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Development Exercise Model In Butterfly Swimming For Athletesin The Age Group 11-13 Years Based on Drill Throught Android App

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Abstract

Purpose: The aim of this study is to develop and produce an exercise model on butterfly stroke swimming skill for athletes aged 11-13 years.
Methods: The method used in this study refers to the model development method or Research and Development (R&D) based on the 10 steps of development proposed by Borg and Gall.
Result: The percentage of the results of trial on small group is 82.06% while the percentage of the results of trial on large group is 84.35%. The results of the study, obtained through the effectiveness test, found t-calculate 16.66 > t-table 2.02 in the experimental group and t-calculate 9.996 > t-table 2.02 in the control group.
Conclusion: Thus, the study concluded that there is the effectiveness of the results on butterfly stroke swimming skill for athletes in the age group of 11-13 years by the use of drill-based exercise through the android app.

Keywords: Exercise Model, Butterfly Stroke, Young Swimmer, Android

1. Introduction

Swimming is a movement activity that contributes greatly to the development of children. A coach or instructor must know the characteristic of a child because it will allow us to know the type of the child. Therefore, the exercise or learning program that we develop will be achieved. Multilateral movement is very necessary for children because it will strengthen the basis of good movement for them. The development of multilateral movement during the early stages of athlete development is very important (Lubis, 2013). The application of the principle in developing athletes' physically and psychologically abilities is the basis for maximizing the athlete's performance in the development of his/her career which is an advantage of the multilateral exercise phase. Swimming exercise can improve motor skills and basic swimming methods (Ganchar, Terentieva & Ganchar, 2018). Swimming is the successive movement of propulsive and healing actions in the water (Ito & Okuno, 2010). Through swimming, children's motor development and growth will be better. In addition, it provides a strong foundation for future sports achievements. In swimming, the element of endurance, strength, flexibility and speed is very necessary. Speed in swimming is very important because it allows swimmers to allocate time as quickly as possible (Sanders, Cappaertl & Devlini, 1995).

Swimming is relatively economical and beneficial for health and body formation. Swimming provides many benefits and people do sports as an exciting hobby activity. In addition, a tall body is one of the effects of exercise. "Successful aquatic athletes are, generally, lean and tall, with lengthy limbs and broader, and have very giant muscle mass, especially in their center and upper bodies" (Troup, 1999). Good and regular exercise can make achievement. "The process of making and developing an exercise program should see the components of training" (Budiwanto, 2012). These components include volume, intensity, frequency, density, rhythm, duration, and exercise examples". "With excessive and extended coaching for aggressive sports, athletes who attain the elite stage are usually characterized with the aid of excessive bodily and motor fitness" (Chang, Chu, & Karageorghis, 2015). Swimming becomes a medium of exercise that is very suitable for children in terms of the characteristics and structure of the motion because it will enrich the movement for children. The wealth of motion that many children have will improve their motor quality so that they will have good mobility. Stimulation in exercise is needed so that an athlete starts changes in his/her body (Pupišová, Pupiš, & Pivovarniček, 2015). Exercise achievement in swimming will be optimal if it gets the support of facilities and infrastructure, technology and exercise models that are developed in a sustainable, sustainable, progressive and on target (not redundant) in its implementation in the field. In addition, an athlete's level of achievement must also be supported by good physical conditions since it can improve his/her performance. The success of a S&C application relies on various elements such as the kind of exercises, methods, materials, periodization, and swimmers' maturation or aggressive stage. (Amaro et al., 2018). Swimming movements consist of limb movement, arm movement, breathing movement, and overall movement (Maglischo, 2003). A coach must pay attention to several swimming principles including the propulsive and resistive principles. Adding propulsive forces can be done with physical exercise in the form of propulsive movements; which is doing muscle strength. Meanwhile, reducing resistive force can be done according to the form of resistance. The speed can be increased either by increasing the propulsive forces or by decreasing the resistive forces. In aquatic locomotion the major resistive force is that of

water (hydrodynamic resistance or drag): it is therefore of pivotal importance to measure/ estimate this parameter (Gatta, Cortesi, Fantozzi, & Zamparo, 2015).

Action-Reaction Principle: every action always causes the same reaction and is in the opposite direction according to the third Newton's law. Buoyancy Principle: the buoyant force on the body of an athlete is the same as the weight of the water displaced by a floating body. Everyone knows that the balance is a biological system that allows us to know where our bodies are and maintain a desired position (Ilie & Adela, 2017). Butterfly stroke swimming skill becomes one of the swimming strokes that must be mastered by athletes. In a butterfly stroke swimming, there are important parts to have in order to swim the butterfly stroke well which includes: body position, foot kick, breathing technique, application of core or central muscles to the body and body stability (Montgomery & Chambers, 2018). Butterfly stroke is the most difficult swimming stroke because both hands move to restore to the surface of the water simultaneously (Thomas David, 2007). Butterfly stroke swimming is a symmetrical swimming movement where lower arm and leg movements are also moved together (Seifert, Delignieres, Boulesteix, & Chollet, 2007). "The primary motion of the butterfly includes an undulating rhythm in which the legs and hands are synchronized by using specific timing. The most necessary thing of a precise butterfly stroke is the use of the body's core, which is the best supply of power" (Bay, 2016). "Butterfly is a symmetrical stroke in which the moves of the right higher and decrease limbs are nearly simultaneous with these of the left. The body undulates upward and downward alternatively than rolling round the longitudinal axis as in the front crawl and backstroke swimming. Thus, butterfly is viewed as an undulating stroke" (Riewald & Rodeo, 2015). Butterfly-stroke swimming movements resemble those of dolphins. It becomes the most beautiful swimming stroke among three other swimming strokes. However, the process of learning or basic technical exercise is very difficult to do since it requires not only the strength of the pull of the hands and feet but also the support of the waist flexibility. The butterfly stroke is dominated by the up and down movements of the body carried out with the position of the body above the water surface (Averianova, Nikodelis, & Kollias, 2016). The exercise model on butterfly stroke swimming has been applied in every swimming club; however, the application of the exercise was very monotonous, less varied and seemed to saturate the athletes. The exercise model does not provide the level of efficiency and effectiveness of athletes in swimming. There are still many athletes who have swimming in the butterfly stroke that make resistance in swimming. It was caused due to the lack of variety of the exercise models that they applied.

Based on the observations conducted by the researchers in each swimming club, in practicing a butterfly-stroke swimming, the trainer rarely develops butterfly-stroke swimming drills. The trainer only trains based on his/her experience when they were still athletes. In this case, they do not want to innovate in finding new drilling methods. The trainer must have creativity in developing an exercise model on butterfly stroke swimming skill so that the athlete can quickly master the skill. Drill and practice are the process of exercise that takes place repeatedly on a matter until a goal is reached. Meanwhile, practice places more emphasis on reality in the field and provides experience (Basukisna Setya Candra, 2014). The drill approach can be termed repetitive and continuous (Poerwodarminto, 2003). "A drill often only teaches the unique skills of that drill" (Rainer, 2004). Children are directed to move technically and repeatedly. (Aprianova, 2016). "Drill method is a way of learning that is more emphasis on controlling the technique by doing movements in accordance with what is repeatedly instructed so that movement automation takes place (Yuni, 2017). Android is a Linux-based operating method that is open-source and is designed for touch screen cellular devices such as smartphones and tablet computers (Salbino, 2014). Android is a subset of software for mobile devices that includes operating method, middleware, and core

applications released by Google. Android is a mobile operating system that adopts a modified Linux operating method. Android was taken over by Google in 2005 from Android, Inc. as a component to fill the mobile operating system market. Google took over all the results of Android's work including the team that optimized Android (Suprianto & Agustina, 2012).

The aim of the study is that the researchers want to develop an exercise model on butterfly stroke swimming skill that has more variety in butterfly stroke swimming exercises, has already using an android application, and has already using a lot of media or tools used in exercise. Thus, athletes experience many challenges in exercise because it attracts them and can increase their motivation to practice. Based on the above discussion, the researchers want to do research about "development of drill-based exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years through android app".

2. Materials and Method

This study uses a Research and Development (or R&D) Approach. The research and development of this exercise uses qualitative and quantitative approaches and uses ten stages of the Research & Development (R&D) development model of Borg & Gall (1983) that include: (1) Research and information (2) Planning, (3) Developing preliminary form of product, (4) Preliminary field testing, (5) Main product revision, (6) Main field testing, (7) Operational product revision, (8) Operational field testing, (9) Final product revision, (10) Dissemination and implementation.The subjects of this study were swimming athletes aged 11-13 years from 4 different swimming clubs including Bina Taruna swimming club, Tirta Merta Bandung swimming club, Tirta Bayu swimming club and Bekasi Olympic Aquatics swimming club.

Research Design

The effectiveness test was carried out to (1) find out whether the final model design is good and correct to be applied by the trainer in the exercise, and (2) how effective the results of the final model implementation are for the purpose of this study. Thus, a quantitative approach was used to find the effectiveness by applying a pre-experimental research design in the form of one group pretest-posttest design (Sugiyono, 2015).

Table 1. Research Design

R	**O_1**	**X**	**O_2**
R	**O_3**	**-**	**O_4**

3. Result

Butterfly stroke swimming skill is performed in five stages of assessment which include: 1) body position, 2) leg movement, 3) breathing technique, 4) arm movement, and 5) coordination movement. Locomotion skills are movements that follow a series of patterns or certain forms that involve coordination and control of part of the body or the whole body that can be performed after going through the locomotion learning process. Swimming is a form of aquatic skill and its mastery requires repetitive exercise at a certain time before actually mastering it. Initially, the breaststroke is modified by the butterfly stroke in which foot movement is the same as the breaststroke but the movement of the arm is in the opposite direction to the recovery of arm movement in the breaststroke which is performed outside the water surface. The exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years can be developed and applied in exercises to improve the drill-based butterfly-stroke swimming skill. The exercise was still not optimal for improving butterfly stroke swimming skill of swimming athletes in the age group of 11-13 years.

The trainers had not used a specific exercise model to improve butterfly stroke swimming skill of swimming athletes in the age group of 11-13 years. The results of field observations showed that the exercise process carried out by athletes is playing in a pool which did not provide specific exercise because many athletes were free to play without any instruction and were only limited to the supervision of the trainer. The exercise given had not focused on athletes in the age group of 11-13 years. The trainer carried out a general exercise process because of the large number of athletes with varying age groups which is inversely proportional to the small number of trainers during the exercise process. Validation result from the three swimming experts obtained 91.69% for drill-based exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years. Thus, the drill-based exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years is very feasible to use.

The researcher drew the concept of the initial exercise model developed by as many as 50 exercise models. After conducting discussion with experts, they suggested refining the model by paying attention to the level of difficulty and variations in drill and infrastructure used. Validation result from the three swimming experts obtained 85.86% for drill-based exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years. Thus, the drill-based exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years is very feasible to use.

The three swimming experts provided input for developing the model from easy to gradual variations to more difficult ones. Broadly speaking, the exercise sequence for basic butterfly stroke swimming skill—based on input from experts—consists of: (1) body position, (2) foot movement, (3) breath movement, (4) arm movements, and (5) overall movement. Validation result from the three swimming experts obtained 82.06% for drill-based exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years. Thus, the drill-based exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years is very feasible to use.

Small group trials obtained input: (a) Model 13: waist movements, legs remained tight and knees not bent 90 degrees, maintaining body balance on the streamline, movement from the waist and groin, abdomen raised, knees not bent, up-and-down waist movements, head still relaxed. (b) Model 16: keep the body from sinking, both feet tight and waist movement, both hands still crossing in front of the chest. (c) Model 18: not too high breathing, only to the chin. There needs to be an explanation of the focus points so that the objectives of the exercise can be achieved. Explanation of the rules of implementation needs to be further refined. In performing swimming exercises, the trainer must oversee the children to avoid the weak supervision of the trainer which creates the risk of drowning. Validation result from the three swimming experts obtained 84.35% for drill-based exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years. Thus, the drill-based exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years is very feasible to use. Field notes, based on the results of observations on this field trial, include: the level of safety of the use of tools in swimming exercises for athletes in the age group of 11-13 years is stated to be safe and feasible to use. The enthusiasm of the athletes will increase if swimming exercises are in the form of varied models and do not reduce the core of the exercise itself. The use of assistive devices that are accessible is stated to have been good by the experts; however, it must be adapted to the needs. Model development starts from a model that is easy to do and continues to the level of the model that is more difficult to do. In this case, the experts stated that the model is well arranged. The experts stated that the effectiveness of the exercise model for swimming athletes in the age group of 11-13 years is effective in helping club coaches/trainers to achieve the objectives of swimming exercise, especially the butterfly-stroke swimming skill. Generally,

all athletes are able to carry out instructions in accordance with the expectations desired by the researchers. After conducting a series of trials, revisions and improvements to the draft model. Therefore, the drill-based exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years has been arranged which consists of 48 forms of variations in drill-based exercise model.

The results of the drill-based exercise model on butterfly-stroke swimming skill with the use of android app are as follows:

Figure 2. The initial appearance of the exercise model of butterfly stroke swimming

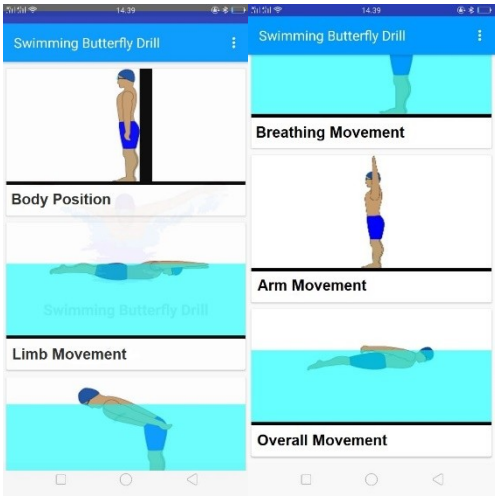

Figure 3. Swimming Movement of Butterfly Stroke

Model Effectiveness Test

Data obtained from the research results need to be tested first using a normality test before being analyzed as a requirement for data analysis. Based on the results of the calculation of the normality test of the data on the initial test data, the experimental group obtained an L-calculate value of 0.1353 which is smaller than the L-table 0.1401. So, it was concluded that the experimental group's initial test data were normally distributed. The results of the experimental final test data obtained a L-calculate value of 0.1379 which is smaller than the L-table 0.1401. So, it was concluded that the final test data of the experimental group were normally distributed.

Meanwhile, based on the results of the calculation of the normality test of the data on the initial test data, the control group obtained a L-calculate value of 0.1380 smaller than the L-table 0.1401. So, it was concluded that the initial test data of the control group were normally distributed. In addition, the results of the final test group of the control group

obtained an L-calculate value of 0.1287 which is smaller than L-table 0.1401. So, it was concluded that the final test data of the control group were normally distributed.

t-Test

After performing normality test, it was followed by a t-test to determine the effectiveness of the Drill-Based Exercise Model on Butterfly Stroke Swimming Skill for Athletes in the Age Group of 11-13 Years. The calculation results are presented in the following table:

Table 3. Test of Differences in Effectiveness of the Drill-Based Exercise Model on Butterfly Stroke Swimming Skill for Athletes in the Age Group of 11-13 Years in Experimental Group

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	FINAL_Test	19.30	40	1.436	.227
	INITIAL_Test	15.05	40	1.358	.215

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	FINAL_Test & INITIAL_Test	40	.334	.035

Paired Samples Test

		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	FINAL_Test – INITIAL_Test	4.250	1.613	.255	3.734	4.766	16.662	39	.000

Based on the analysis of data processing, the average pretest value of the experimental group is 15.05 and the average posttest value of the experimental group is 19.30. The standard deviation value of the pretest of the experimental group is 1.36 and the standard deviation value of the posttest of the experimental group is 1.44. The average value of the experimental group pretest and posttest is 4.25 and the average standard deviation value of the experimental group is 1.61. The t-calculate value of the experimental group is 16.66.

Based on the above table, df = 39 so that the t-table value is 2.02 and the significance level is 0.05. Since the t-calculate value of the experimental group is 16.66 > t-table 2.02 then H0 is rejected. Based on this information, it was concluded that the Butterfly Stroke Swimming Model for athletes in the age group of 11-13 years is effective and could improve butterfly stroke swimming skill for athletes in the age group of 11-13 years. The following is

a comparison of the results of the athlete's ability level before treatment and after treatment using swimming exercise model for athletes in the age group of 11-13 years using bar charts:

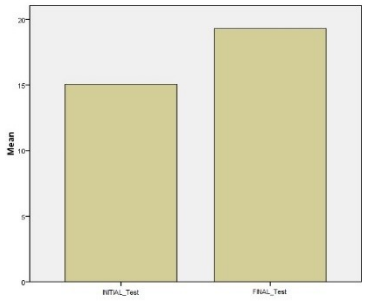

Figure 2. Experimental Group Bar Chart
(Effectiveness Test)

Table 4. Test of Differences in Effectiveness of the Drill-Based Exercise Model on Butterfly Stroke Swimming Skill for Athletes in the Age Group of 11-13 Years in Control Group

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	FINAL_Test	15.95	40	1.724	.273
	INITIAL_Test	14.10	40	1.257	.199

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	FINAL_Test & INITIAL_Test	40	.405	.010

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	FINAL_Test INITIAL_Test	1.850	1.673	.264	1.315	2.385	6.996	39	.000

Based on the analysis of data processing, the average pretest value of the control group is 15.95 and the average posttest value of the control group is 14.10. The standard deviation value of the pretest of the control group is 1.72 and the standard deviation value of the posttest of the control group is 1.25. The average value of the control group pretest and

posttest is 1.850 and the average standard deviation value of the control group is 1.67. The t-calculate value of the control group is 6.996.

Based on the above table, df = 39 so that the t-table value is 2.02 and the significance level is 0.05. Since the t-calculate value of the experimental group is 9.996 > t-table 2.02 then H0 is rejected. Based on this information, it was concluded that the Conventional Model is less effective than Butterfly Stroke Swimming Model for athletes in the age group of 11-13 years in improving butterfly stroke swimming skill for athletes in the age group of 11-13 years. The following is a comparison of the results of the level of ability of athletes in conventional model using bar chart:

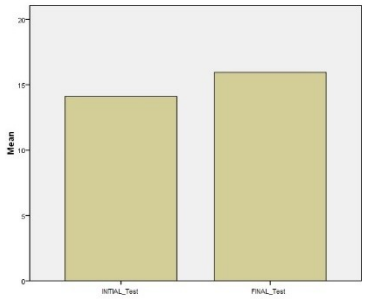

Figure 3. Control Group Bar Chart
(Effectiveness Test)

4. Discussion

The development of an exercise model on butterfly stroke swimming skill for athletes in the age group of 11-13 years was originated from problems found in the field by researchers and went beyond relevant research studies, observations and interviews. This research was based on the results of research conducted by Cholis Nur (2015) who stated that the exercise model on butterfly stroke swimming using hand fin can improve butterfly stroke swimming skill. The research conducted by Pradana, Hermawan, & Marani (2018) found that there was effectiveness in the results of the swimming speed of butterfly stroke swimming athletes aged 9-10 years who were given exercise in core stability using the stability ball. Research carried out by Ildikó, József, Ladislav, L'ubom'ira, & Matúš (2017) concluded that the application of properly made exercise programs will make athletes adapt to the aquatic environment, basic swimming skills, and the basis for practicing many complex swimming strokes. Based on the results of their research, Nakashima & Tsunoda (2015) said that the development of an exercise model on humanoid robot-based free-stroke swimming could improve free-stroke swimming skills. Maulana, Azhari, & Darmawan (2018) explained that swimming based on mobile learning can improve swimming abilities. The m-learning system is carried out to provide high-quality education (Al-Hunaiyyan, Al-Sharhan, & Alhajri, 2017). The research results of Darmawan & Asmawi (2017) confirmed that technology-based development research contributes positively in supporting learning. Development of android-based learning resources can be used as a learning resource for *pencak silat* (Aljabar, 2016).
The technique used in processing research data was obtained from sports experts, swimming club coaches/trainers, and swimming athletes using percentage techniques.

5. Conclusion

The results of the study based on the data processing consist of expert validation, small group trials, large group trials and discussion of the results of the study. Thus, the researchers can draw the conclusion that the Drill-Based Exercise Model on the Butterfly Stroke Swimming Skill for Athletes in the Age Group of 11-13 Years Using an Android App has practical value and can improve butterfly stroke swimming skills. Drill-Based Exercise Model on the Butterfly Stroke Swimming Skill for Athletes in the Age Group of 11-13 Years Using an Android App is more effective than a conventional exercise model.

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7. Conflicts of Interest

This Article is for the requirements to take a graduation exam a doctoral study program

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