, muscle ache, depression, accident proneness and

substance abuse (Randolph, 2000). It is estimated that over fifty % of these conditions reported for treatment have a psychosomatic source as opposed to biological source (Seamon and Kerick, 1994).

According to Seamon and Kerick (1994), continued stress leads to wear and tear and a gradual collapse of the various body systems. Selye (1974) asserted that in the human body there is always one system that according to external factors or heredity is the weakest. It is this weak system that is affected first. External factors could be the person's lifestyle or the environment they live in. Disease occurs when the weak link gives in to stress. This explains why people may develop different conditions due to the same stressing events. Stress in one area could induce disease conditions in another. For example, a burns patient could develop a heart attack after a quarrel (Selye, 1980).

In a study conducted by Opstad (1992), students were exposed to extremes of stress for a period of five days through sleep and energy deficiencies. During the experiment they expended forty thousand kilojoules of energy while being allowed only two thousand kilojoules uptake. In this period they were allowed only one to three hours of sleep. During the post tests there was a fifty to eighty % drop in leutenizing hormone, follicle stimulating hormone, adrenocorticotrophic hormone and testosterone. There was a significant increase in plasma cortisol, aldosterone and

progesterone. Cortisol levels have a significant influence on the immune system, while testosterone levels determine male sexual function (Opstad, 1992).

Chronic stress influences a person's physiological function. Levitt and Derick (1991) evaluated eighteen students working in the emergency unit of a busy hospital. The students worked in shifts and were expected to receive and treat the casualties. In this study a significant increase was found in systolic blood pressure, serum epinephrine and norepinephrine from the beginning of the shift to the middle of the shift. This was backed by self-report on the perception of the stress.

Studies have shown that the immediate response to stress is accompanied by suppressed immunity. This is demonstrated by suppressed lymphocyte proliferative ability, reduced control of latent herpes viruses, blunted humoral responses to immunization and poor healing (Kiecolt Glasser *et al.*, 2002a: Cohen, *et al.* 2000). These findings are supported by Engs (1996) who notes in addition to the suppression of immunity, there is a rise in blood pressure and the chronic muscle tension.

In studying the effects of chronic stress Miller *et al.*, (2002) tried to establish the control of pro-inflammation cytokines. This study involved fifty parents half of whom were undergoing chronic stress due to their

children being diagnosed with cancer. The stress group scored higher on the psychological stress measures. However, they had a lower cortisol secretion than the control group. This pointed to the fact that chronic stress lowered the immune system's inflammatory response compared to the anti-inflammatory response. The capacity of a synthetic glucocorticoid hormone to suppress in vitro production of the pro inflammatory cytokine inter leukin-6 was diminished among parents of cancer patients. This may explain the autoimmune response found in some individuals under chronic stress (Miller *et al.*, 2002).

Some studies have established the predictive value of both acute and chronic stress to future health status. In their study Douglas *et al* (2001) used seven hundred and ninety six public servants aged between thirty-five and fifty five years. The study aimed at finding out whether present blood pressure reaction to mental stress was predictive of future blood pressure and hypertension. After ten years a post test was conducted which moderately supported the hypothesis that heightened blood pressure reactions to mental stress may contribute to development of hypertension. In a study involving five hundred and eight healthy students measured for anticipatory blood pressure response to exercise, those with high reactivity to anticipated stress were more prone to hypertension compared to the low reactivity group (Caroll *et al.* 2001). In another epic predictive study Everson (2001) looked at whether a stress induced blood pressure spike

could be linked to stroke risk. The students were two thousand three hundred and three elderly Finish men. Measures were taken before an exercise tolerance test. This was the anticipation stress indicated blood pressure. The study was followed for a period of eleven years. They established that students with higher than average elevations of anticipatory blood pressure had a 72% greater risk of having a stroke. All these studies draw a strong link between stress at present and probability of disease in future (Everson, 2001 and Everson, *et al.* 1996).

2.6 Psychological Responses to Stress

Stress is necessary and unavoidable without which there will be no motivation to the activities of life. How an individual reacts to stress depends on the environment, magnitude, past experience, perceived self-efficacy, one's physical condition and habits. Stress can be self-imposed if an individual sets too high standards, has unrealistic expectations, time constraints, lack of resources, feels well-being is threatened and/or takes up challenges that are beyond their abilities or physical well-being or have conflicts with other people (Libby, 1987). The stress value of a situation will be dependent on appraisal. Appraisal involves determining the relevance of the situation. In harm or loss situations the injury or damage has already occurred and this may provoke anger, disgust, sadness or disappointment. Threatening situations create anxiety in the individual. In challenging situations, a potential exists for gain, growth or mastery and

therefore creates excitement. Stressors determined as irrelevant do not bring about any change. All these categorizations are dependent on one's past experience and learning (Papalia and Olds, 1988).

The overall stress produced by a situation is dependent on the amount of control it offers and characteristics of the individual. Individuals can thus be classified as having- Type A behaviour pattern (TABP) or Type B behaviour pattern (TBBP) (Darley *et al.,* 1991). The latter is identified as having opposite behavior patterns to the former. TABP is characterized by aggressive, ambitious, time urgent, impatient and competitive behaviours elicited by environment stressors or challenges. These are normally accompanied by the physiological stress parameters. TABP is a result of interaction between the perceived stressor and a predisposed individual. They become particularly challenged with situations where their control is threatened. A typical response is to struggle aggressively to maintain control over the perceived stressor and the environment. Epidemiological studies firmly link TABP with coronary heart disease. Type B behaviour pattern is exactly the opposite of the TABP (Lovallo *et al.,* 1986).

Individuals classified as exhibiting TABP do not always respond to challenges with more than normal sympathetic activity but depend on the characteristics of a situation. The greater the degree of perceived challenge, the higher the TABP. In examining TABP men and women for

a given period, men tended to be aroused more than women for a given challenge (Darley *et al.,* 1991). Experiments by Manuck and Galand (1979) reported that individuals with TABP responded to challenges more actively and resisted helplessness than TBBP. Where chances of failure were high, TABP individuals resorted to more denial. According to Pittner and Houston (1980), this could lead to experiencing heightened or prolonged stress. On a treadmill task TABP students expended more physical effort while acknowledging less fatigue (Carver *et al.,* 1976) than TBBP. A tendency to deny seeking medical attention has been observed in TABP individuals (Matthew *et al,* 1981). Nixon (1981) proposed a human function for TABP individuals. In response to environment and self-generated demands, coronary prone TABP individuals deny fatigue in a struggle to achieve. Initial success and achievement is accompanied by rising aspirations and increasing demands. This results in an escalating ever-increasing effort in which the health of an individual is affected and consequently performance. This culminates in exhaustion, poor health and coronary disease.

Prolonged exposure to stress causes the following physiological symptoms: headaches, fatigue, gastrointestinal problems, and inability to focus mentally, sexual disturbances, hypertension, sweating palms, shaking hands, anxiety, tachycardia and palpitations. These are accompanied by behavioral symptoms which include irritability,

disruptive eating patterns, harsh treatment of others, rise in alcohol and cigarette consumption, feelings of isolation, compulsive behaviour and difficulties in communication. Each individual manifests the symptoms differently (Newcommer *et al.* 1999). Built-in coping mechanisms include crying, humor, discussing the problem, sleep and dreams (Newcommer, 1999).

An essential factor in an individual's response to stress is the appraisal and the manner of coping. Thus if a stressor does not outweigh the ability to cope effectively, the effects are minimized. When coping is ineffective stress is prolonged and the effects apparent (Carlson and Carlson, 1990). As mentioned earlier, the body has inbuilt mechanisms which seek to reduce tension, anxiety and repair psychological damage as equilibrium is restored. The stress experience is due to the imbalance between demand and coping causing mentally perceived feelings of loss of control to the situation (Rathus, 1996).

This situation was described by Freud (1936) as anxiety, a generalized feeling of fear and apprehension. In his scheme he identified three forms of anxiety: reality, neurotic and moral. While reality anxiety could be dealt with practically, the other two could not. In extreme cases he postulated that individuals resort to defense mechanisms. These were denial, displacement, fixation, projection, rationalization, reaction formation,

regression, sublimation and undoing (Freud, 1936). However, these are extreme methods of dealing with anxiety generated by mental stress which could lead to impaired psychological health.

In studies reported earlier (Pitter and Houston, 1980) on TABP, men seem to be aroused more by a specific challenge than women. This is supported by a study by Rath (1987) who reported greater manifestations of psychic stress among students while observing a group of doctors awaiting an examination. In a research aimed at measuring cortisol response to stress, Klomstein (2004) tested one hundred and fifty three students performing before an audience. For both male and female students, there was elevated cortisol secretion. However, it was noted that in anticipating men showed greater levels of stress without having to perform. This is contradicted by Saccham and Lahad (2004) who tested a group of children of mean age 12.9 years undergoing severe stress. Girls reported more stress on all tested variables; physiological, emotional and cognitive reactions. Differences were particularly significant in emotional and cognitive reactions.

2.7 Examinations as a Source of Stress

The culture and the society shape the events that are perceived as stressful and the acceptable coping strategies. Value systems, stratification, organization of its institutions and the rapid changes taking place within

these may be a source of stress (Pearlin, 1982). Commenting on the United States, Merton (1957) suggested that society was creating stress by promoting values that conflict with the structures in which they are achieved. Society expects success in attaining monetary independence and honor among people that could not be accommodated in the opportunity structures. As a consequence, the many individuals who internalize these culturally prized goals are doomed to failure.

In the Kenyan education system, examinations are given a lot of importance. This has led to a situation where a lot of importance is placed on acquisition of certificates for their own sake. Due to lack of other avenues except formal employment, success in examinations plays a determining role to future income and security. This leads to a very intense competition among candidates (Kamotho, 1991). Carver, (2000) notes that examinations started out as a measure of importance but has ended up being the only important aspect of school systems. Knowledge that examinations will determine their future enhances the fear of failure and therefore stress. As the examinations approach more pressure is applied by the teachers, parents and school administrators. This pressure increases the learner's feeling of inadequacy, anxiety and tension (Awour; 1987; Kamuyu., 1999 and Carver, 2000). This stress has been blamed for cheating in examinations and at times school riots (Kimutai, 1999, Macharia, 2000).

A study conducted by Supe (1998) on students in a medical school brought out examinations stress as being very disturbing. The study involved two hundred and twenty eight students in their first, second and third years. Seventy-three % (73%) perceived the course as being very stressful. Stress was found to be higher in the second and third year of study. These levels of perceived stress were higher during examinations. In a study by Malakey *et al.* (1995) to determine changes in stress hormones during competitive oral examinations, the levels of adrenocorticotrophic hormone (ACTH), betaendorphin, betalipotropic hormone, prolactin and cortisol were measured prior and during the examinations. The students were healthy young college students. Twenty-two minutes after the start, levels of adrenocorticotrophic hormone rose by fifty-nine (59%). Betaendorphin seventy-nine % (79%), beta lipotrophic hormone by forty two % (42%) and prolactin by forty-six % (46%), twenty-two minutes after the start. Cortisol level rose by fifty nine % (59%). The levels of the hormones gradually fell back to normal after the examinations. This shows that examinations are the main mediating factor in the production of these hormones (Malakey *et al.* 1995).

In their study, Sprangler *et al.* (2002) measured the influence of academic stress on mean concentrations of adrenocorticotrophic hormone, (ACTH) cortisol and betaendorphin. Examinations produced higher levels of

adrenocorticotrophic, during the day as opposed to night. Students with higher levels of perceived stress had the most significant levels. However, there was no significant increase in betaendorphin secretion (Sprangler *et al.* 2002).

In a study measuring the neurohormonal changes during examinations, Al-Ayadhi (2005) found a significant increase in adrenocorticotrophic hormone, cortisol, neuropeptides, adrenomedullin, nitrite and nitrates just after the examination compared to before the examination (Al-Ayadhi, 2005).

Presence of stress related hormones in the body for prolonged periods can have an impact on the immune system. Kiecolt- Glasser and Glasser (1993) concluded that examination stress affected very wide immunological functions. In a study spanning ten years from 1982-1992, conducted on college undergraduate students, measures were taken throughout the year. During examinations there was a reduction in the activity of natural killer cells, which fight tumors and viral infections. Gamma interferons, which stimulate proliferation and activity of natural killer cells, had decreased by ninety %. T killer cells showed a poor response to test tube stimulation. Hourly samples taken before, during and after showed a significant increase in epinephrine and adrenalin levels (Kiecolt- Glasser and Glasser, 2002b).

Gloger *et al.* (1997) looked at the effect of intense intellectual stress on the immune response. Samples of forty-two students were taken just before the final examinations and after the holidays. In comparing the two, there was a decrease in lymphocyte proliferation and an increase in cortisol levels just before the examinations. The study concluded that exposure to examinations stress may lower immuno-competence in healthy students.

Cohen *et al.* (2000) measured the DNA repair capacity during and after examinations. Inability for the DNA to repair is considered an important factor for carcinogenesis. The study involved sixteen (16) healthy medical students. The result indicated a significant increase in DNA repair capacity during the examinations than after vacation. This suggested a positive association between stress and the repair capacity. While this may seem a contradiction to the expected reduction in immunity, it might be the body's unique way of preparing itself for the physiological damage expected from exposure to stress.

The Epstein Barr Virus (EBV) is prevalent in ninety % (90%) of people. It remains latent throughout most individuals' lives. However, in immuno compromised individuals it can cause life threatening diseases. Sarid *et al.* (2001) in their research measured EBV specific antibodies as related to the stress caused by examinations. This was accomplished by sampling

immunoglobulin salivary secretions of EBV antibodies among first-year female students. This study reported a significant increase in EBV antibodies during exams. In a similar study, Sarid *et al.* (2004) assessed changes in human cytomegalovirus virus (HCMV) antibodies before and during examinations. The students were fifty four (54) nursing and physiotherapy students. The results showed that there was a significant increase in HCMV antibodies during the examinations and a proportional decline after examinations. All these studies show examinations related stress has an impact on the immune system. This is emphasized by the body resorting to other mechanisms other than the natural immunity as reinforcement; an indicator that the homeostatic balance has been upset (Sarid *et al.* 2004).

Stress has been identified with decreased immunity in individuals. Stowell (2003) suggests that examination stress can have a significant impact on psychological and physical health. Marucha *et al.* (1998) investigated this association using dental wounds. They found that it took forty % (40%) longer for healing to take place during examinations as opposed to during vacation. This suggested that the drop in immunity was caused by examination stress. Deinzer *et al.* (1998) assessed gingivial inflammation before and after examinations. In the experiment, the level of inflammation increased significantly during examination and reduced after examinations. Marshall and Agarwal (2000) while reviewing literature on

studies conducted on the immunoglobin, a salivary excretion, found that chronic and acute examination stress affected immunological defense differently. However, in both cases, a lowered immunity was observed. This suggested that examination-related stress had a significant effect on immune system and therefore on gingivial health. These studies show that examination stress may have an impact on health through the reduction in the body's natural immunity.

2.8 Sports as an Innoculant to Stress

Sports and exercise involve movement of the major limbs of the body. Since they upset the equilibrium already in existence at the time, they create stress on the body. Being controlled by the duration of the activity the effects are temporary but similar to those associated with non activity induced stress (Gretchell *et al.* 1988). During physical exertion, there is an increase in heart rate, breathing rate, blood pressure, muscular tension and neural stimulation (Sharkey, 1997). Since it involves a high expenditure of energy, some scholars view exercise as an ideal way of burning energy produced by the stress related response (Payne and Hahn. 2000).

In a survey on reasons for participation in sports, Stubbe *et al.* (2005) established that young athletes mainly do so for enjoyment. However, it was noted that competitive sport could just as well create positive and negative stress. It was found that state anxiety levels during competition

were in the same range as found during classroom tests. Anxiety produced by stress was found to be highest among individual sports, followed by small teams being least on large teams. The more an individual was held accountable for the results, the greater the stress during competition. The anxiety levels were found to drop immediately after a competition (Stubbe, 2005). Kuhlman and Schweinhart (1999) found that improved fitness due to exercise could be related to achievement in mathematics and reading. Tremblay *et al.* (2000) posit that exercise enhanced self-esteem which could act as a support to cognitive learning. Exercise may be beneficial to academic performance. Gitonga (1998) found that athletes performed better in class work than non-athletes.

Hamer *et al.* (2006) assessed the changes in blood pressure of students undergoing psychosocial stress. The experimental group was put through fifty % VO_2 max for as long as they could exercise. A post test showed a significant drop in resting blood pressure for the exercise group than the control group. The longer the exercise period, the lower the resting blood pressure.

Exercise has an impact on the production and excretion of stress related hormones. Mola *et al* (2001) assessed the effect of exercise on students who had been exposed to mental stressors. A pre-test was carried out on thirty students (30) before administering the mental stressors. On

completion of the task the students followed with a maximal bicycle exercise, and then a post test was taken. Starting with the initial task the heart rate and skin conductance rose and continued to rise with the second task. There was a gradual drop after the exercise. Testosterone and cortisol levels diminished with the exposure to both stressors indicating that exercise has an impact on the levels of stress hormones in the body. Using a group of forty eight experimental and forty eight controls (48), Jin (1981) found that exposure to mental and emotional stress enhanced cardio vascular responses, catecholamine levels, disturbed mood states, heart rate and blood pressure. On exercising through a brisk walk there was a drop in the heart rate, blood pressure, catecholamine concentration and cortisol. Scully *et al.* (1998) found that exercise makes the body more efficient in removing the stress metabolites.

Excessive exercise can create the same conditions as other forms of stress. When individuals are exposed to very heavy training, they may be undergoing the same amount of stress as those with chronic stress. While reviewing stress related- research, Neiman (2000b) reported that most studies showed that in most cases at rest, the immune systems of athletes and non-athletes were similar. However, this is with the exception of natural killer cell activity which is elevated in athletes. Infection risk can be related to acute changes during exercise. Epidemiological data suggests

that endurance athletes are at a risk of increased upper respiratory infections during training and one to two weeks later (Neima, 1994).

Fifty % of the athletes experience stress related symptoms during periods of heavy training and intense competition. The pressure to win produces an excessive anxiety, frustrations, conflicts and fear (Humphrey *et al.* 2000). This psychological stress may be accompanied by denial of injury, fatigue or affect actual ability leading to feelings of low self esteem (Nuddet *et al.* 2000). During this time, many athletes report many physical health concerns such as lack of sleep, inability to relax, continuous fatigue and digestive problems (Humphrey *et al.* 2000). Wilson and Pritchard (2005) postulate that student athletes may experience more stress due to dual demands of participation and academics, which determine their financial status and, therefore their stay within the college.

Benefits of regular exercise depend on the intensity and volume of activity pursued by the individual. Exercise improves glucose metabolism, reduces low density lipids, increases high density lipids, improves interleukin 2 natural killer cell system and has no adverse effects on the immune system. Inclusion of regular physical activity could be used as a tool for prevention of chronic disease (Southern *et al.* 1999). Habitual physical activity improves cardiovascular efficiency, lowers blood pressure, helps preventing thrombosis, helps manage obesity, improves joints, muscle and

tendons, reduces osteoporosis, improves glucose tolerance and insulin sensitivity, and reduces stress (Scottish cabinet office, 1999). Other physiological benefits are prevention and alleviation of lower back pain, reduction of insommia, improved posture, relaxed muscles, increased ability to withstand fatigue and greater ability to cope with illness and accidents (Weiten, 2004). Gretchel *et al.* (1990) point out that exposure to exercise prepares one to be better placed to deal with environmental stressors.

In their research, Couture and Bocksnick (1998) established that the effect of exercise on adults and young athletes was similar. After exercise, there was 18.2% drop in resting heart rate in the experimental group compared to the control group. There was also a rise in peripheral skin temperature for the exercise group. These physiological changes should promote the state of relaxation. Other benefits derived from exercise are reductions of boredom and enhanced self-esteem and efficacy. Kraweczyki and Krawezynki and Olszewski (2000) reported psychological well being among individuals over sixty years old participating in regular exercise. Greenberg reported a positive correlation between slower breathing tempo, lower catecholamine levels, and rise in skin temperature after exercise and relaxation. These studies confirm a positive correlation between warm peripheral temperature and low manifestations of stress.

Inglewood and Sullivan, (2002) found that exercise training improved on athletes' health beliefs and their perceived body image.

Paulsen *et al.* (1990) compared twenty-six (26) wheelchair basketballers and twenty-eight non-players and found that the athletes scored significantly better in mood state especially depression. This supports the fact that sports participation is beneficial to the mental health of people with disabilities.

A study by Campbell and Jones (1994) reported that disabled athletes scored better than non-athletes, being less prone to tension, depression, anger and confusion. They also scored higher in positive self-perception and health. Studying a similar population, Wells and Hooker (1995) found the onset of disability was followed by muscle atrophy, fat build up and inefficient body function. Disabled people were prone to cardiovascular, respiratory and infectious diseases. Comparing wheelchair athletes and non-athletes the study found that the former had better body composition, pulmonary functioning, muscle strength, muscle endurance and anaerobic power than the latter. They were also able to handle stress better, had a better self-image, were more independent and had better interpersonal skill (Wells and Hooker. 1990).

A study conducted by Thorlindson *et al.* (1990) found that participation in sports had a substantial positive effect on the perceived health status of adolescents in Iceland. Participants experienced less psychological distress and had reduced chances of engaging in negative health habits such as smoking. Amongst the psychological benefits reported from regular participation in exercise and sports are increased and improved self-esteem, confidence, alertness, more positive perception of others, decreased anxiety, depression, accident susceptibility and stress-related behaviours. All these point to the improved ability to manage stress (Asci, 2003).

Engs (1996) suggests that both rhythmic and vigorous activities could be used as alternatives to relieving stress. Rhythmic activities include running, jogging, fast walking, swimming, cycling and dancing. Vigorous activities include such activities as outdoor adventures and competitive sports. These are known to produce feelings of well-being and tranquility among children and adults. According to Blair *et al* (1985) and Caspersen *et al.* (1985) physical fitness is positively correlated to cognitive function and self-discipline and negatively correlated to stress.

2.9 Gender Differences in Sports Participation

Research conducted by the cultural consortium of England's Northwest, found a great disparity in participation in sports between boys and girls

(Morrin, 2004). The study involved fifty-five thousand (55,000) adolescents aged between thirteen and fourteen years. On one hand the findings indicated that while 70% of the boys participated in sports as a co-curricular and club activity, conversely less than 50% of the girls did. Girls, on the other hand, participated two times more in creative activities than boys. This echoes a United States government report on physical education (2000) that in high school, 72% of the boys participate in vigorous physical activity compared to 57% of the girls. A survey by Eiosdottin *et al.* (2008) showed that only one third of high school and college athletes in England were women. Kidd (1987) and Parrat (1994) postulate that males have twice as many opportunities to sports resources, control of the activities and they demonstrate little interest in addressing the imbalance.

Competition at the highest levels is the objective of all or most of the participants. At its best it provides an income. At these levels, professional athletes serve as role models for the upcoming ones. According to Coakley (2001), most professionals in the area tend to be men and hence have more impact in shaping the attitude of sports in males than females. Kane and Bjonstal, (2008) attribute the lack of the role models to outdated stereotypes of feminity and masculinity. Culturally, women are not supposed to excel in vigorous activity and therefore drop out early before they excel. This also leads to a situation where those charged with sports

for girls have little training or experience (Mbabu, 1997 and Koivule, 2001). This stereotyping leads boys towards sports demanding vigour, risk, speed, strength, challenge and team spirit. Girls in turn seek sports that provide beauty and visual pleasure such as figure skating, gymnastics, tennis and riding (Croxton *et al.,* 2002). However, the attitude towards the benefits of sports is the same for both boys and girls (Wamukoya, 1994). Other reasons advanced for the disparity have looked at the number and variety of sports available to either gender. Acosta and Carpenter (1985) explain the existence of more male sports by stating that most sports were invented for men by men, which is neither enhanced by socially constructed barriers that inhibit women from participating and thus the great disparity.

Klomsten *et al.* (2004) conducted a study on self-concept and sports participation among adolescents. Boys scored higher on physical self-concept and appearance than girls. The study also noted that boys participated more in sports activities which contributed to the development of positive self-concept. Croxton *et al.* (2002) found that males expressed more competitive and assertive attitude towards sports participation and were more confident of success prior to competition than females. Rudolph (2000) found that women student athletes had greater stress adjusting to college life than men. Fryderberg and Lewis (1993) in their study noted that males resorted more to physical recreation while girls

tended more to social support. Females also suffered twice as many injuries due to sports as men (Dunn, 2001).

There are probably different factors that motivate each gender to participate in sports. In a study by Kelinske and Chen (2001) both male and female college students, viewed sports as being more masculine oriented than feminine. Both groups agreed on the potential benefits such as moral reasoning, socialization, competition, health and fitness. However, males gave more emphasis to competition as their main motivation to participation while females viewed socialization as being more important. These results agree with a study by Shotten *et al.* (2000) on gender differences in participation among members of a private golf club. Men tended to place more emphasis on improving personal skill level and achieving success while women placed socialization and fun first.

Chandra and Batata (2006) report that one of the greatest sources of stress was the school environment. As they are promoted to a higher class there is a great increase in the amount of homework. This raises the level of stress which peaks as the examinations approach. Girls also use social support as a means of coping while boys tend to resort to physical activity. All these factors contribute to the numbers of girls in sports being fewer than boys. Kane and Bjonstal (2008) state that girls consistently lag behind

in all types of physical activity and have a higher dropout rate. This is supported by a United States government report on physical education (2000) that shows girls not only join organized sports later but drop out earlier. Klomstein *et al.* (2005) found that girls and women are less likely to participate in physical activity than men and boys. In areas where they did the activities were less vigorous and engaged in less often. These studies highlight the already existing differences between the genders in participation. There is a higher rate of drop-out among the female participants than the male.

2.10 Summary

Any phenomenon that threatens the internal equilibrium of an individual causes stress. In an examination-oriented system like the Kenyan education system, a lot of stress is present in those individuals expecting to sit major examinations. Stress causes both physiological and psychological reactions. The presence of stress hormones in the circulatory system affects the body's immune system. If this phenomenon is prolonged it may cause chronic disease. However, for the short duration of examinations it may cause only minor ailments. Acute stress affects psychological functions such as control of behavior and causes cognitive disruptions such as loss of concentration and attention. Individual reactions to stressful situations are determined by their proneness, nature

of the stress and past experience. Appraisal of these will determine the strength of the stress reaction and the duration of the after-effects.

Participation in physical exercise and sports produces a stress response from the body. Intense and prolonged training found among professional athletes produces a response found in chronic stress situations leading to a compromised immune function. Exercise and sport participation allows the body to recover back its homeostasis acting as inoculants to future stresses. These are both in the psychological and physiological dimension. Regular exercise and sports may thus serve as a buffer to stress caused by academic examinations.

There are gender differences in participation with males participating more than females. Culturally, sports are viewed as a male domain and thus less socialization into sport for females. This is observed by the existence of fewer role models, fewer avenues for females to excel, fewer sports and fewer facilities. This may be explained by the relatively few numbers of female student participants in the last year of high school.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter covers the methods and procedures used in the study. It is organized under the following sub-headings:- location of study, research design, target population, sample and sampling procedures, instrumentation, pilot study , data collection, and data analysis.

3.2 Location of Study

The study was conducted in seventeen national schools spread around the country (Appendix A). These schools are the most competitive in admission of students as they select candidates from all over the country (Gitonga, 1998). Academically, most of them tend to perform better in the Kenya Certificate of Secondary Education examinations than the majority of provincial and district schools (Gitonga, 1998). They are well endowed in sports facilities offering opportunities in a wide variety of sports, some of which are not available in provincial and district schools. Records of participation prior to the study show that national schools excelled in such sports as hockey, rugby, swimming, tennis and badminton in the years 2000, 2001 and 2002. Schools such as Alliance, Maseno and Lenana excelled in rugby and hockey. Kenya High emerged champions in racket games and swimming while Mangu and Limuru did the same in basketball (Njenga, 2000; Wephukulu, 2001; and Tsuma, 2002). The students were

selected among Form Three students and tested during the second term. The same students were again tested just before they sat for their mock examinations the following year.

3.3 Research Design

This was a longitudinal study involving a quasi-experimental design due to the inability to control the students directly. There were two groups of students, namely an experimental group of sports participants and a control group of non-sports participants. Sports participation was treated as the independent variable while the level of perceived examination stress was the dependent variable. A pre test was administered in the months of May and June 2004 when the students were in Form Three and a post test carried out on the same group in June 2005 just before they sat for mock examinations. The research was conducted over a period of one calendar year.

3.4 The Sample and Sampling Procedure

3.5 Sampling

Purposive sampling was used with sports participation as the main criteria. In each school the researcher assisted by the games master or mistress identified the active sports participants. These were students who were representing the school in a sport or representing their house in two sports. The members varied from 35 to 45. These numbers were determined by the fact that in all schools there was a tendency to be represented over a

wide range of sports by the same individuals. Using a table for random numbers 16 students were chosen. In mixed schools the researcher selected eight boys and eight girls to make up the number needed per school. In all schools the sample size was thirty two (32). This sample comprised between 35.6% and 45.7% of the sports active students According to Borg and Gall (1983) when a sample is 30% or more, the sampling distribution is almost a normal distribution. Using a matched pair design the selected students identified their colleagues who had not been active in sports during their Form Three year of study to form the control group. Two stratified groups of active sports participants and non-sports participants were thus identified. Having used two schools for piloting, the remaining fifteen schools produced a total of 480 students, 240 in each category.

3.6 Instrumentation

Various measures were used in the study. A questionnaire was used to establish the students' level of stress by self-reports. Physiological measures were taken as stress indicators. Past academic records and the frequencies of visits to the school nurses were also used.

3.6.1 Questionnaire

The questionnaire shown on Appendix G was administered to the students to rate their own levels of stress. The items were partly adopted from Eliot and Breo (1984) and partly developed by the researcher. They addressed

three major areas in which stress manifests itself namely physiological, behavioral and cognitive.

Scoring was on a five point Likert scale ranging from A indicating the highest level of stress having five points to E indicating the lowest level of stress with a score of one. Out of the pilot study the questionnaire scored a reliability score of 0.89 which is acceptable. The purpose and use of the questionnaire was to obtain a large amount of information (Macmillan and Schumacher, 1989).

3.6.2 Physiological Measurements

As a person experiences stress, two systems controlled by the hypothalamus go into action namely, the sympathetic nervous system and the endocrine system (Santrock 1995). The effect of the action is to change the following parameters as explained by Davis *et al.* (1988):

i. A rise in the heart rate.

The resting heart rate of an individual under stress is normally above the average (70) due to the presence of catecholamine in the blood stream. To measure the resting heart rate, the researcher used a standard heart rate wrist tachometer. The was crosschecked with the standard wrist fifteen second method. Where there was a variation both measures were repeated until agreement.

ii. A rise in the blood pressure

Presence of stress related hormones creates conditions where the blood pressure is constantly elevated even at rest. The school nurse assisted in the measure using an adult type of cuff with bladder size of 24 x 12.5 cm. The student was required to relax for ten minutes before the measure. For confirmation, the measure was repeated after five minutes to eliminate the effects of anxiety.

iii. Lowering of skin temperature

Stress hormones cause an individual to sweat due to raised basal metabolic rate. The effect of this is to cause an individual peripheral temperature to cool. Measures were taken of skin palmer skin temperature using a digital feedback thermometer. The thermometer was placed in the palm of the hand and the students wrapped their hand around the thermometer. After three minutes, the reading was taken. This was repeated after five minutes and the readings compared.

For all physiological measures, the students were requested to go to school hall after the last lesson at 4.00 p.m. Here, they were met by the games master, the school nurse and the researcher. On arrival they were asked to relax for ten minutes before the measures were taken. At least two

measures were taken of each parameter per student. Where there was a variation, repeated measures were taken until consistency was achieved.

3.6.3 Academic Records

The researcher obtained results in English and Mathematics per term starting from second term Form Three and going on to pre-mocks examinations. The choice of Mathematics and English was due to the two being compulsory in secondary schools. Their importance is emphasized by the Koech Report (2000), which considers them core to the education in Kenyan secondary schools. The six sets of scores, three for each student were from Form Three second term, Form Three annual examinations and pre-mock examinations in the first term in Form Four. Due to the differences in the school environments, the scores were standardized using the formular.

$$x\text{-}x = \breve{y}\text{-}y$$

$$\therefore Z = \frac{y - \breve{y}}{ay} \quad ax + x$$

x = desired standard score
x = constant mean
ax = standard deviation constant
y = a given raw score
$\breve{y}$ = a given mean for raw data
ay = standard deviation for raw data for which y is the mean score

The results were used to compare the academic performance of active sports participants and non-sports active students. Data were recorded in form of tables (Appendix E).

3.6.4 School Medical Records

The researcher obtained in confidence the medical records of the research students sampled. Schools are required to keep medical records for each student which include type of ailments reported and the prescription administered. This enables both the Ministry of Education and the Ministry of Health monitor trends of disease occurrence in schools and act before serious out breaks occur (Public Health Act, 1962).

These were in the form of group frequencies for sports active students and the non-sports active students. This data was compiled by the school nurse as per a prepared table. This was for the period of the research, second and third term Form Three and first term Form Four. Care was taken to exclude injuries occurring during participation. Ailments used in the frequencies, as provided by De Neue (1999) were as follows:-

i Common colds.

ii Stomach upsets.

iii Headaches.

iv Unexplained rashes.

These were recorded for each term as per frequency (Appendix F).

3.7 Pilot Study

For the pilot study, the researcher randomly selected a boys school and a girls school from the group of national schools. Using the same criteria to

be used in the main study, two stratified samples of sports active and non-sports active students were identified. The purpose of the pilot study was to establish the validity and reliability of the questionnaire as well as acquaint the researcher with the data collection procedure. Suitability of the instrument in terms of language and clarity were also tested. The data from the pilot study was not used on the actual study. A pre-test was conducted in September 2003 and a post-test in November of the same year. Annual examinations done during this period were used to confer index numbers for the Kenya Certificate of Secondary School examinations and thus are considered important. The post-test was conducted just before the students sat for examinations which was a time when students were expected to have heightened stress.

3.7.1 Reliability of Research Instruments

Mugenda and Mugenda (1998) describe reliability of a research instrument as the measure of the degree to which a research instrument yields results after trials. The researcher obtained sixty four questionnaires from the pilot study which were subjected to split- half as a measure of reliability. Each question was scored by giving a mark depending on the levels of stress perceived. The following steps were used to test reliability:

i. Low stratified samples of sports active and non-sports active students were obtained.

ii. The questionnaires were administered to all selected students.

iii. All odd numbered items and even numbered items were grouped together.

iv. Each student's total score from the two groups of items was computed.

v. The scores from the groups of items for all students were correlated.

Data with high split-half reliability has a high correlation coefficient. Since the researcher was correlating half of the test scores with the other half, the coefficient so computed did not reflect the reliability of the whole instrument. Hence, the Spearman-Brown prophecy formula was used to correct the realized coefficient as provided by Gay (1992).

$$r_s = \frac{2r_h}{r_h + 1} \qquad r_s = \frac{2r_n h+1}{r_h + 1}$$

r_s =Split -half reliability

r_h=Correlation between the two halfs of the test.

The result obtained from the reliability test gave a coefficient of 0.89. Any instrument with a split-half estimate between 0.8 and 1 is accepted as reliable enough according to Gay (1992).

3.7.2 Validity of Research Instruments

Best and Khan (1992) describe validity of a research instrument as the degree to which it measures what is intended by the researcher. This is a judgment made better by a team of professionals or experts in the particular field (Mugenda and Mugenda, 1998). In this connection, the researcher established face, content and construct types of validity through the pilot study and professional guidance from his university supervisors and senior lecturers. This was done by holding discussions, making relevant comments and suggestions that were synchronized.

3.8 Procedure for Data Collection

Prior to the study, the researcher obtained a research permit from the Ministry of Education, Science and Technology. During the first term of 2004, the researcher visited all the schools to be used in the study. The purpose of the visit was to obtain permission from the Principals to conduct the study. During the visits the researcher was acquainted to the respective Games Master or Mistress and the school nurses. In this process the objectives of the research were explained and cooperation requested.

In May 2004 the researcher visited the schools for the pre-test. At this point the students for the study were identified and their cooperation requested. With the help of two assistants, the school nurse and Games Master/Mistress the tests were administered. Before leaving the school,

the researcher left the Games Master/Mistress with a form to record the academic scores over the period of the research. In turn the school nurse was requested to record the frequencies of minor ailments over the same period. The post-test was conducted in May 2005 just before the students sat for their mock examinations. All the tests were repeated which upon completion the researcher collected the record of academic scores and the frequencies for minor ailments.

3.9 Ethical Considerations

Before research was carried out, a research permit was obtained from the Ministry of Education, Science and Technology. This was to verify the appropriacy of conducting this research in the country (Appendix B). During the initial visit to the schools the researcher explained the objectives of the research to the school Principals, Games masters/mistresses and the School Nurses. Consent was thus obtained to carry out the study. Attached to each questionnaire (Appendix D) answered by the students was a letter requesting for cooperation from individual students. This was accompanied by an explanation on the objectives of the research and the voluntary nature of participation. All chosen students consented to go ahead and participate in the research. For confidentiality of the data each students was assigned a number. For the purpose of post-test only the Games Master/Mistress knew the identity of the students. Medical data was reported in form of frequencies for the whole group.

3.10 Data Analysis

Data were obtained in four different categories namely the questionnaire responses, physiological measurements, medical and academic records. The first two sets of the data involved a pre-test and post-test score. Visits to the School Nurse were recorded in form of frequencies for the period May 2004 to May 2005. Academic records were tests scores for termly examinations and in term two and three Form Three and pre-mocks examination in Form Four. The data obtained fell into four categories; sports active boys, sports active girls, non-sports active and non-sports active girls. The analysis aimed at establishing any differences in levels of perceived and physiological stress at the beginning of the study and at the end. It also sought to find out if there were any significant differences in academic performance between students active in sports and those who were not. Finally, the study also sought to find out whether there were any significant differences in the occurrence of minor ailments within students active in sports and those who were not. Analysis was done to establish differences between the whole group, between sports active students and non-sports active students, and between genders. These comparisons at all times involved two groups. The data were analyzed for means and standard deviation. For significance it was subjected further to independent t tests, chi-square and a one-way analysis of variance.

An independent to t test was used to establish the difference in perceived stress levels between sports active boys and non-sports active boys, sports active girls and non-sports active girls, non-sports active boys and non-sports active girls and between sports active students and all non- sports active students. The analysis for minor ailments between sports active and non-sports active students was done using a chi square. A one-way ANOVA was used to analyze perceived stress level for all students in the period post-test, academic performance among the sports active and non-sports active, differences in skin temperature, heart rate and blood pressure between the sports active and the non-sports active. Where the researcher was dealing with all the students, four groups were always involved. These were sports active boys, sports active girls, non-sports active boys and non-sports active girls. ANOVA was used as a more powerful analysis due to the groups being more than two. The acceptance and rejection levels were set at $P<0.05$. Tukey HSD test could not be applied since only two groups were being compared at any one time.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

The purpose of this study was to investigate the effect of sports participation on examination-related stress in secondary schools in Kenya. Seventeen national schools were used, two for the pilot study and fifteen for the main study.

With the exception of the occurrence of minor ailments which was in form of frequency during the period of research, all other measures were taken in Form Three second term and repeated on the same students just before their mock examinations in Form Four. The research lasted approximately one calendar year between the pre and post tests. At the beginning of the study in May 2004 the mean age of the students was seventeen and a half years (17.5). To test the hypothesis, chi-square, t test and one way analysis of variance were used. The acceptance and rejection levels was set at $P<0.05$. Turkeys HSD test could not be applied since only two groups were being compared at any one time.

4.2 Demographic Information

4.2.1 Distribution of Subjects In Terms of Gender and Participation

The total number of students was 489 of which 244 were girls and 245 were boys (Figure 4.1).

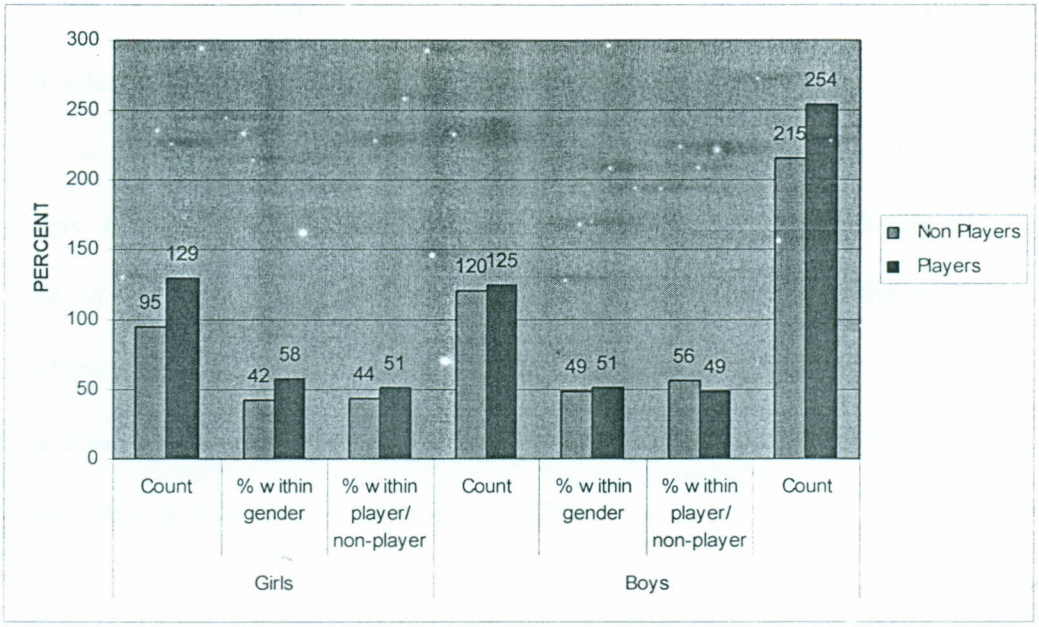


Figure 4.1 Gender distribution of the participants.

Overall, there were 254 sports active and 215 non-sports active students. Among the girls, the sports active made up 58 % of the group while non-participants made up 42%. Sports active boys comprised 51 % while the non-sports active made up 49 % of the group. The sampled boys were more evenly distributed within the two categories. This shows that there was a higher dropout rate among the non-sports active girls between the time of sampling and the time of completion of the study. Among the non-sports active students, boys made up 56% while girls were 44%. Thus, though boy participants and girl participants were almost the same in numbers, non-sports active boys were more than the girls.

4.2.2 Academic Scores between Sports Active and Non-sports Active Students

In the pre-test, the overall mean of the scores for the sports active students was 42.67±SD 14.74± SD while for non-sports active was 43.42± SD 15.46 (Table 4.1). There was no significant difference between the means of the sports active and non-sports active students. It is, however, evident that within the groups, there were big variations in performance which was probably an indicator of the abilities within.

Post-test mean scores for the non-sports active students were 42.85± SD 12.57, while those of the sports active students were 41.25± SD13.30. This shows that there was a slight improvement in performance for the sports active students than the non-sports active students. However, the variations within the groups reflected the distribution in abilities.

Table 4.1 Distribution of academic scores

	Measures of Central Tendency	Pre-test Academic scores	Post test Academic scores
Non-players	Mean	43.42	41.25
	Std. Deviation	15.46	13.30
	N	**215**	**215**
Players	Mean	42.67	42.85
	Std. Deviation	14.74	12.57
	N	**254**	**254**
Total	Mean	43.01	42.12
	Std. Deviation	15.06	12.92
	N	**469**	**469**

4.2.3 Distribution Of Stress Scores

The mean for all the students for the pre-test was 52.9± SD 9.78 (Figure 4.2a). During the post-test the mean score was 51.9± SD 10.48 (Figure 4.2b). This indicates that there was a slight drop in perceived stress levels as the mock examinations approached. The variation in the stress level within the group remained more or less the same.

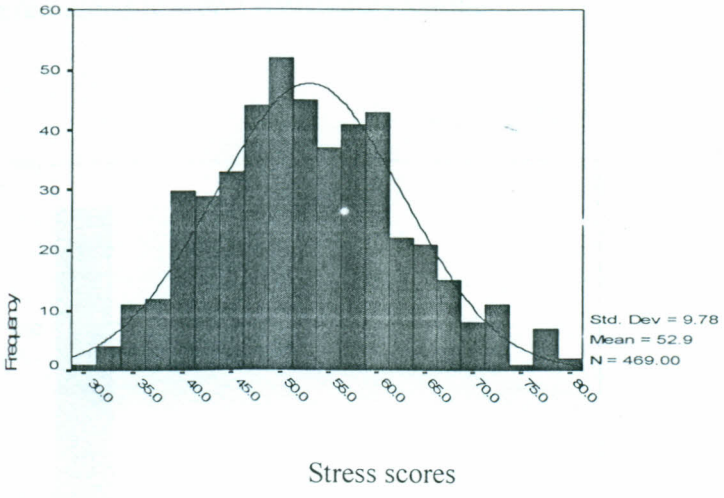


Figure 4.2a Pre-test stress scores

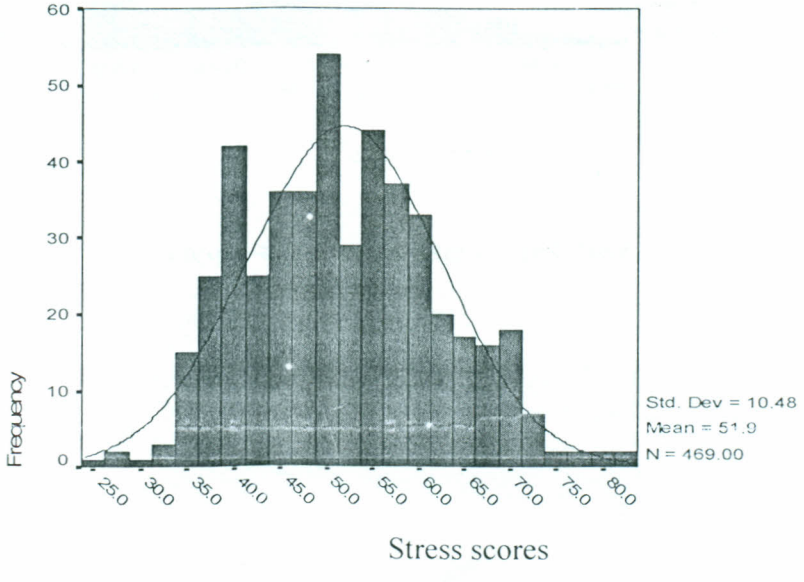


Figure 4.2b Frequency distribution of post-test stress scores

4.2.4 Distribution of Skin Temperatures in the Pre-Test and Post Tests

During the pre-test the mean skin temperature for all the students was $32.6^0 \pm$ SD 1.23^0C (Figure 4.3a). For the post test, the mean skin temperature was 33.3^0C $\pm$ SD 1.53^0C (Figure 4.3b). The post test mean was slightly higher than the pre test mean. However, the standard deviation remained low and statistically similar.

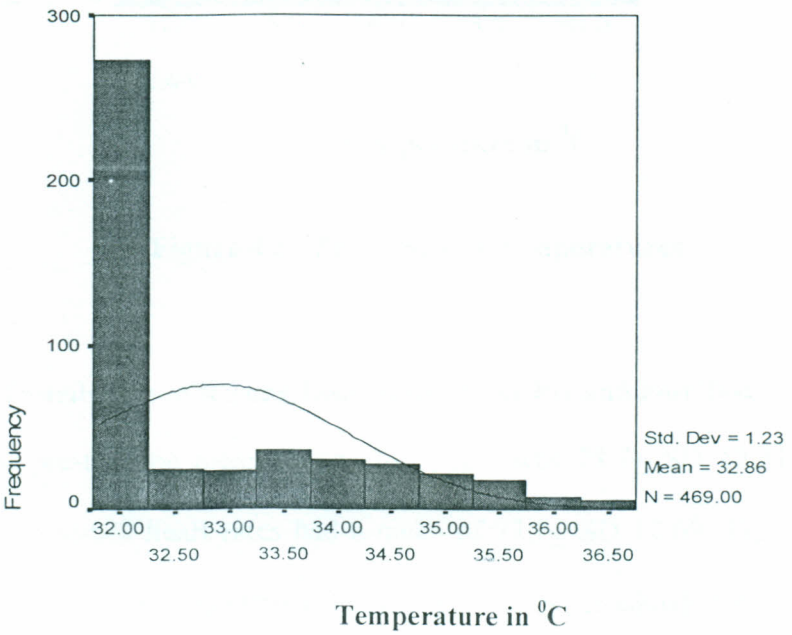
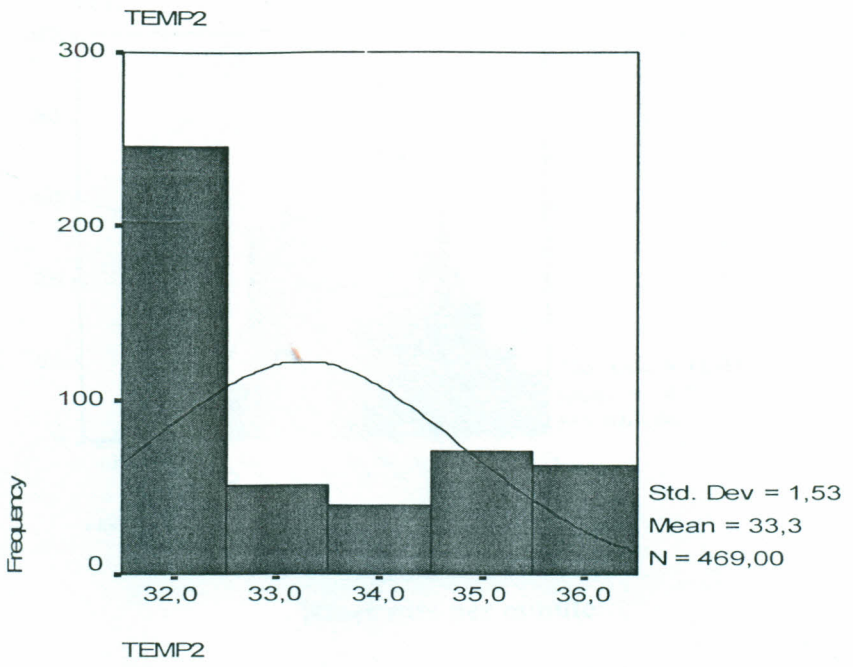


Figure 4.3a Pre-test skin temperature

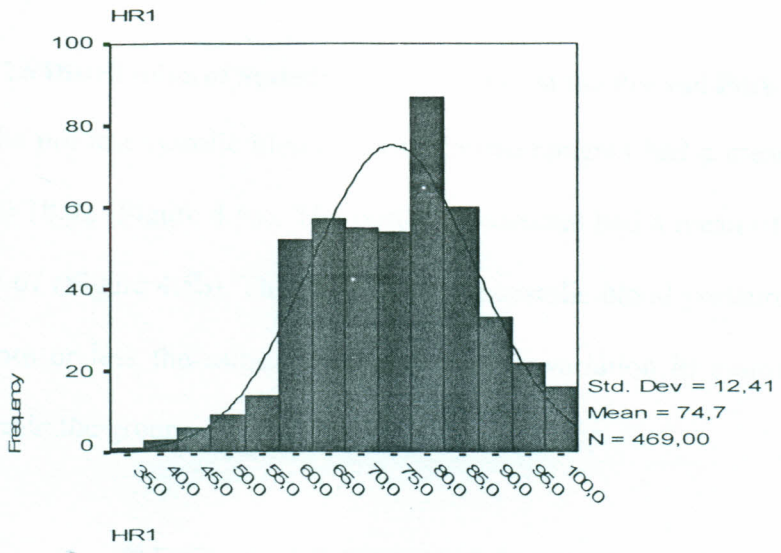


Temperature in ^{0}C

Figure 4.3b Post-test skin temperatures

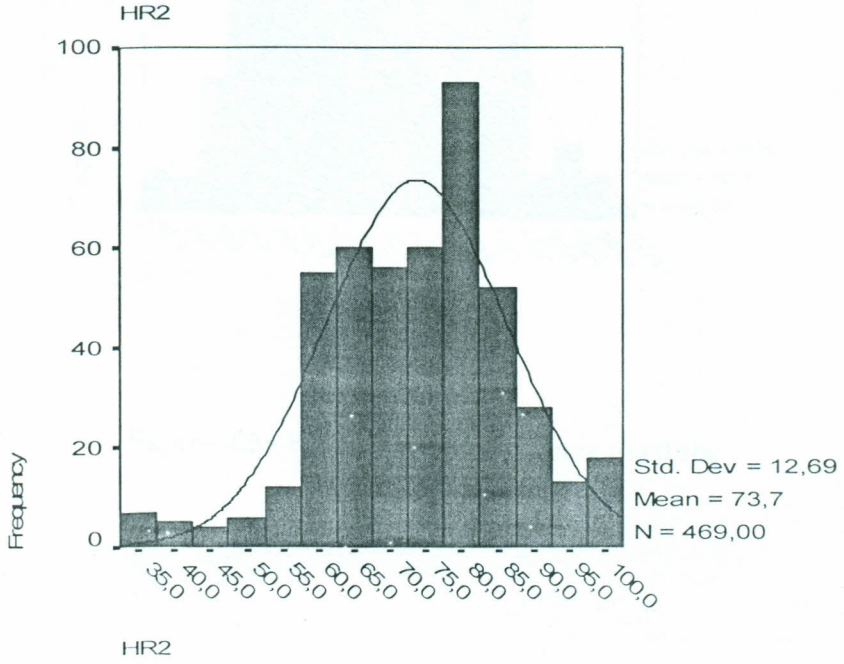
4.2.5 Distribution of Resting Heart Rates in the Pre and Post Test

In the pre-test the mean resting heart rate was 74.7± SD 12.41 (Figure 4.4a). Post-test heart rates had a mean of 73.7± SD 12.69 (Figure 4.4b). From these data, it is shown that the heart rates remained statistically the same. The variations in distribution also remained the same. From both figures, it is noted that though there was a central tendency, at the extreme there were students with very low heart rates and on the other side, there were some with much above average heart rates.



Heart rate per minute

Figure 4.4a Pre test Heart rate



Heart rate per minute

Figure 4.4b Post-test heart rate

4.2.6 Distribution of Systolic Blood Pressure in the Pre and Post-Test

The pre-test systolic blood pressure measurements had a mean of 120.7± SD 18.02 (Figure 4.5a). The post-test measures had a mean of 121.6± SD 17.67 (Figure 4.5b). This shows that the systolic blood pressures remained more or less the same. There was a great variation in systolic pressure within the group.

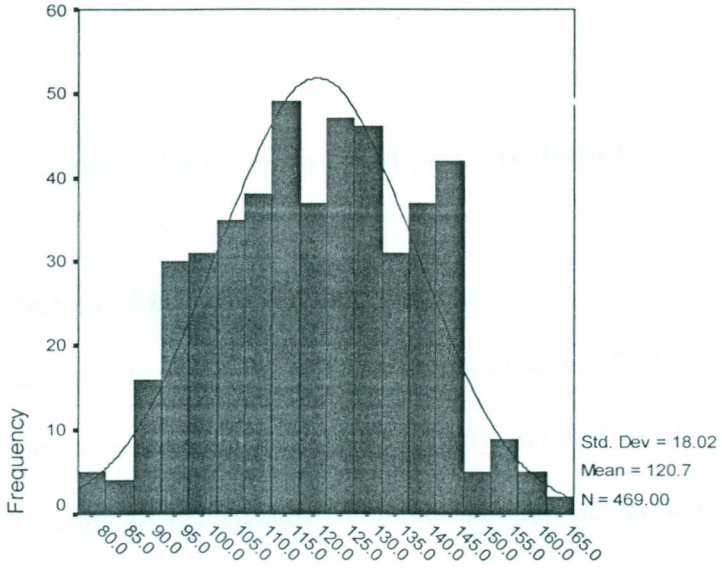
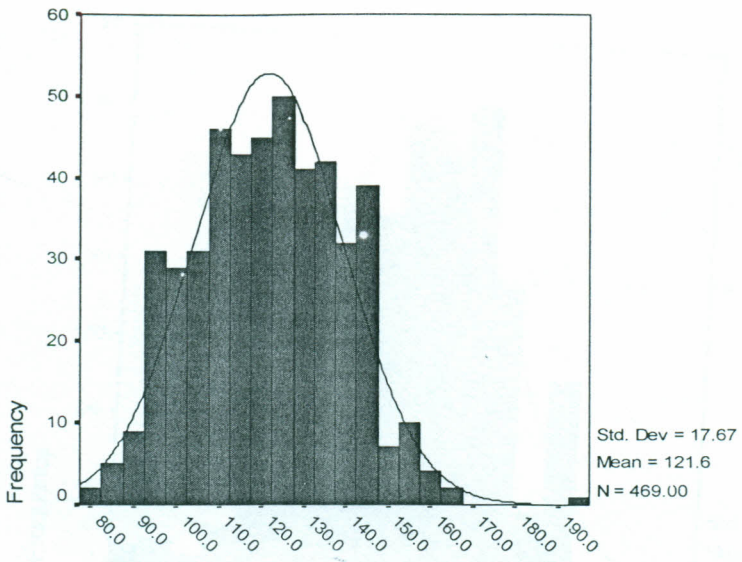


Figure 4.5a Pre-test blood pressure diastolic



Mm Hg

Figure 4.5b Post-test blood pressure diastolic

4.2.7 Distribution of Diastolic Blood Pressure

During the pre-test the mean diastolic blood pressure was 78.8± SD 15.35. In the post-test the mean rose slightly to 79.0± SD 15.93. The diastolic blood pressure for all the students remained almost the same within the measured distribution (Figure 4.6a and b).

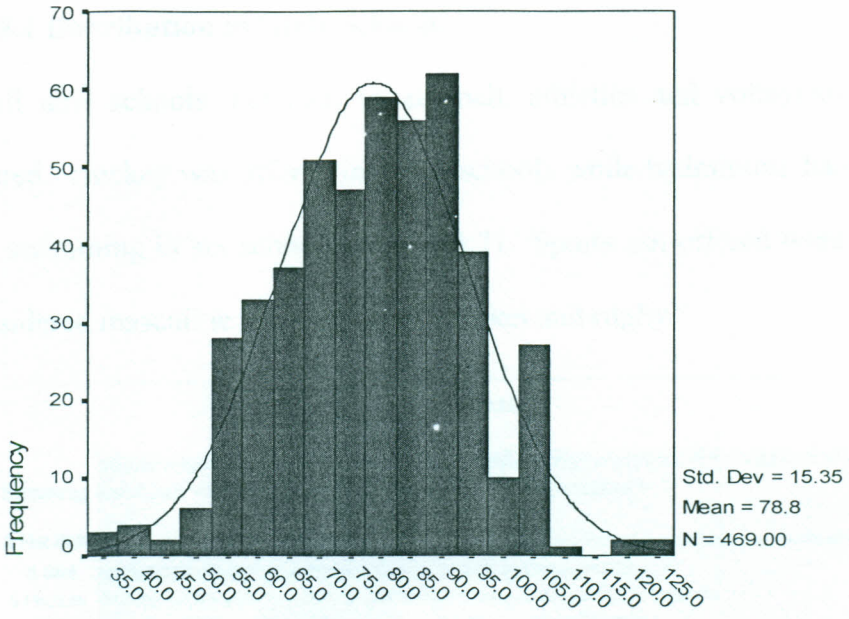


Figure 4.6a Pre-test measures

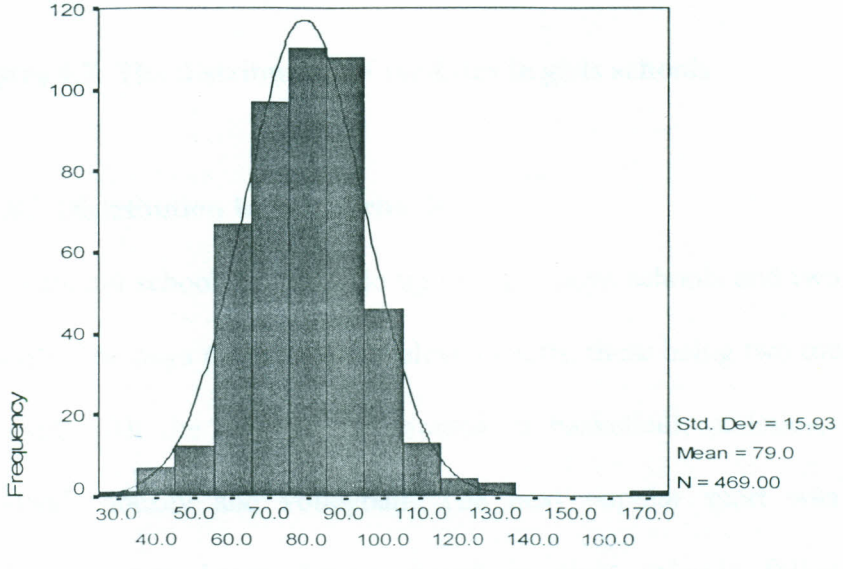


Figure 4.6b Post-test measures

4.2.8 Distribution of Sports in Terms of Facilities and Participation

4.2.8.1 Distribution in Girls Schools

In all nine schools, net ball, basket ball, athletics and volleyball were offered. Hockey was offered in seven schools while badminton, hand ball and swimming in six schools (Figure 4.7). Sports not offered were those considered masculine such as soccer, cricket and rugby.

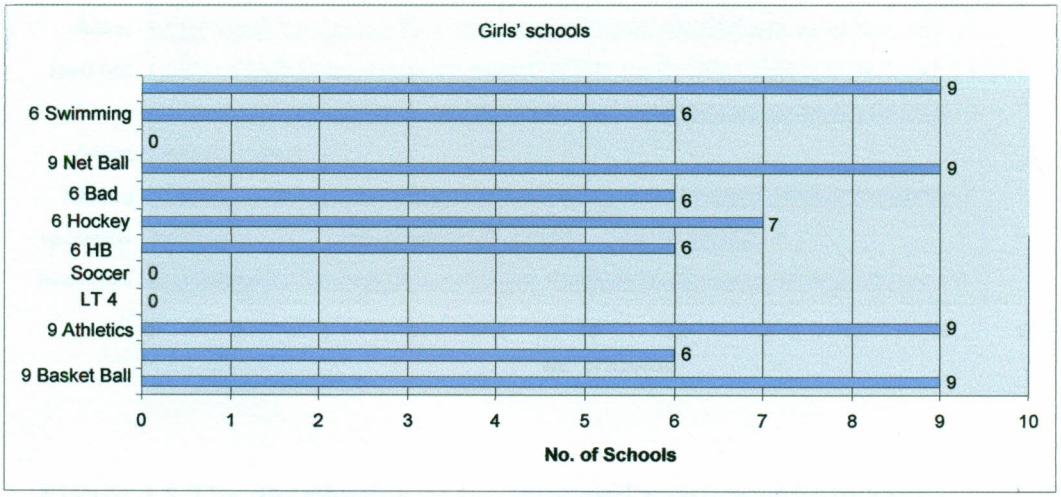


Figure 4.7. The distribution of facilities in girls schools

4.2.8.2 Distribution in Boys Schools

The national schools were made up of eight boys schools and two mixed schools. The boys participated in eleven sports, these being two more than the girls. All the schools participated in basketball, athletics, soccer, handball, hockey and volleyball. The next popular sport was rugby Badminton and Lawn Tennis found in eight schools followed by swimming in six schools. Cricket was the sport least participated in being

available only in three schools (Figure 4.8). In general, boys schools tended to have more facilities than girls schools. Boys tended to have a greater opportunity for participation than girls.

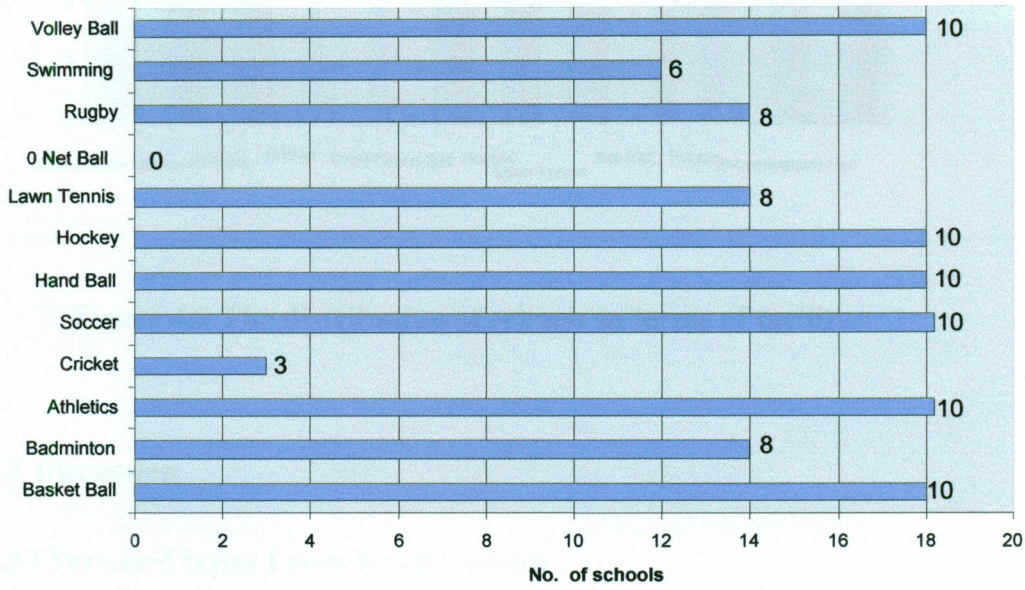


Figure 4.8 The distribution of facilities and participation in boys schools

4.2.8.3 Distribution of Games in All Schools

The most common sports found in both boys and girls schools were volleyball, athletics and basketball, which were found in all schools. This was followed by hockey which was offered in fourteen schools, handball and swimming in twelve schools. Cricket was the sport least participated in being found only in three schools. Compared to others, these schools were relatively better endowed in sports facilities.

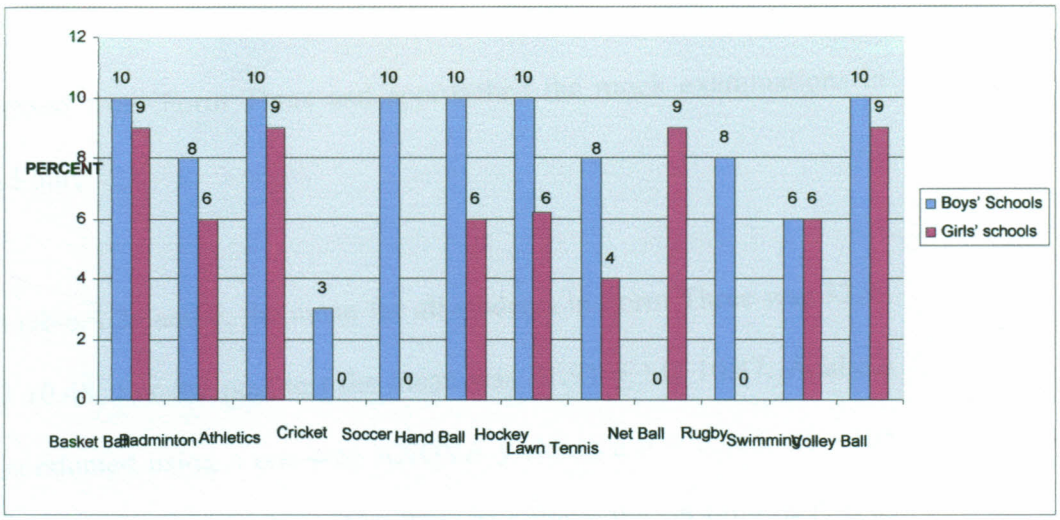


Figure 4.9 The distribution of schools in terms of facilities

4.3 Discussion

4.3.1 Perceived Stress Levels for all Students

Table 4.2a Perceived stress levels for all students

	N	Mean	Std. Deviation
Pre-test stress score	469	52.9186	9.78378
Post test stress score	469	51.9122	10.47534

Table 4.2b ANOVA Test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9772.304	105	93.070	.965	.579
Within Groups	35025.745	363	96.490		
Total	44798.049	468			

P>0.05

Stress levels were the main factor in the study. It was therefore important to establish if there were changes in stress levels as the students

progressed from Form Three and approached the mock examinations in Form Four.

From table 4.2a and b, the mean for all students in Form Three was 52.92 $\pm$ SD 10.48. For the post-test the mean was 51.91 $\pm$ SD 10.47. Analysis was conducted using a one-way ANOVA yielding a $F = 0.965$, df – 105 and $p= 0.0579$ 9tables 4.2a and b). This was above the set limit of $P>0.05$ set for the study. The null hypothesis that stated that there is no significant difference in perceived stress levels of all students during there second term in Form Three and just before they sat for their mock examinations in Form Four is accepted. The slight differences in the means in the pre- and post-test could be attributed to errors in random sampling.

These results seem to contradict studies by Meyerhoft, *et al.,* (1988) whose study found a great increase in the secretion of stress hormones during oral examinations which immediately fell after examinations. Marlakey *et al.* (1995) measured the influence of academic stress on the mean concentrations of adrenocortropic hormones, cortisol and beta endophine among college students. The levels rose prior to the examinations reaching a peak during examinations and falling gradually after examinations.

All these studies were conducted within the short period of just prior and immediately after examination. However, Marshall and Ararwal (2000) (1995) argue that examinations can produce both acute and chronic stress. The lack of difference in the levels of perceived stress between the two measures could be a reflection of the nature of preparation for the Kenya Certificate of Secondary Examination preparation. In the country preparation starts as early as Form Three with the competition for the index numbers. For the whole population of students showing no significant differences in perceived stress levels in Form Three and Form Four can only be attributed to chronic examination stress.

4.3.2 Perceived Stress Levels in Sports Active and Non-sports Active Boys

The researcher was interested in establishing if there was any difference in perceived stress levels among the sports active boys and non-sports active boys during the pre- and post-test. Table 4.3 a. and b. show the results of the analysis.

Table 4.3a Perceived stress levels for all boys

		N	Mean	Std. Deviation
Pre-test stress score	Non players Players	120 125	52.7967 51.4816	9.46921 8.79912
Post test stress score	Non players Players	120 125	53.4400 44.0800	10.46899 7.88596

Table 4.3b Independent t-test

		t	df	Sig. (2-tailed)
Pre-test stress score	Equal variances assumed	1.127	243	.261- no sig
Post test stress score	Equal variances assumed	7.925	243	.001-significant

The mean stress scores for non-sports active boys during the pre-test was 52.80 $\pm$ SD 9.47. The pre-test mean for the sports active boys was 51.48 $\pm$ 8.80. For the post-test the non-sports active had a mean of 53.44 $\pm$ SD 10.47. For the sports active boys, the mean was 44.08 $\pm$ SD 7.90. These results were subjected to further analysis using an independent t test. For the pre-test the results yielded a significance of 0.261 with a t value of 1.127. This was above the significance level set for the study of $P<0.05$. This shows that there was no significant difference in the stress levels between boy students at the beginning of the study.

Further analysis was carried out for the post-test scores yielding a significance level of 0.001 and at t value of 7.925 (Table 4.3a and b) which was below the significance level set for the study of $P>0.05$. This shows that there was a significant difference in the stress levels between sports active and non- sports active boys during the post-test. The null hypothesis that stated that there is no significant differences in stress levels between boys who were active in sports and those who were not

during their Form Three second term and just before they sat for mock exams is therefore rejected. This difference could be attributed to the perception of examination as a threat. In Form Three, both groups perceived examinations as a threat with the same magnitude of stress. In Form Four, however, sports active boys were able to moderate their perception of examination stress while that of the non-sports active boys heightened. These differences in the pre- and post-tests could be attributed to sports participation assisting in the alleviation of stress among the sports active boys.

Eysenck (1983) states that previous experience of stress inoculates one against subsequent stress. Participation in sports upsets the body's homeostasis and therefore, causes stress for a temporary period of time. Stubbe (2005) measuring stress levels during competition found that the anxiety levels were in the same range as a classroom test. These were found to drop immediately after competition. Mola *et al.,* (2001) exposed students to a mental task then exercise. After a rest, the physiological parameters indicated that the relaxation levels were proportional to the length of exercise. The level of stress hormones testosterone and cortisol fell indicating that physical activity has an impact on the level of stress hormones in the body. Jin (1981) states that on exposure to mental and emotional stress, the students benefited from stress reduction through exercise.

From the above studies, there is an indication that exercise helps reduce the level of stress hormones in the bloodstream. This translates into less stress. The active boys had less levels of stress due to participation. This was probably due to reduced stress hormones in circulation after the activity. In other words, participation in physical inoculated them against stress which was not the case for the non-sports active boys.

4.3.3 Perceived Stress Levels in Sports Active Girls and Non-sports Active Girls

The results of the effect of sports participation on perceived examination-related stress are shown below in tables 4.4a and b.

Table 4.4a Perceived stress levels among the girls

		N	Mean	Std. Deviation
Pre-test stress score	Non players Players	95 129	56.9305 51.4698	9.24106 10.62134
Post-test stress score	Non players Players	95 129	56.3537 54.8093	9.43346 9.40883

Table 4.4b Independent t-test

		t	df	Sig. (2-tailed)
Pre-test stress score Post-test stress score	Equal variances assumed Equal variances assumed	4.015 1.213	222 222	.002-significant .227-not significant

The mean for the pre-test for non-sport active girls was 56.93 $\pm$ SD 9.24 while sports active girls had a mean of 54.80 $\pm$ SD 9.40. Data from the post-test gave a mean of 51.47 for non-sports active girls with a standard deviation of 9.43 while sports active girls had a mean of 54.81 $\pm$ SD 9.41. These results indicate that the means had greater differences during the pre-test than post-test. On being subjected to an independent t test, the scores produced a significance of 0.002 with a t value of 4.015 for the pre-test (Table 4.4a and b) which indicates that the differences in the two groups were significant at $P<0.05$. This means that at the beginning of the study, the sports active girls perceived examinations less as a threat than the non active girls. For the post-test, the independent t test produced a significance of 0.227 with a t value of 1.213 (Table 4.4a and b). The significance was above $P<0.05$ set for the study. This indicates that as the mock examinations approached, the perceived stress levels for both girls active in sports and those not active in sports were statistically the same. The null hypothesis that stated that there is no significant difference in stress levels between girls who were active in sports and those not active in sports in their Form Three third term and just before they sat for their mock examinations is therefore accepted.

The results seem to contradict Giaccobbi *et al.* (2007) who report that students who exercise prior to examinations approach them with less stress. Their study shows that exercise behaviour is an effective way of

coping with stress during academically demanding times. These results show that initially, sports active students had less level of perceived stress but later they were similar to those of the non-sports active. This loss in the inoculation effect of participation can only be explained by the sports active having dropped out. In a report by a United States Government on physical education (2000) it is noted that girls join organized sport at later age than boys and tend to drop out earlier. This could be explained by their increasing perception of sports as a masculine phenomenon (Mbabu, 1997) as they progress through the teenage years. Thus, the girls mature more physically, there is a tendency not to participate in physically demanding tasks as per expected gender stereotype (Klomstein, 2005). This could explain the lack of significance in that the sports active had ceased to be active or reduced their participation to the level that it had no significance in stress reduction.

4.3.4 Perceived Stress Levels In Sports Active Boys And Sports Active Girls

Among the sports active students it was important to establish whether there are any significant differences in perception of stress in the pre and post-test between the students who were active in both genders. The results are presented below in tables 4.5a and b.

Table 4.5a Perceived stress levels among the sports active students.

	GENDER	N	Mean	Std. Deviation
Pre-test	Girls	129	51.4698	10.62134
	Boys	125	51.4816	8.79912
Post-test	Girls	129	54.8093	9.40883
	Boys	125	44.0800	7.88596

Table 4.5b Independent t-test

		t	df	Sig. (2-tailed)
Pre-test stress score	Equal variances assumed	-.010	252	.992-no significant
Post-test stress score	Equal variances assumed	9.834	252	.0020-significant

At the beginning of the study sports active girls had a mean of 51.47 ± SD 10.62. The sports active boys results produced a mean of 51.48 ± SD 8.80. From the means, there was almost negligible difference in the stress levels of the two groups. In the post-test the sports active girls recorded a mean of 54.80 ± SD 9.40, while the sports active boys had a mean of 44.08 ± SD 7.89. It will be noticed that the differences in the means for the post-test were much greater than those of the pre-test. The results were subjected to an independent t test in which the pre-test scores produced a significance of 0.992 with a t value of –0.10 (Table 4.5a and b). Thus, there was no significant difference in the perceived stress levels for the sports active girls and the sports active boys. The post-test scores were subjected also to an independent test yielding a significance of 0.0020,

which was lower than the set value of $P<0.05$ (Tables 4.5a and b). This means that there were significant differences in perceived stress values between sports active girls and sport active boys. Sports active girls perceived examinations as being more stressful than boy. The null hypothesis that stated that there is no significant difference in perceived stress levels between sports active boys and sport active girls during their Form Three second term and just before they sat for their mock examinations in Form Four was therefore rejected.

Boys schools tended to have a wider variety of sports than girls schools (Figure 4.8). Availability of more facilities for boys allowed for greater competition to join a house or a school team. This required that more time be spent on practice to meet the standards for both internal and external competitions. This indicates that though boys and girls schools had sports programme the levels of competitions were not the same. Klomstein *et al.* (2003) report that even in countries where many girls and boys participate in sports, boys seem to exercise more often. The level of competitions is much higher for boys than girls in secondary schools. This requires sports active boys put in more time than girls. This explains the reason why boys had significantly less perceived stress than girls.

Girls are more likely to drop out of sports than boys (US, Gov. 2000). A dropout among the sports active girls could also help explain the loss of

the stress inoculation effects of participation. Even among those who remain sports active, the inoculation effect of participation is higher among the boys than girls. In the choice of activity, boys tend to choose activities requiring more viqour and energy than girls (US Gov. Report 2002). All these factors point out to girls receiving less inoculation effects than boys and losing out in the inoculation effects gradually as the mock examinations approached.

4.3.5 Perceived Stress Levels in Non-Sports Active Girls and Non-Sports Active Boys

In the absence of sports participation, it was important to establish whether the girls and boys perceived examinations with the same amount of stress. The results are presented below in table 4.6a and b.

Table 4.6a Perceived stress levels for the non-sports active

	GENDER	N	Mean	Std. Deviation
Pre-test	Girls	95	56.9305	9.24106
	Boys	120	52.7967	9.46921
Post-test	Girls	95	56.3537	9.43346
	Boys	120	53.4400	10.46899

Table 4.6b Independent t-test

		t	df	Sig. (2-tailed)
Pre-test stress score	Equal variances assumed	3.213	213	.002-significant
Post-test stress score	Equal variances assumed	2.116	213	.035-significant

The pre-test scores for the girls produced a mean of 56.93 ± SD 9.24, while boys the mean was 52.79 ± SD 9.46. For the post-test the girls had a mean of 56.35 ± SD 9.43 (Fig 4.6) while boys had a mean of 53.44 ± SD 10.48. For both groups the means for the pre-test and post-test remained statistically similar. The results were subjected to an independent t test and for the pre-test a significance of 0.002 was obtained with a t-value of 3.213. The significance was below the acceptance value of $P<0.05$ meaning there was a significant difference in the levels of stress between non-sports active girls and non-sports active boys. The post-test yielded a significance of 0.035 with a t-value of 2.116 (4.6a and b). This was below the set value of $P<0.05$. This means that there was a significant difference in stress levels between sports active boys and sports active girls in the post-test. From the means of both the pre- and post-test the girls perceived level of stress among girls were always higher than those of the boys. The null hypothesis which stated that there would be no significant difference in perceived stress levels between non-sports active girls and non-sports active boys in their Form Three second term and just before they sat for their mock examinations was therefore rejected.

In his survey among adolescents in schools (Morrin 2004) found that 70% of the boys participated in sports regularly, while only 50 % of the girls did. A report by the United States Government (2000) indicates that while

72% of the boys engaged in vigorous physical activities only 57% of the girls do. According to Kane and Bjonstal (2008), girls participation in all types of physical activities consistently lags behind those of boys and girls and the drop out rates are higher.

The significant difference could be explained that boys tend to choose physical activity more often as a choice of recreation than girls. Selection into boys teams is more difficult than into girls teams noting the numbers to select from. This indicates that while boys may not be selected into the school team, they continue to engage in more vigorous physical activity than girls. This explains why non-sports active boys levels of perceived stress were lower than that of non-sports active girls.

4.3.6 Gender Influence on Perceived Examination Stress For All Students

The results of a comparison in between all the female students and all the male students are presented below in table 4.13a and b.

Table 4.7a Stress level descriptives among the genders

	GENDER	N	Mean	Std. Deviation
Pre-test	Girls	224	53.7857	10.39550
	Boys	245	52.1257	9.13845
Post test	Girls	224	55.4643	9.42921
	Boys	245	48.6645	10.34598

Table 4.7b Independent t-test

		t	df	Sig. (2-tailed)
Pre-test	Equal variances assumed	1.840	467	.066
Post-test	Equal variances assumed	7.416	467	.0001

The pre-test means for all female students was 53.79 ± SD 10.40 while that of boys was 52.13 ± SD 9.14. On subjecting the results to an independent t test, a t-value of 1.84 was obtained with a significance of 0.066, which was not significant as per the set value of $P<0.05$ (Table 4.13a and b). This means that at the beginning of the study, there was no significant difference in the stress levels between the genders.

Post-test results produced a mean of 55.46 for the girls ± SD 9.43, while the boys had a mean of 48.66 ± SD 10.35. An independent t test carried on this result produced a t-value of 7.42 with a significance of 0.0001, which was below the set value of $P<0.05$. This means that there was a significant difference between the perceived stress levels of the girls and boys during the post-test. The null hypothesis that stated that there is no significant difference in perceived stress levels is rejected.

These results indicate that female students perceived more stress as the mock examinations approached. Klomstein (2005) reports that sports participation is assigned according to cultural sereotypes of masculinity

and feminity. Those requiring danger, risk, violence, speed, strength, endurance, challenge and team spirit are designated for boys. On the other hand, those with high aesthetic value such as skating, gymnastics and riding are assigned to girls (Klomstein, 2005). From these, the two genders derive their role models. Coakly (1990) states that boys have more role models in sports than girls. Due to the stereotyping, girls find themselves in situations where the amount of participation in physical activity is limited. This may explain their level of perceived stress being higher due to their low levels especially as a result of lack of motivating role models.

Cultural practices shape people's attitudes towards certain activities. Wamukoya (1985) found that there was no difference in altitude towards participation in physical activity between boys and girls. However boys tended to participate more. This could be interpreted to mean that while girls may know the benefits of physical activity, they are unable to translate this into action to the prevailing cultural practices. This may explain reasons why girls were less active and therefore perceived more stress.

From the study, it was established that boys had more facilities for their sports (Table 4.7 and 4.8) and hence more opportunities for participation. Parat (1984) found that males have many opportunities for sports activities than females. The success of sports programmes is dependent on the

quality and expertise of the decision makers, managers and coaches who manage them. Kane and Bjonstal (2008) state that those responsible for sports for girls tend to have minimal training. Considering all these factors, the participation of girls is at best minimal compared to boys. This explains reasons why girls seem to benefit less in stress reduction than boys.

4.3.7 Perceived Differences in Stress Levels among All Sports Active Students and All Non-Sport Active Students

To determine whether sports participation played a role in stress reduction, it was important to analyze the stress levels of both sports active and the non-sports active students. The results are presented below in table 4.7a and b.

Table 4.7a Perceived Stress Levels for the Sports Active and the Non-Sports active

	PLNOPL	N	Mean	Std. Deviation
Pre-test stress score	Non players	215	54.6233	9.57110
	Players	254	51.4756	9.74795
Post test stress score	Non players	215	54.7274	10.10635
	Players	254	49.5291	10.20557

Table 4.7b Independent t-test

		t	df	Sig. (2-tailed)
Pre-test stress score	Equal variances assumed	3.513	467	.0001-significant
Post test stress score	Equal variances assumed	5.521	467	.0002-significant

The mean for the non-sports active students was 54.62 $\pm$ SD 9.57 while sports active students scored a mean of 51.48 $\pm$ SD 9.75. For the post-test, the non-sports active students had a mean of 54.73 $\pm$ SD 10.11, while the sports active students scored a mean of 49.53 $\pm$ SD 10.21 (Table 4.7a). The means for the pre- and post-test for the non-sports active students did not vary very much, while there was some variation in the pre-test and post-test for sports active students. For both tests, there were no major differences in the standard deviation for both groups.

These results were subjected to an independent t test whereby the pre-test yielded a significance level of 0.0001 with a t-value of 3.513. This was below the accepted value of $P<0.05$ indicating that there was a significant difference in stress values between sports active students and non-sports active students. A t-test conducted on the post-test yielded a significance level of 0.0002 and a t value of 5.521 (Table 4.7b). This was lower that the set level of $P<0.05$ meaning there was a significant difference between perceived stress levels between the sports active students and non-sports active students. This means that the null hypothesis that stated that there is no significant difference in perceived stress level between the sports active students and non-sports active students in their Form Three second term and just before they sat for their mock examination is rejected.

From the results the sports active students perceived less stress than the non sports active students. Participation in physical activity makes the body more efficient in the removal of stress metabolities from the body (Scully *et al.* 1998). This removal leads to a state of relaxation or absence of stress. Other benefits derived from participation in physical activity are reduction of boredom and enhanced self esteem and self efficacy (Sinyor et al1986). This leads to improved sleep and rest. Jin (1981) states that participation in physical activity leads to a reduction in stress.

Students who were active students in sports perceived less levels of stress than the non sports active students. This was in general irrespective of the level of activity. This difference can be attributed to the inoculating effect of sports activity. The results also agree with Reed and Ones (2006) who report that exercise promotes relaxation and hence reduces stress.

4.4 Academic Performance Among the Sports Active Students and the Non-Sports Active Students

A comparison was made in the performance of English and Mathematics between the sports active students and non-sports active students in their Form Three second term and just before they sat for their mock examinations. The results are presented below in table 4.8a and b.

Table 4.8a Academic performance for the sports active students and the non-sports active students

		N	Mean	Std. Deviation
Pre-test	Non player	215	54.6233	9.57110
	Player	254	51.4756	9.74795
	Total	469	52.9186	9.78378
Post-test	Non player	215	54.7274	10.10635
	Player	254	49.5291	10.20557
	Total	469	51.9122	10.47534

Table 4.8b ANOVA Test

		Sum of Squares	df	Mean Square	F	Sig.
Pre-test	Between Groups	1153.656	1	1153.656	12.344	.0003
	Within Groups	43644.392	467	93.457		
	Total	44798.049	468			
Post-test	Between Groups	3146.468	1	3146.468	30.480	.0001
	Within Groups	48208.473	467	103.230		
	Total	51354.941	468			

The non-sports active students had a mean of 54.62 $\pm$ SD 9.57 in their Form Three second term examinations. The sports active students had a mean of 51.47 $\pm$ SD 9.75. These results were subjected to analysis using a one-way ANOVA and yielded an F-value of 12.34 and a significance of 0.0003 (Table 4.8a and b). This was below the set value of $P<0.05$ and hence indicated that there was a significant difference in the academic performance between sports active students and non-sports active students

Results for the pre-mocks held in the first term of Form Four were used as the post-test. Non-sports active students obtained a mean of 54.75 $\pm$ SD 10.11, while the sports active students had a mean of 49.53 $\pm$ SD 10.21. Analysis using a one-way ANOVA indicated an F-value of 30.48 with a

significance of 0.0001 (Table 4.8a and b). This value was lower than the set value of $P<0.05$ and therefore, indicated that there was a significant difference in academic performance between non-sports active students and the sports active students.

Studies conducted relating physical activity and academic achievement suggests that exercise may help in improving academic performance. Tremblay *et al* (2002) found that exercise improves self esteem which may support cognitive learning. Kuhman and Schweinhart (1999) found that improved rhythmic competency due to physical activity related to achievement in mathematics and reading. Gitonga (1989) found out that athletes tended to perform better than non athletes.

An examination of the means obtained in the study show the non sports active students scored higher both in the pre and post test. In addition these were more consistent than the sports active students. These findings are in disagreement with the studies cited above. This could be attributed to the criteria used in the selection of the students which was wholly based on sports activity. This selection of the students did not take into consideration the level of performance at the beginning of the study or the attitudes of the students towards the selected students. This is reflected in that the means of the sports active students were always lower than those

of the non sports active students. The results thus may not be used directly to attribute physical activity to academic outcome.

4.5 Occurrence of Minor Ailments among the Sports Active and the Non-Sports Active Students

To obtain results for the occurrence of minor ailments the school nurses of respective schools provided information on the two groups during the period of study.

Table 4.9 chi square

Chi-Square	277.814
Df	1
Sig.	.0003

The non-sports active students recorded an average of 30.19 visits to the school nurse, while the non-sports active students had average of 17.76. The scores were subjected to further analysis and using a chi-square, a value of 277.81 was obtained with a significance level of 0.0003 table 4.9a and b). This was below the set value of $P<0.05$ indicating that there was a significant difference in the occurrence of minor ailments between non-sports active students and the sports active students. This means that the null hypothesis which stated that there is no significant difference in the occurrence of minor ailments between non-sports active students and the sports active students is rejected. Comparison of the means shows that

non-sports active students had almost twice the number of visits compared to sports active students.

Perceived stress is always accompanied by physiological responses. A study by Al-Ayadhi (2005) found out that there was an increase in stress hormones in the blood stream during examination periods. Presence of stress hormones in the blood stream for prolonged periods can have an impact on the immune system. In their study, Kiecolt-Glasser and Glasser (1993) concluded that examination related stress affected many immunological functions. Preparation for the Form Four examinations starts as early as Form Three and stress builds up gradually and is very high during mock examinations. This is because mock examinations serve as an indicator of the final performance. This build-up is accompanied by secretion of stress-related hormones, meaning their continued presence in the blood stream.

In their study, Gloger *et al.* (1997) looked at the effect of intense intellectual stress on the immune response and found a depressed lymphocyte proliferation and increase in cortisol just before examinations. Cohen *et al.* (2001) found a decreased DNA repair capacity among students during examinations (Marucha *et al.* 1998). Dental wounds took longer to heal during examinations. Many other studies show that there is

a drop in immunity levels caused by examinations (Sarid *et al.* 2001 and Deinzer *et al.* 1998).

From the results, the sports active students perceived less stress as the examination approached and reported fewer occurrences of minor illnesses. Tholindson *et al.* (1990) reported in their study that sports active students experienced less psychological stress. Among psychological benefits reported due to sport activity include; improved self-esteem, decreased anxiety, depression, accident susceptibility and stress-related behaviour. All these point to improved ability to manage stress (Jerrold, 1999). Due to enhanced ability to handle stress, sports active students physiological responses were less than those of non sports active students. This explains why more minor ailments occurred in the non-sports active students group.

4.6 Skin Temperature Measures a Among the Non-sports Active and Sports Active Students

The results for the skin temperatures measures are represented in tables 4.11a and b.

Table 4.10a Skin temperature descriptives

		N	Mean	Std. Deviation
Pre-test	Non player	215	32.8540	1.19104
	Player	254	32.8732	1.26538
	Total	469	32.8644	1.23059
Post-test	Non player	215	33.3535	1.54244
	Player	254	33.1772	1.51804
	Total	469	33.2580	1.53017

Table 4.10b ANOVA Test

		Sum of Squares	df	Mean Square	F	Sig.
Pre-test	Between Groups	.043	1	.043	.029	.866
	Within Groups	708.672	467	1.517		
	Total	708.715	468			
Post-test	Between Groups	3.620	1	3.620	1.548	.214
	Within Groups	1092.162	467	2.339		
	Total	1095.783	468			

The mean for the pre-test skin temperatures for the non-sports active students was 32.85 ^{0}C $\pm$ SD 1.19 while those of the sports active students were 32.87 $\pm$ SD 1.27. These results were subjected to a one-way ANOVA which yielded F value of 0.029 and a significance of 0.866 (Table 4.10a and b). This was above the set value of $P<0.05$ meaning there were no significance differences in the skin temperatures for the two groups during the pre-test.

For the post-test, the mean skin temperatures for the sports active students was 33.35 $\pm$ SD 1.54, while those of the non-sports active students was 33.17 $\pm$ SD 1.51 (Table 4.10a and b). These were subjected to further analysis and yielded a significance of 0.214, which was higher than the set value of $P<0.05$. This means that the null hypothesis which stated that there is no significant difference in skin temperatures between sports

active students and non-sports active students in their Form Three second term and just before they sat for their mock examinations is accepted.

During stress, blood is diverted to the brain and heavy muscles. This process involves vasoconstricting blood vessels to the periphery of the body (Tanaka and Ide, 2008). This lowers the skin temperature which make the palms cold and dammy (Kosslyn, 2004).

Couture and Boeksrick (1998) found that after exercise, there is a rise in peripheral skin temperatures and that there was a correlation between warm peripheral temperature and low manifestations of stress. The study showed there was no significant difference in skin temperatures between the sports active students and the non-sports active students. This seems to be a contradiction having recorded higher levels of stress among the non-sports active students. The sports active students would have been expected to record significantly higher skin temperatures than the non-sports active students. Several factors could have contributed to this lack of significant differences. The temperatures were recorded between May and July which are the coldest months in the year. Environmental temperatures would have played a role in lowering the palmar skin temperatures.

Most studies measure skin temperatures immediately after exercise and therefore capture the process of relaxation. The study sought to measure the long-term effects of exercise. Lack of significant differences could be attributed to lack of persistence and vigour in the exercise to produce measurable long-term effects.

4.7 Resting Heart Rates among the Non-sports Active and the Sports Active Students

A comparison was made to establish whether there were any differences in resting heart rates of non-sports active students and sports active students. The results are presented below in table 4.11a and b:

Table 4.11a Resting heart rates descriptive

		N	Mean	Std. Deviation
Pre-test	Non player	215	75.0605	13.55746
	Player	254	73.6063	13.68168
	Total	469	74.2729	13.62965
Post-test	Non player	215	72.7721	16.01078
	Player	254	73.7874	11.98426
	Total	469	73.3220	13.96840

Table 4.11b ANOVA Test

		Sum of Squares	Df	Mean Square	F	Sig.
Pre-test	Between Groups	246.222	1	246.222	1.326	.250
	Within Groups	86692.844	467	185.638		
	Total	86939.066	468			

Post test	Between Groups	120.032	1	120.032	.615	.433
	Within Groups	91194.352	467	195.277		
	Total	91314.384	468			

During the pre-test, the non-sports active students had a mean resting heart rate of 75.06 beats per minute $\pm$ SD 13.56. The sports active students had a mean of 73.61 $\pm$ SD 13.68. Subjection to a one-way ANOVA produced a F value of 1.326 with a significance of 0.250 which was not significant (Table 4.11a and b). The heart rates of the non-sports active students were not significantly different from those of the sports active students.

For the post-test, the non-sports active students had a mean of 72.77 $\pm$ SD 16.01 while the sports active students had a mean of 73.79 $\pm$ SD 11.98. On analysis through a one-way ANOVA, the results produced an F value of 0.62 with a significance of 0.433, which was above the set value of $P<0.05$ and therefore not significant (Table 4.11a and b). This means that there were no significant differences in the resting heart rates between the non-sports active students and the sports active students during the post-test. Therefore the null hypothesis which stated that there is no significant differences in resting heart rates of the non-sports active students and the sports active students during their Form Three second term and just before they sat for their mock examinations is accepted.

Though there were slight differences in the resting heart rates between the two groups in both the pre- and post-test, these did not translate into any significant differences. This implies that the participants' levels of activity did not achieve the physiological change of reduced heart rates. Research in the area shows that through participation in physical exercise, there is an increase in efficiency of the heart. This translates into lower resting heart rates for the sports active students as opposed to non-sports active students (Jin, 1981; Hooker, 1995); Couture and Bocksnicks, 1998; and Mola *et al.* 2001). All these studies measured the resting heart rates after exercise. They also imply that reduced heart rate can only be achieved through regular exercise. The researcher measured the heart rate of the students before they engaged in sports activity to assess the long-term effects of participation. The lack of significance between the two groups can be attributed to the level of participation not being vigorous enough to leave long-term effects.

4.8 Blood Pressure Among the Non-Sports Active and the Sports Active Students

The results of the systolic and diastolic blood pressure for the pre- and post-test for both sports active students and non-sport active students are presented in Table 4.13a and b:

Table 4.12a Blood pressure descriptive

		N	Mean	Std. Deviation
Systol pre-test	Non players	215	119.9488	17.01682
	Players	254	121.2835	18.83710
	Total	469	120.6716	18.01883
Dystol pre-test	Non players	215	78.7163	14.92281
	Players	254	78.9567	15.72749
	Total	469	78.8465	15.34802
Systol post-test	Non players	215	121.8698	16.01406
	Players	254	121.3543	18.98701
	Total	469	121.5906	17.66977
Dystol post-test	Non players	215	78.9209	15.74500
	Players	254	78.9921	16.12329
	Total	469	78.9595	15.93404

Table 4.12b ANOVA Test

		Sum of Squares	df	Mean Square	F	Sig.
Systol pre-test	Between Groups	207.405	1	207.405	.638	.425
	Within Groups	151742.028	467	324.929		
	Total	151949.433	468			
Dystol pre-test	Between Groups	6.730	1	6.730	.029	.866
	Within Groups	110236.217	467	236.052		
	Total	110242.947	468			
Systol post-test	Between Groups	30.935	1	30.935	.099	.753
	Within Groups	146088.464	467	312.823		
	Total	146119.399	468			
Dystol post-test	Between Groups	.590	1	.590	.002	.962
	Within Groups	118821.640	467	254.436		
	Total	118822.230	468			

The non-sports active students had a mean systolic blood pressure of 119.5 $\pm$ SD 17.02 while the sports active students had a mean of 121.28 $\pm$ SD 18.84. Diastolic blood pressure for the non-sports active students produced a mean of 78.72 $\pm$ SD 14.92, while that of sports active students resulted in a mean of 78.95 $\pm$ SD 15.73 (Table 4.12a).

For the post-test systolic blood pressures for the non-sports active students the mean was 121.87 $\pm$ SD 16.01, while the sports active students of sports active students had a mean of 121.35 $\pm$ SD 18.99. For the post-test the mean diastolic blood pressure for non-sports active students was 78.92 with a standard deviation of 15.75, while that of sports active students was 78.99 $\pm$ SD 16.12 (Table 4.12a). These results were subjected to a one-way ANOVA. The pre-test systolic blood pressure produced an F value of 0.638 and a significance of 0.425. This was above the set value of $P<0.05$ and therefore non significant. The F value for pre-test diastolic blood pressure was 0.029 with a significance of 0.866 which was above the set value of $P<0.05$ and was therefore not significant. Post-test systolic blood pressure F value was 0.099 with a significance of 0.753, which was above the set significance of $P<0.05$ and therefore not significant. Post-test diastolic blood pressure produced an F-value of 0.002 and a significance of 0.962, which was above $P<0.05$ and therefore, not significant (Table 4.12b). This means that the null hypothesis which stated that there are no significant differences between resting blood pressure of non-participants and participants in their Form Three second term and just before they sat for their mock examinations is accepted.

Systolic blood pressure is the measure of the contraction of the heart while diastolic blood pressure is measured during relaxation. Hamer *et al.*,

(2006) reported a significant drop in resting blood pressure after exposing students to exercise and comparing them with the control group. Levitt and Derrick (1991) evaluated stress parameters among emergency personnel in a hospital. They reported elevated systolic and diastolic blood pressure. Everson *et al.* (2001), in their study of elderly Finish citizens found that elevated systolic blood pressure after exercise was a predictor to the occurrence of a stroke. Though studies have reported the changes in blood pressure due to exercise, none of them looks at the significance of each of the parameters (Everson *et al.*, 2001). Regular exercise reduces the need for a strong contraction due to improved cardiovascular efficiency. Lack of significance between non-participants and participants can be attributed to the level of sports activity not being intense enough to produce the desired long-term changes.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study, conclusions and recommendations.

5.2 Summary of the Findings

The purpose of the study was to investigate the effect of sports participation on examination related stress. Seventeen national schools were used in the study, two for the pilot study, and fifteen for the main study. Of these eight were boys, seven girls' schools and two mixed schools. Two stratified samples were obtained for the study one being made up of sports active students and the other non-sports active students. These groups were compared using measures of perceived stress and physiological parameters. To guide this study some objectives and hypothesis were formulated. The hypotheses for the study were:-

HO_1 There was no significant difference in perceived stress levels of all students during their Form Three second term and just before they sat for their mock examinations in Form Four.

HO_2 There was no significant difference in perceived stress levels between students who were active students in sports and those who

were not active students in sports in their Form Three second term and just before they sat for their mock examinations in Form Four:-

i. Between boys who were active students in sports and those who were not,

ii. Between girls who were active students in sports and those who were not,

iii. Between boys who were active students in sports and girls who were active students in sports,

iv. Between boys who were not active students in sports and girls who were not active students in sports,

v. Between all students who were active students in sports and all students who were not active students in sports.

vi. There was no significant difference in perceived stress levels between all female students and all male students in their Form Three second term and jut before they sat for their mock examinations in Form Four.

$H0_3$ There was no significant difference in academic performance between students who were active students in sports and those who were not during their Form Three second term and just before they sat for their mock examinations in Form Four.

HO_4 There was no significant difference in the occurrence of minor ailments between students who were active students in sports and those who were not in the period between Form Three second term and just before they sat for their mock examinations.

HO_5 There was no significant difference in skin temperatures between students who were active students in sports and those who were not during their Form Three-second term and just before they sat for mock examinations in Form Four.

HO_6 There was no significant difference in the resting heart rates of students who were active students in sports competition and those who were not during their Form Three second term and just before mock examinations in Form Four.

HO_7 There was no significant difference in blood pressure measurements between students who were active in sports and those who were not in their Form Three second term and just before they sat for mock examinations in Form Four.

The following is the summary of the findings of the study:

a) There was no significant difference in the perceived stress levels of all students in Form Three second term and just before they sat for their mock examinations in Form Four.

b) The following were the findings of comparison between and within groups

(i) There was a significant difference in the perceived stress levels of boys who were active in sports and those who were not between Form Three second term and just before they sat for their mock examinations in Form Four.

(ii) There was no significant difference in the perceived stress levels of girls who were active in sports and those who were not in their Form Three second term and just before they sat for their mock examinations in Form Four.

(iii) There was a significant difference in perceived stress levels between boys and girls who were active in sports in their Form Three second term and just before they sat for their mock examinations in Form Four.

(iv) There was significant difference in perceived stress levels between boys and girls who were not active in sports in their Form Three second term and just before they sat for their mock examinations in Form Four.

(v) There was a significant difference in perceived stress levels between all students active in sports and those not active in sports in their Form Three second term and just before they sat for their mock examinations in Form Four.

(vi) There was a significant difference in perceived stress between all boy students and all girl students in their Form Three second term and just before they sat for mock examinations in Form Four.

c) There was a significant difference in academic performance between students active in sports and those not active in sports in their Form Three-second term and just before mock examinations in Form Four.

d) There was a significant difference in the occurrence of minor ailments between students active in sports and those not active in sports in the period between second term Form Three and just before they sat for mock examinations in Form Four.

e) There was no significant difference in skin temperatures between students active in sports and those not active in sports in their Form Three second term and just before mock examinations in Form Four.

f) There was no significant difference in resting heart rates between students active in sports and those not active in sports in their Form Three second term and just before mock examinations in Form Four.

g) There was no significant difference in blood pressure parameters between students active in sports and those not active in sports in their Form Three second term and just before mock examinations in Form Four.

5.3 Conclusions

Based on the findings of the study the following conclusions were made:

1. There was no significant increase in perceived stress among all students as the mock examinations approached. Final examinations are viewed with the same amount of threat from Form Three carrying on to Form Four.
2. Boys active in sports perceived the approaching examinations as being less stressful than boys not active in sports.
3. Girls active in sports and girls not active in sports perceived the approaching mock examinations with the same amount of stress.
4. Boys active in sports perceived the approaching examinations as being less stressful than girls active in sports.
5. Boys not active in sports perceived the approaching examinations as being less stressful than girls not active in sports.
6. All sports active students perceived the approaching examinations with less stress than all non-sports active students.
7. Perceived examination stress manifested itself more among the female students than the male.
8. Non-sports active students performed better academically than participants.
9. Occurrence of minor ailments was significantly higher among the students active in sports than students not active in sports.

10. Changes in stress levels did not manifest themselves in skin temperature measures for all the students.
11. Effects of participation in sports did not manifest itself in heart rate measurements.
12. Blood pressure parameters for both sports active students and non-sports active students remained similar as the examinations approached.

5.4 Recommendations

From the findings of the study, the following recommendations have been made for policy formulation and future research.

5.4.1 Policy and Practice

1 There is need to sensitize administrators, teachers and students on the therapeutic nature of exercise and sports participation

2 Emphasis should be placed on physically vigorous activities performed over a prescribed amount of time several times a week.

3 Efforts should be made in girls' school to delink masculinity from participation.

4 There is need to provide more facilities to encourage mass participation.

5 The Kenya Institute of Education needs to review the curriculum to include sports that many students can participate in at any given time.

6 The Ministry of Education should develop policies to encourage mass participation in sports and the provision of facilities.

5.4.2 Recommendations for Further Research

1 Research should be conducted to establish the perceived psychological stress levels before, during and after mock examinations.

2 Research should be done using experimental design to determine the impact of exercise and sports on stress hormones concentrations in blood and urine during examinations.

3 Studies should be conducted on the impact of stress on academic performance.

4 Longitudinal studies should be conducted to establish the levels of sports participation from form one to Form Four.

5 Research should be done to determine the cause for low numbers of participants in girls' schools and possible causes for dropouts.

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APPENDIX A

A LIST OF THE NATIONAL SCHOOLS USED

SCHOOL NAME	TYPE OF SCHOOL
Alliance High School	Boys Boarding
Alliance Girl's High School	Girls Boarding
Mangu High School	Boys Boarding
Limuru Girls High School	Girls Boarding
Loreto High School- Limuru	Girls Boarding
Mary Hill School- Thika	Girls Boarding
Lenana School	Boys Boarding
Nairobi School	Boys Boarding
Kenya High School	Girls Boarding
Starehe Boys Centre and School	Boys Boarding
Moi Forces Academy	Boys Boarding
Moi Girls High School- Eldoret	Girls Boarding
Nakuru High School	Mixed Boarding
Moi High School- Kabarak	Mixed Boarding
Moi Forces Academy – Lanet	Girls Boarding
Utumishi Academy- Nakuru	Boys Boarding
Maseno National School	Boys Boarding

APPENDIX B

Research Permit

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

Telegrams: "EDUCATION", Nairobi
Telephone: Nairobi 334411
When replying please quote
Ref. No. MOEST 13/001/33C318/2
and date

JOGOO HOUSE "B"
HARAMBEE AVENUE
P.O. Box 30040-00100
NAIROBI

31st October, 2003

Robert Kang'ethe Muniu
Kenyatta University
P.O. Box 43844
NAIROBI

Dear Sir

RE: RESEARCH AUTHORIZATION

Please refer to your application for authority to conduct research on: "The Effects of Sports Participation on Examination Related Stress Among Kenyan Secondary Schools Students", I am pleased to inform you that you have been authorised to conduct research in National Secondary Schools in Kenya for a duration of two years ending 30th June, 2005.

You are advised to report to the District Commissioners and the District Education Officers of the areas of your research before commencing study.

It is noted that the research is a requirement in Partial Fulfilment for the award of Ph.D by Kenyatta University.

You are further expected to deposit two copies of your research report to this office upon completion of your research project.

Yours faithfully

T. MOTURI
FOR: PERMANENT SECRETARY

C.C.

All the District Education Officers
All the District Commissioners

APPENDIX C
Request for permission to conduct Research

Robert K. Muniu
Department of Physical and
Health Education
Kenyatta University
P.O. Box 43844
Nairobi

September 20 2004

The Principal

Dear Sir,

RE: REQUEST TO CONDUCT RESEARCH IN YOUR SCHOOL

Currently I am conducting a research for my Ph.D thesis at Kenyatta University. The study is titled "The Effects of Sports Participation on Examination Related Stress Among Kenyan Secondary School Students". This will involve forms three and four students. I would like to request the assistance of your games master in identifying the students and administering the tests. The later are simple and do not require a lot of time.

I will visit your school in February to further acquaint you with the study. Attached is an abstract and a copy of the Research Authorization.

Please accept my humble request for assistance in this endeavour.

Robert K. Muniu
Lecturer
Physical and Health Education Department

APPENDIX D
Request for students cooperation

23rd February 2004

Robert K. Muniu
Department of Physical and
Health Education
Kenyatta University

Dear Student,

RE: **REQUEST FOR COOPERATION**

I would like to request for your cooperation in this study. The purpose is to help educators understand the pressures you undergo as you await your final examination.

The extent of which may determine your success or failure. This will involve comparison of responses from third andfourth formers. By participating you will help us understand the problem better and enable us come up with new ways to deal with examination stress.

The study is being conducted in all National School and individual responses will be completely anonymous.

Your honesty and candidness will be your greatest contribution.

Yours sincerely,

Robert K. Muniu

DEPT. OF PHYSICAL and HEALTH EDUCATION

APPENDIX E
PARTICIPANTS

MATHS SCORES
School No:
Form 3 – Form 4

ENGLISH SCORES

Form 3 – Form 4

Candidate No.	2nd	3rd	1st	Mock		2nd	3rd	1st	2nd
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									
11.									
12.									
13.									
14.									
15.									
Non-Participants									
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									
11.									
12.									
13.									
14.									
15.									

APPENDIX F

School No. .....

Frequency of visit to the school nurse

PARTICIPANTS

Form 3			**Form 4**	
2nd Term	3rd Term		1st Term	2nd Term
Non Participants				
2nd Term	3rd Term		1st Term	2nd Term

APPENDIX G

QUESTIONNAIRE TO BE USED IN RATE STUDENTS STRESS BY SELF-ASSESSMENT

Questionnaire: Read the questions and circle the statement you most agree With (a) Strongly Agree (b) Agree (c) Undecided (d) Disagree (e) Strongly disagree

1. Things must be prefect	A B C D E
2. I must do it myself	A B C D E
3. I feel isolated from my family and friends	A B C D E
4. I feel people should listen better	A B C D E
5. My life is running me	A B C D E
6. I must not fail	A B C D E
7. I cannot say no to participation in new activity without feeling guilty	A B C D E
8. I need to generate excitement constantly to avoid boredom	A B C D E
9. I feel lack of intimacy with people around me	A B C D E
10. I am unable to relax	A B C D E
11. I am unable to laugh at a joke about myself	A B C D E
12. I avoid speaking my mind	A B C D E
13. I feel under pressure to succeed all the time	A B C D E
14. I automatically express negative attitudes	A B C D E
15. I feel less confident after revising	A B C D E
16. I am sometimes forgetful and at times misplace my things	A B C D E
17. I am irritable and disappointed with people with around me	A B C D E
18. Spending time with friends seems more trouble that it is worth	A B C D E
19. I consider myself overworked	A B C D E
20. I wake up earlier and cannot sleep	A B C D E
21. I feel unrested	A B C D E
22. I feel dissatisfied with my personal life	A B C D E
23. I am unhappy with school life	A B C D E
24. I avoid being alone	A B C D E

25. I feel dissatisfied with my studies A B C D E
26. I have trouble getting sleep A B C D E
27. I have trouble getting up A B C D E
28. I cannot seem to get out of bed A B C D E
29. I find myself revising the same page over and over before moving to the next A B C D E
30. I find myself sometimes unable to speak when asked a question by the teacher A B C D E
31. I am always on the verge of tears whenever confronted with a difficult situation A B C D E
32. I cannot give reasons for some of the things I do A B C D E
33. I often find myself grinding my teeth A B C D E
34. I tend to hurt myself whenever I try to do some practical work A B C D E
35. Usually get hungry long before lunch time A B C D E
36. I sometimes find myself eating very little in the dinning hall A B C D E
37. I am easily statled by sudden noises or movements A B C D E
38. I find myself laughing in a situation where others do not see the joke A B C D E
39. I sometimes find myself sweating even thought it is not hot A B C D E
40. I often feel my heart is beating too fast A B C D E
41. I am sometimes temporarily unable to write due to trembling while taking a test A B C D E
42. I sometimes suffer temporary numbness at the beginning of a test A B C D E
43. I often feel thirsty not long after drinking water A B C D E
44. I often feel tired by break time A B C D E
45. I find myself asking for permission to go to the urinal often A B C D E
46. I avoid eating due to frequent stomach upsets A B C D E
47. I am constantly disturbed by a headache A B C D E
48. I often develop a mild pain in the neck after a day in class A B C D E
49. I often develop a mild pain in the lower back after a day in class A B C D E
50. I often develop colds and coughs A B C D E

APPENDIX H

PHYSIOLOGICAL MEASURES

I Procedures for obtaining blood pressure

(a) Students to be seated in a relaxed position while circumference of his upper arm is measured as per the table below:

Upper arm size	Type of cuff	Bladder size
33-47 cm	large adult	42 x 15
25- 35 cm	adult	24 x 12.5
18 – 26 cm	child	21.5 x 10

(b) Blood pressure cuff is secured around the upper arm and a stethoscope secured below the antecubital space of the brachial artery. Blood flow at this stage is not yet impeded and therefore the pulse cannot be heard through the stethoscope.

(c) Blood pressure cuff inflated to 110 mm Hg using the inflation tube. Blood flow at this stage is impended and therefore no sound can be heard through the stethoscope.

(d) Cuff pressure released slowly at the rate of 2 mm Hg per second using the release value. When the pressure falls just below the systolic blood pressure, blood flows through the artery and can be heard with each heart beat. This sounds are referred to as Korot Koff sounds, and are created by blood going through a partially compressed blood vessel. The pressure at which the first Korot Koff sound is heard represents the systolic blood pressure.

(e) Continue release of pressure and the Korot Koff sounds are heard more clearly. As the pressure continues to be released there is a muffling of the Korot Koff sounds which is taken to be the fourth

Korot Koff sound and it is called the first measure of diastolic blood pressure (DBP). The disappearance of the sounds represents the second diastolic blood pressure (DBP_2) and is taken to be the fifth Korot Koff sound. The fifth is taken to be the best measure among adults and the fourth the best for children (Adopted from Plowman and Smith, 1997).

Called the first measure of dystolic blood pressure (DBP). The disaperence of the sound represents the second diastolic pressure (DBP_2) and is taken to be the best measure among adults and the fourth the best for children (Plowmand smith, 1997).

II Skin conductivity is caused by sweating using a dermograph the galvaric skin response will be measured.

III The most common muscles used in measuring muscle tension using an electromyogram are the frontalis, masseter and trapezius (Davis et al, 1988).

The Researcher will use the trapezius for his measurements.

IV To measure skin temperature a feedback thermometer will be attached to the thumb of the students. Fluctuations in the temperature will be obtained from the feedback thermometer.

V To measure pulse rate a pulse rate meter tachometer will be used. This gives a digital reading on being strapped on the wrist.