

The Development of the Physiology-Based Aerobic Exercise Model

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Abstract—The purpose of this research and development is to produce an aerobic exercise training model for students of the Faculty of Sports Sciences (FIK) of Universitas Negeri Makassar (UNM), primarily for students in the Field Teaching Program (PPL) who must have skills in the field of sports. This is considered necessary as they can deal with students and teachers in field teaching practice schools. It will be difficult if students do not have skills in the field of sports, i.e., gymnastics. Therefore, gymnastic skills are very necessary for the provision of PPL. This is related to the programs carried out by schools every Friday for a joint exercise. During joint gymnastics, PPL students from FIK must lead joint gymnastics. Ideally, PPL FIK students must be able to lead joint gymnastics, both for package gymnastics (for example Physical Health Gymnastics and Healthy Heart Gymnastics) and aerobic exercise in accordance with the rules of sports physiology. This research is the R & D model, which aims to assist the students by seeing a great interest of each school to do aerobic exercise together every Friday. The results of the development of this research are the creation of several types of movements that are in accordance with the characteristics of sports physiology, ranging from heating, core and cooling motions.

Keywords—aerobic exercise, physiology science, the training model

I. INTRODUCTION

It is very especially for the Faculty of Sports Sciences (FIK) that Field Teaching Program (PPL) students must have sports skills in their fields. It is considered necessary for every PPL students so that they can deal with students and teachers in schools. It will be difficult if students do not have skills in the field of sports, one of which is gymnastics. Therefore, gymnastic skills are very necessary for PPL. This is related to the programs carried out by schools every Friday for a joint exercise. During joint gymnastics, PPL students from FIK must lead joint gymnastics. Ideally, PPL FIK students should be able to lead joint gymnastics both for package gymnastics (for example Physical Health Gymnastics, Healthy Heart Gymnastics) and aerobic exercise in accordance with the correct rules of motion according to the anatomy and physiology of the human body.

In fact, many students do not have sufficient skills of gymnastics, especially motions that are in accordance with the anatomy and physiology of the human body. In general, students are not able to lead gymnastics together comprehensively especially for aerobic exercise material caused by the facts that, (1) students are not able to make

their own gymnastic motions, (2) students do not master sports physiology. For that reason, it is hoped that the present research can help facilitate students in undertaking PPL.

Aerobic exercise is an activity that requires a lot of oxygen and may ultimately improve the system responsible for oxygen transport. The system is often considered a cardiovascular system, because the heart and blood vessels transport oxygen [1], [2]. Aerobic exercise is a series of motions that are combined with music that has been selected for a certain duration. In doing aerobics, music plays a role in guiding motion as well as evoking motivation and enthusiasm. Therefore fun, full-energy, and moving rhythm music is frequently chosen. Selected music usually has four beats per rhythm of which the rhythm is fixed.

The parts of aerobic exercise are described as follows:

A. Warming up

Warming up is physical, psychological and emotional preparation for doing exercises. The goal of warming-up exercises is to increase the heart rate, prepare muscles and joints, increase body temperature gradually and prepare oneself psychologically and emotionally

B. Core movement

The core motion is a motion that has been active by following a certain path. The core motion aims to strengthen the body's muscles and train the coordination of motion among parts of the body

C. Cooling down

The cooling down motion aims to restore the heart rate to reach the normal level

Aerobic exercise has several kinds, i.e. [3]:

1. Low impact aerobic, which is a low-intensity exercise,
2. High impact aerobic, which is a high-intensity exercise,
3. Mix impact aerobic, which is the combination of low impact aerobic and high impact aerobics
4. Aerobic with tools, which is basically the development of aerobic exercise aimed at making it more varied and more intense. The equipment which can be used are benches, chairs, sticks, sanchtband (such as ribbons but made of rubber with flexible elasticity), gymball (flexible rubber balls). The equipment which is used are benches, chairs, sticks, sanctband (like ribbons made of

rubber with flexible elasticity), and gymball (flexible rubber balls).

II. METHOD

The present research is a type of research and development research. It combines quantitative and qualitative methods to be used in a research activity, to obtain comprehensive, valid, reliable and objective data [4], [5]

The adapted procedures [6] of the research are consecutive as follows:

- a. Needs analysis
- b. Plan of the exercise model
- c. The development of the exercise model
- d. Cycle-one Experiment 1
- e. Revision of the Exercise Model
- f. Cycle-two experiment
- g. Expert validation and model revision
- h. Cycle-three experiment
- i. Final Revision

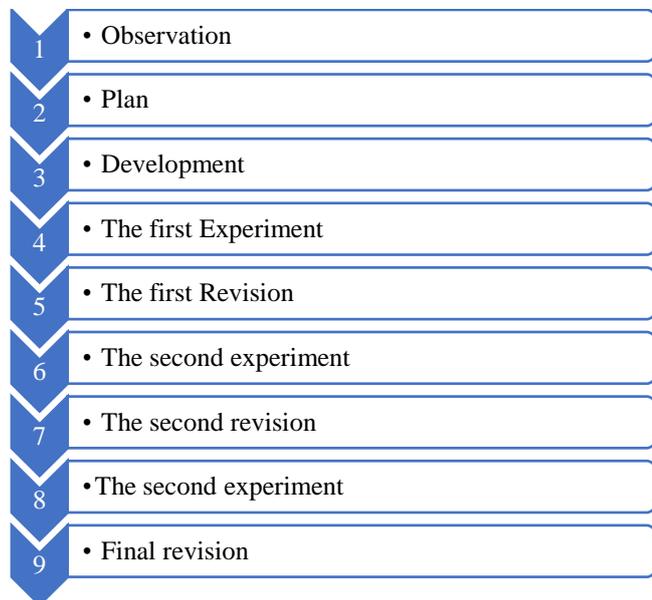


Fig. 1. The Schemes of the Research Procedures

In this study, the concept of the R & D model is the form of aerobic exercise models with variations of using hands and feet. The plan of an exercise model was made to provide clear guidance for undertaking research in training students, and formulate a training model which is crucial for the success of the program. It implied that the development of an aerobic exercise training model that was compiled and developed was in the form of the modifications and the creations of fitness training. The equipment used in developing this aerobic exercise model were a sound system, music player device, and a mirrored room which functions to control the motion [7].

III. RESEARCH RESULTS

The expected results of the development of this physiology-based aerobic exercise training model are aerobic exercise training model including the product specifications and the testing of its effectiveness whether it

improves the ability to teach aerobic exercise to the PPL students.

The training model simply covers a low impact motion, which is a gymnastic motion with music that is performed casually and increases the pulse slowly [8]. Therefore, physiology-based aerobic exercise can be performed properly and correctly. Moreover, it makes everybody effortless in controlling motions. The development of physiology-based aerobic exercise is aimed to change the muscle fibers used in training and can increase the ability of muscles to produce energy [9]. The exercise has been evaluated for the feasibility by two experts, i.e., an anatomist and a gymnast.

TABLE I. THE EXPERT TEST ON THE ANATOMICAL SCIENCE-BASED AEROBIC EXERCISE MODEL

No	Motion	Expert 1	Expert 2	Information
1.	The model of anatomy based aerobic exercise - Warming Up 1	appropriate	appropriate	
2.	The model of anatomy based aerobic exercise - Warming Up 2	appropriate	appropriate	
3.	The model of anatomy based aerobic exercise - Warming Up 3	appropriate	appropriate	
4.	The model of anatomy based aerobic exercise - Core 1	appropriate	appropriate	
5.	The model of anatomy based aerobic exercise - Core 2	appropriate	appropriate	
6.	The model of anatomy based aerobic exercise - Core 3	appropriate	appropriate	
7.	The model of anatomy based aerobic exercise - Core 4	appropriate	appropriate	
8.	The model of anatomy based aerobic exercise - Core 5	appropriate	appropriate	
9.	The model of anatomy based aerobic exercise – Cooling down 1	appropriate	appropriate	
10.	The model of anatomy based aerobic exercise – Cooling down 2	appropriate	appropriate	
11.	The model of anatomy based aerobic exercise – Cooling down 3	appropriate	appropriate	

Reflecting on the expert tests, a conclusion can be drawn that the variations of the model are feasible and can be used in aerobic exercise for beginners. There are a number of suggestions in refining the anatomy-based aerobic exercise training model for beginners, namely:

- a. the exercise covers weight training, which makes the motions more powerful.

- b. The motions must start at the easiest level.
 c. The need to learn to move by mirroring to make the right moves.
 d. The instructions must be made clear to easy to understand.

TABLE II. THE VARIATIONS OF ANATOMICAL SCIENCE-BASED AEROBIC GYMNASIIC EXERCISE FOR BEGINNERS

Composition	Motion	Physiology Motion
Warming up	1. Feet : <i>marching</i>	Walking on the spot exercise, Jogging motion, namely raising the feet about calf height, knees about 90 degrees, and landing each preceded by the arch of the foot, of which the trained muscles are <i>quadriceps</i> , <i>hamstring</i> , and <i>anterior tibial</i> .
	Hands : <i>butterfly / open the window</i>	The motion of opening and closing the arm in front of the face affected by the chest muscle or the <i>pectoral muscle</i> .
	2. Feet : the combination of the spot dan <i>toe touch</i>	<i>On the spot</i> : Motion of legs opened shoulder width, namely Toe touch muscles : the motion rests on the foot arches, of which the knees slightly bent.
	Hands : <i>shoulder press up</i>	The motion of pushing the arm or shoulder up, dominated by shoulder muscles: <i>deltoid (anterior deltoid, lateral deltoid, posterior deltoid)</i> .
	3. Feet : <i>marching</i> .	Walking on the spot exercise, Jogging motion, namely raising the feet about calf height, knees about 90 degrees, and landing each preceded by the arch of the foot, of which the trained muscles are <i>quadriceps</i> , <i>hamstring</i> , and <i>anterior tibial</i> .
	Hands : <i>pumping dan clapping hands</i>	The motion of pushing both arms downward like pumping dominated by shoulder muscles (<i>deltoid</i>)
Core	1. Feet : single step.	The footwork technique, i.e., stepping 1 to the right and left, of which knee bent slightly bent, and both knees fuse and face forward.
	Hands : bicep curl	The motion of bending (flex) the elbow joint and straightening it back (extension). The motion is carried out by the front arm muscle (bicep).
	2. Feet : v-step.	Foot motion forms triangles forwards and backward while maintaining the direction of the knee forward.
	Hands : upright row	The motion of raising the hand from the front of the lower abdomen towards the chest which is dominated by the side muscles of the body (<i>latissimus</i>).
	3. Feet : grapevine.	The motion steps as many as 2 steps aside, of which the back leg crosses when stepping.
	Hands : chest press	The motion of pushing the arm to the front of the chest, dominated by the chest muscle (<i>pectoral</i>)
	4. Feet : mambo.	Stepping with one of the feet forward or backward and the other foot acts as a support.
	Hands : shoulder press up	The motion of pushing the arm or shoulder up, dominated by shoulder muscles: <i>deltoid (anterior deltoid, lateral deltoid, posterior deltoid)</i> .
	5. Feet : twist.	The motion of rotating the hips leftward and rightward.
	Hands : rowing	Rowing motion, which is dominated by the side muscles of the body (<i>latissimus</i>).
Cooling down	1. Feet : <i>marching</i>	Walking exercise, Jogging motion, namely raising the feet about calf height, knees about 90 degrees, and landing each preceded by the arch of the foot, of which the trained muscles are <i>quadriceps</i> , <i>hamstring</i> , and <i>anterior tibial</i> .
	Hands : <i>pumping and clapping hands</i>	The motion of pushing both arms downward like pumping dominated by shoulder muscles (<i>deltoid</i>).
	2. Feet : the combination of the spot and toe touch	<i>On the spot</i> : Motion of opening the legs about shoulder width (Toe touch muscles: the motion rests on the feet arches of which the knees slightly bent.
	Hands : <i>tricep extension</i>	The motion of straightening the arms aimed to train the forearm muscles (<i>triceps</i>).
	3. Feet : heel touch	The motion of moving the heels leftward or right or forward by bending the knee slightly, weighing on the concentric foot.
	Hands : <i>tricep extension</i>	The motion of straightening the arms aimed to train the forearm muscles (<i>triceps</i>).

IV. DISCUSSION

The results of the development of the aerobic exercise model are aimed to assist PPL students of FIK UNM to lead joint gymnastics every Friday, in schools. Particularly it may help them do an appropriate aerobic exercise based on the principles of physiology which can avoid the wrong movement causing injury and affecting body posture. By applying right and appropriate motions based on the rules of physiology, the aerobic exercise makes the body more beautiful. The product is designed specifically for beginners namely all the developed motions developed are still simple.

The exercise should follow the consequence, i.e., warming up, core, and cooling down [10].

- a. Warming up is applied repeatedly with a minimum duration of 10 minutes
 b. The core is applied based on low impact motion.
 c. Closing or cooling down is the same as the warming up part functions as auto massage or self-massage, by

activating the body's venous pump mechanism to recover quickly [10].

The obstacles derived in this study, peculiarly when doing aerobics, is that the motions are carried out carelessly, meaning that they move inappropriate to sports physiology movements. Consequently, it takes a longer time to control good and right movements to get maximum results. The implementation of this research is carried out step by step, starting from warming up, core, and cooling down. The motion stems from the feet until all students can carry out feet motion correctly which is appropriate to the science of sports physiology. However, at the beginning of the study, it takes a relatively long time to get used to the correct motions. This situation also holds for the hand's motion. After the hands and feet motion are made properly, it continues to the motion of arms and legs. When combining hand and foot motions, some mistakes will usually occur because they more focus on memorizing movements than making the right motions.

The product has several strengths and weaknesses that must be taken into account. The strengths include:

- a. As a reference for aerobic exercise for beginners,
- b. A combination of several easy motions,
- c. The movement starting at an easy level.

Meanwhile, the weaknesses include

- a. Limited infrastructure,
- b. The absence of musical accompaniment created for the aerobic exercise,
- c. The product is still not comprehensive.

V. CONCLUSION

Based on the produced products, some conclusions can be drawn, i.e.:

- a. The aerobic exercise model produced is appropriate for beginners, with the combination of motions that are simple to do beginning with the easiest movements.
- b. The aerobic exercise model can be used as a reference for the development of aerobic exercise models for future studies.
- c. The purpose and the implementation of aerobics from the point of view of Physiology is very necessary, to make it truly appropriate with the principles of physiology. Therefore it is expected to achieve healthy sports goals effectively and efficiently.

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