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# **AEROBIC AND ANAEROBIC TYPES OF PHYSICAL EXERCISE: INDISPENSABLE INDICES TO HUMAN CARDIOVASCULAR FITNESS DEVELOPMENT**

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**By**

**A. K. Ototo**

*Delta State College of Physical Education,  
Mosogar.*

**Pat Edore**

*Delta State College of Physical Education,  
Mosogar.*

**And**

**Beatrice Itie**

*Delta State College of Physical Education,  
Mosogar.*

## **Abstract**

*This paper looks at the aerobic and anaerobic physical exercise as indispensable indices to human cardiovascular fitness development. The oxygen intake during and after exercise is dependent on the aerobic and anaerobic system vis-a-vis the intensity of the exercise. Two level of the Physical Activity Pyramid were sighted and some precautionary limits for exercise were highlighted. A talk on clarification of physical activity intensities for a person with good cardiovascular fitness was used to illustrate how physical activity can help in improving cardiovascular fitness in human being. Some measurement of laboratory tests cardiovascular fitness were highlighted while the benefits of both aerobic and anaerobic exercises were dwelt on. Recommendations were proffered.*

Health is also the ability to relate well with others and sleep well when the need arises. Everybody wants to be healthy, to carry on daily tasks with minimum strain or stress, relate well with others, and have enough exercise, rest and sleep.

Health according to Egeneg (2006) is a state of an individual's well-being that enables him to carry out his daily tasks with minimum strain or stress. When ones energy level begins to fall where one does not sleep deep enough, when one is easily excitable, then its time for him to devise way and means of bucking up. To build up physical and mental stamina, the surprising thing is not to get less active. The fact is the more it can do, within reasonable limits of course. It does not help much to all the healthy stuff and have a lazy disposition. The body is built to move. If your muscles likelihood does not allow you enough physical exertion, then what you have to do is to

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introduce an exercise regime to buck you up. The exercise factor is very crucial in the maintenance of good health and vitality. The best means of safeguarding the body from unnecessarily falling ill is to make it a point to stretch and strengthen all the muscles of the body and to practise deep rhythmic breathing to purify the blood and improve the vital organs (Health & Fitness, Sunday Vanguard March 11, 2012 Pp. 20).

Exercise, judiciously practiced, is not only enjoyable but a practical way to understanding your body better. If you have not exercised in a great long while, you can start-off with ten minutes programme and gradually increase the time to about half-hour. Success will come from regularity.

According to Robergs and Keteyian (2003), the term exercise can be used to denote activity that is performed for the purpose of improving, maintaining, or expressing a particular type of physical fitness.

Wilmore (2003) is of the view that, there are many ways in which physical exercise can be performed e.g. bowling, golf, calisthenics tennis, weight training, bicycling and jogging. There are just a few of many forms and all activities according to him, basically fall into one or a combination of several major categories: (a) flexibility or joint loosening; (b) strength and power; (c) speed and agility; (d) endurance; and relaxation. The types of exercises that are selected will depend to a large extent on the purpose of training.

In 1995 the American College of Sports Medicine, in conjunction with the Centres of Diseases Control and Prevention and the President's Council on Physical Fitness and Sports, issued recommendations on increased physical activity for Americans (Pate, Pratt & Blair, 1995). The recommendation stated that all children and adults should accumulate a minimum of 30minutes of moderate-intensive physical activity on most and preferably all days of the week. This position statement on exercise is one of the most powerful single events to have occurred in the last decade in the field of sports medicine and exercise physiology (Robergs & Keteyian, 2003).

The consensus statement indicate that portions of physical activity accumulated throughout the day results in health-related benefits, and individuals should strive to participate in activities that improve and maintain the key components of health-related fitness (Braer, 2003). During reset, the body is able to meet all of its energy needs. This is done by the aerobic system, which allows the body to produce energy by breaking down a food in the presence of oxygen.

To improve one's health and fitness, activities must challenge the body to work above its resting level on a regular basis. Moderate-intensive exercise that involve the larger muscle groups of the body are aerobic physical activities (Franklin, 2001). The human body must require the aerobic fitness in order to build up cardio vascular fitness. To proceed further into vigorous exercise that requires less oxygen to meet, the body

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must rely on short-term energy provided by the anaerobic metabolic system (Franklin, 2001).

The oxygen intake during and after exercises is dependent on the aerobic and anaerobic system vis-à-vis the intensity of the exercise. This paper then dwells on aerobic and anaerobic types of physical exercises, as indispensable indices to human cardiovascular development fitness.

### **The Physical Activity Pyramid**

The physical activity pyramid classifies activities by type as associated benefits. The pyramid evolved from a pyramid of activity emphasis development more than 20 years ago and from the food guide pyramid developed by the U.S. Department of Agriculture to help people understand appropriate serving of foods. The physical activity pyramid has four levels and each level includes one or two types of activity and characteristics the “portions” of physical activity necessary to produce different health, wellness, and fitness benefits (Ainsworth, 2003; and Corbin, Masurrier & Franks, 2002).

The two levels of the pyramid are based on the beneficial health outcomes associated with regular physical activities. Activities having broad general health and wellness benefits for the larger number of people are placed at the bases of the pyramid (Ainworth, 2003). Corbin, Masurrier and Franks, (2002), classified the four of pyramid as follows:

**Level 1; Lifestyle Physical Activity** These activities include walking to or from work, climbing the stairs rather than taking an elevator, working in the yard and doing other types of exercise as part of one’s normal daily activities. This type of exercise is necessary because activities lower in the pyramid often do not contribute to flexibility development. The muscle fitness category includes exercises that are planned specially to build strength and muscular endurance. This type of exercise is necessary because activities lower in the pyramid often do not contribute to these part of fitness.

**Level 2: Rest or Inactivity** Real or inactivity can be important to good health. Some time off just to relax is important to everybody, and of course, proper amounts of rest and 8 hours of uninterrupted sleep help us to recuperate. Sedentary living results in low fitness as well as poor health and wellness.

### **Precautionary Hints for Exercise**

Certain things must be kept in mind if exercise is to be beneficial, if the participant wishes to avoid strains and pains, if he desires not to harm his health, and if he wants his exercise to be thorough enjoyable (Jokl, 2000). There are principles that, if followed, will increase and improve the rate of learning and consequently, the participant’s level of achievement. A more efficient performance in turn leads to greater thrills and joys for the individual player or athlete.

Jokl (2000), Bracko (2002) and Manson(2002) started the following as precautionary hints for exercise thus:

**1. Regular Physical Check-up** The importance of periodic physical examination by a physician for every individual cannot be overemphasized. The necessity for this increase as one grows older; it is of fundamental importance for people who participate in physical exercise. Serious damage to one's health may easily result from the failure to find out first what activities one's body is capable of undertaking.

**2. Training Regimen** It is recommended that a regular training routine should be followed, and it is not advisable to go all out in any activity before one's body is in condition for it. Adults must train more slowly than younger people and one should be regular in exercise habits and prevent sore, stiffened muscles.

One advantage of being in good physical condition is that this condition will continue for two or three months after and in spite of a curtailment of exercise. After this time, however, continued inactivity will cause well-trained individuals to retrogress markedly. After adequate condition is achieved, it may be maintained with a smaller amount of training;

**3. Warm-up** Experts agree, however, that the workout should be preceded by a warm-up and followed by a cool-down (Wilmore, 2003). The warm up prepares the body for physical exercises. A proper warm-up decreases the risk of irregular heartbeats associated with poor coronary circulation. A proper warm-up can also improve performance, since it minimises the premature formation of lactic acid at the start of physical activity. Research suggests that 2 minutes of walking, jogging, or mild exercise is adequate for moderate activities, however, some experts recommend 5 minutes or more of moderate activity as a warm up for vigorous activity (Shepard, 2001);

**4. Cool-down** A cool-down after the workout is important to promote an effective recovery from physical exercises. The cool-down is done immediately after the workout and there are two principal components of a cool-down static muscle stretching as part of the cool down. This may be more effective for lengthening the muscles than stretching at other times because the muscle temperature is elevated and therefore, the stretching is more like to produce optimal flexibility improvement (Shepard, 2001 and Wilmore, 2003)

**5. Speed and Endurance** Speed is an attribute of youth and once speed is lost, it cannot be regained. The older an adult becomes, the less he should subject himself to activities in which speed or sudden starts and stops are fundamental factors in playing a game. It is important to remember that strength and endurance have to continually be maintained, and they cannot be acquired by piecemeal methods. If an older person has long neglected conditioning, he should begin training and gradually with mild exercise;

**6. Taping-Off** It permits one physiological mechanism to return to normal gradually. An abrupt change places a greater burden on human body causing discomfort immediately after violent exercise, it is advisable for participants to move about immediately rather than sit still. If a participant gradually tapes off after exercise, his breathing and heart rate will recover much more quickly and his temperature is equalized more rapidly. Acids and other waste products by exercising muscle cause capillaries to open wide, thus getting more blood to the needy muscles;

**7. Muscle Stiffness and Soreness** If one encounters slight muscular lameness, one should employ moderate exercise to recover rather than remain inactive. Moderate exercise helps the pumping action of the heart that is necessary to bring new blood to body parts.

**8. Diet** People who participate in sports require more food than sedentary individuals. Activity requires energy, and food is the source of energy. The essence of balance diet is very important to physically exercised bodies. One who intend to engage in a recreational sports should be well fed, and should eat light meal or wait a while before eating heavy meal after vigorous exercise. When exhausted, participants can get a quick lift from a small amount of food like a candy bar on a soft drink. This is because sugar is quickly digested and reaches the blood stream in a comparatively short time.

**9. Clothing** Cleanliness is the first rule in regard to clothing worn in playing sports. This is important not only for the purpose of minimising skin infections but also for aesthetic value. Comfortable dressing that are not too light are recommended and care should be given for proper fitting shoes and socks. Wool or part-wool socks are better than cotton ones and two pairs are better than one, for they help prevent blisters on the soles and heels of the feet. The texture of the clothing should be considered in relation to climate weather.

**10. Rest** Adequate rest is necessary for health. The average individual requires eight or nine hours of sleep each night. A growing boy or girl needs more than a mature man or woman, and exhausting exercise or work necessitate additional rest.

**11. Injuries** Too much care or caution cannot be used when dealing with injuries received in exercise. Even the slightest cut or scratch, if neglected may lead to serious complications. Prompt and immediate first aid should be administered for all injuries, however slight they may be. After first aid, the safe procedure is to consult a physician.

**12. Smoking is Harmful** Smoking stands condemned for those who are concerned for their health and physical fitness. It has loon been recognised that smoking is detrimental athletics performance, especially for those sports that requires endurance and has therefore been forbidden by most coaches (Elder, 2001 and Baer, 2003).

**13. Safety** Every interest in sports is vitally concerned with making the playing of a game as safe as possible. The equipment, rules, and courtesies are all designed to protect the players as much as is humanly possible. The ultimate responsibility for the participants' safety, however, rest in large measure on the player themselves. A participant should keep in mind not only his own welfare, but that of the other players as well. Each sports has its own safety code.

### **Aerobic Types of Exercise**

Aerobic means in the present of oxygen. Aerobic exercise are activities for which the body is able to supply adequate oxygen to sustain performance for long period of time (Franklin, 2001).

Moderate – intensive physical activities that involves the large muscle groups of the body are aerobic physical activities, which are often referred to lifestyle activities (Corbin, Welk, Corbin & Welk, 2004). Some light-to moderate intensive

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sports can be classified as lifestyle physical activities. Golf, shuffle board, table tennis, bowling and recreational activities are examples (Franklin, 2001).

Scientists have devised a method to classify level of activity by intensity. With this system, all activities are compared against the amount of activity needed at rest. The amount of energy expended at rest (oxygen used) is referred to as one metabolic equivalent (MET). Activities listed as 2 METs require twice the energy of rest and activities listed as 4 METs require four times the energy required for rest (American College of Sports Medicine, (ACSM), 2000). For a person with good cardiovascular fitness, moderate intensity activities typically require 4.7 -7.0 METs. Fit people can perform moderate activity aerobically. This means that the aerobic system can meet the energy demands for this activity and the activity can be performed for relatively long periods of time (ACSM, 2000).

**Table 1: Classification of Physical Activity Intensities for a Person with Good Cardiovascular Fitness.**

<b>Classification</b>	<b>Description</b>	<b>Examples</b>
<b>Maximum</b>	Activities more than 12times as intense as result (12+METs)	Running (10mph, 6min, mile)
<b>Very Hard</b>	Activities more than 10 intense and up to 12 times as intense as rest (10 to 12 METs)	Running (8.5mph, 7min, mile), hand-ball, full-court competitive basket-ball
<b>Hard</b>	Activities more than 7 and up to times as intense as rest (7 to 10 METs)	Digging, level jogging (5mph, 12 min, mile), cycling (13mph), Skiing fencing.
<b>Moderate</b>	Activity about 4 <sup>2</sup> / <sub>3</sub> to 7 times as intense as rest (4.7 to 7 METs)	Brisk walking, lawn, mowing, shovelling, social dancing.
<b>Light</b>	Activity that is 2 <sup>1</sup> / <sub>2</sub> to 4 <sup>2</sup> / <sub>3</sub> times as intense as rest (2.5 to 4.7 METs)	Normal walking downstairs, bowling, mopping
<b>Very Light</b>	Activity that is about 2 to 2 <sup>1</sup> / <sub>2</sub> times as intense as lying or sitting at rest	Washing your face, dressing yourself, typing, driving a car (2 to 2.5 METs)

**Source:** American College of Sports Medicine (2000)

Activity classification varies, depending on one’s level of fitness. Normal walking is considered light activity for a person with good fitness, but for a person with low to marginal fitness the same activity is considered moderate (ACSM, 2000). Beginners with low fitness should start with normal rather than brisk walking, and

physical activities considered very light to light for young fit people are equal to moderate activity for many people eighty and over. For many people over sixty-five activities typically classified as light are equal to moderate activities (ACSM, 2000).

### **Cardiorespiratory Test**

Traditionally, the test used to measure cardiorespiratory has been that of the maximal rate of oxygen consumption ( $\text{VO}_2 \text{ max}$ ) (Robergs & Keteyian, 2003).  $\text{VO}_2 \text{ max}$  is the rate of oxygen consumption for a given individual. However, research evidence indicates that  $\text{VO}_2 \text{ max}$  alone may not be an accurate assessment of the cardiorespiratory demands of submaximal exercise (Londere, 1986, Coyle, Coggan, Hopper & Walters, 1988; Robergs Costill, Fink & Pascoe, 1990,).

Direct measurement of  $\text{VO}_2$  requires the measurement of expired gas fractions and ventilation during exercise. A variety of gas-analysing system have been developed over the years, ranging from expired gas collection in Douglas bags with the chemical analyses of expired air for oxygen and carbon(IV)oxide content to today's sophisticated computer-driven equipment with electronic analysers that compute data for each breath (Astorino, Robergs, Ghiasvand, Marks, & Burns, 2000).

### **Measurement of Laboratory Test**

- (i) **Treadmill Protocols**  $\text{VO}_2 \text{ max}$  can be predicted from sub maximal exercise duration. It can be estimated by equations that use the heart rate to exercise at different submaximal intensities accompanied by the ACSM equation for steady-state  $\text{VO}_2$  (Roberg & Keteyian, 2003).
- (ii) **Cycle Ergometer Protocols** Bicycle ergometer tests are commonly used to measure and predict oxygen uptake. One of the most common submaximal cycle ergometer protocols used to predict  $\text{VO}_2 \text{ max}$  was developed by the YMCA (Golding, Meyers, & Shining, 1989)
- (iii) **Lactate and Ventilatory Thresholds** Lactate Threshold (LT) is the term used to denote the intensity of exercise when there is an abrupt increase in lactate accumulation in blood or muscle. The best measure of success in running events longer than 1, 500m for running and also in long-distance road cycling is the pace or  $\text{VO}_2$  at the lactate threshold (LT). The intensity at LT reflects an individual's maximal steady – state intensity. Research has continually revealed very high correlation ( $>0.9$ ) between the pace at the LT and some expression of race performance (time, average, pace etc.) (Londere, 1986; Sjodin & Svedenhag, 1985. Tanaka & Matsuura, 1984)

### **Field Tests**

- (i) **Coopers 1.5 mi Run** The 1.5mi test originally developed by Kenneth Cooper, is a popular test used to protect cardiovascular fitness. This test is conducted on a four hundred meter track. After subjects have warmed up, they walk, jog or run as fast as they can 6 times around the track. Oxygen uptake is predicted by a formular.

(ii) **Rockport Walk Test** The Rockport walk test is an excellent test to predict cardiovascular fitness, especially for sedentary individuals. Individuals are instructed to “walk” as fast as they can for 1-mi and then record their heart rate at the end of the walk.  $\text{VO}_2\text{max}$  is predicted by using a multiple regression equation developed by Kline and colleagues (Robergs & Keteyian, 2003).

(iii) **Step Tests** The 3-min step test predicts oxygen uptake from the recovery heart rate following 3 min of stepping. The test is conducted on a bench 161<sup>1/4</sup> in height. A metronome should be set to 88 counts on 22 steps/min for women, and 96 counts or 24 steps/min for men. At the signal to start, subjects step to a four-step cadence (up-up-down-down). At the end of 3 min, the subject remains standing and a 15-s pulse rate is recorded between 5 to 20s into recovery (Robergs & Keteyian, 2003).

### **Anaerobic Types of Exercise**

Anaerobic means in the absence of oxygen. Anaerobic exercises are performed at an intensity so great that the body’s demand for oxygen exceeds its ability to supply it (Franklin, 2009). Anaerobic physical activities are so vigorous that your body cannot supply adequate oxygen to meet the energy demand using the aerobic system. The body must rely on short-term energy provided by the anaerobic metabolic system.

### **Aerobic and Anaerobic Exercises on Human Cardiovascular Fitness Development**

The following constitute the benefits of aerobic and anaerobic exercises on human development.

1. **Physiological Values** One common benefit of exercise is improved efficiency in the functioning of the vital organs and the muscular system. The physically trained person will in his every pursuits, expend proportionately less energy and put less strain on his body than the sedentary or physically untrained individual (Smith, 2001). Another general effect of exercises is the growth development of different body parts.

(i) **Improved Circulation** Exercise promotes better circulation throughout the entire body. This results in part from the fact that the heart pumps out a greater volume of blood with fewer strokes per minutes. Exercise promotes improved circulation by aiding the “peripheral heart” action. This means that the movement of muscles and body assist in returning the blood to the heart. Improved circulation assures improvement in the heat regulation mechanism of the body (Smith, 2001, Johnson, 2000). Exercise warms the body when it is cold, while on hot days, mild exercise has a cooling effect on the body (Smith, 2001).

Exercise not only speeds up circulation but also assures the different body muscles of their share of the blood supply. It also accelerates blood to the legs and arms and increases evaporation, which cools the body (Johnson, 2000).

(ii) **Improved Respiration** During exercise, the rate of respiration increases. The trained person will have a slower and deeper respiration than the one who is out of condition, and will meet the demands placed on his respiratory system with less effort and more efficiency (Troiano, 2002).



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- (iii) **Improved Digestion** Exercise aids digestion in two ways; (i) it increases the appetite because of the consequent increases demand or need for food by the body, and (ii) the movement of the digestive organs speeds up the peristaltic action that moves the digested food along more rapidly and easily (Stevenson, & Dudley, 2001).
- (iv) **Improved Elimination** Elimination is greatly aided and constipation is prevented by exercise. The peristaltic action increase, and therefore the processes of excretion are more efficiently regulated. Physically active persons are much less apt to be afflicted with kidney stones and similar ailments than sedentary people. Many waste products are removed through the sweat glands in the skin (Wilmore, 2003).
- (v) **Improved Musculature** With regular exercise the muscle becomes stronger and the general muscle tone of the body is improved through exercise. The special value of callisthenic and body conditioning exercise lies in the fact that especially weak muscle groups can be singled out for developmental attention. Posture can be improved by developing the elastic muscles of the back (Bracko, 2002). Strong abdominal muscles assist in preventing a flabby, sagging abdomen, and also prevent the pooling of blood in the lower abdomen, thus reducing faintness or vertigo (Bracko, 2002).
- (vi) **Increase Red Blood Cell Production** The red blood cell in the bone marrow is increased with exercise. The haemoglobin count of the blood also is raised through exercise. Exercise can help in keeping blood pressure from becoming too high (Wilmore, 2003).

(2) **Physical Fitness Values** Regular exercise improves and maintains the general all-round fitness of the individual Physical fitness is associated with an individual ability to work effectively, enjoy leisure time, be healthy, resist hypokinetic disease, and meet emergency situations. Regular exercise will assist in maintaining and improving both the health and skill-related components of physical fitness (Armbrusher & Gladwin, 2001).

Regular aerobic and anaerobic exercise also improves metabolic fitness. Metabolic fitness is a state of being associated with lower risk for many chronic health problems, but not necessarily associated with high performance levels of health-related physical fitness. Examples of non-performance indicators of reduced risk are lowered blood pressure, lowered fat levels in the blood, and better regulation of blood sugar (U.S department of Health and Human Services, 2000).

**3. Longevity** Americans today live more than three times as long as the citizens of Rome did during Julius Caesar's time, and twice as long as Americans did during the Revolutionary war. The total length of life is greatest among industrial nations (Johnson, 2002).

Research findings show that regular and standard exercise had greatly improved the lives of people who get themselves involved in it, and this is due to the modified physiological and fitness attributes as a result of regular exercise (Ainsworth, 2003).

**4. Psychological Values** Exercise is relaxing to the mind. It improves the mental tone of an individual and also assist in maintaining mental health. An interesting game takes the mind off oneself and concentrate at on outward interest. For this reason a healthful game or hobby is more valuable than walking. Exercising also permits release of part-up emotions through social approved channels (Hickman, 1993). Exercise provides for self-expression and it is a means by satisfying primitive wages and obtaining the joys and satisfaction that comes from a successful completed task (Hickman, 1993).

**5. Sociological Values** Man is strongly motivated by the social instinct of gregariousness. He desires to be with and mingle with his fellow men. This instinct or desire may be satisfied through sports. In sports, other social values such as team work, loyalty, and sportsmanship may also be achieved. The congenial atmosphere of sports offer opportunity to develop fellowship and friendship. Sports have core creational values also (Jokl, 1993, Karpovich & Shinning, 1992).

### **Conclusion**

Exercises are physical activities performed for the purpose of improving, maintaining or expressing a particular type of physical fitness. The physical activity pyramid classified activities by type a s associated benefits and range from level 1 to 2. Hints and precautions to exercise were highlighted, ranging from regular physical check-up and safety. Aerobic and anaerobic types of exercises were categories according to classification of physical activity intensities for persons with good cardiovascular fitness. Aerobic and anaerobic exercise on human development looked at the physiological, physical fitness values, longevity, psychological values as well as the sociological values.

Aerobic and anaerobic exercises differ in capacity but in combination, form the basis for exercise at its peak. Based on their importance on human development in terms of all-round, physical, mental and emotional well-being, it is therefore surprising to observe that well-informed individuals are cultivating the habit of indulging in regular physical exercises. Fitness centers are being established in relation to demand for its services by clients who wish to stay fit.

### **Recommendations**

The following recommendations were made for the study

1. Physical exercise should be done by everybody for good health and wellness purpose.
2. Individuals who wish to indulge in physical exercise must undergo medical check-up.
3. Physical exercise must be approached from simple to complex basis.
4. The services of qualified sports practitioners or exercise physiologists should be sought for prescription of adequate does of exercise in relation to sex, age, and health of interested individuals.
5. Adequate nutritional pattern is also important for fitness purpose in addition to physical exercise.

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6. Physical fitness course should be embedded in the tertiary curriculum and be made compulsory course for all students of the College.

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