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EFFECTIVENESS OF ENDURANCE TRAINING BASED ON SMALL-SIDED GAMES MODEL FOR BEGINNER WOMEN FUTSAL

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Abstract

This study aims to see the effectiveness of endurance training based on small-sided games models for female futsal beginner players. The subject of the study is 12 beginner female futsal players from Padang Futsal Academy aged 19-23 years. The endurance variables are measured before and after endurance training based on small-sided games program is given. Research instruments using Multistage Fitness Test (MSFT). The results of the pre-test analysis were an average value of 28.6 ml/kg/min, the highest value of 31.4 ml/kg/min, the lowest value of 25.2 ml/kg/minute. Furthermore, the results of post-test analysis were the average data value of 37.9 ml/kg/min, the highest value of 41.1 ml/kg/min, the lowest value of 36.2 ml/kg/min. Test paired Sample T-Test through SPSS.26 application obtained Sig value. (2-tailed) of 0.000 < 0.05, it was concluded that there is an average difference between pre-test and post-test in Padang Futsal academy athletes in Padang City. Then, the mean difference between pre-test and post-test is 7.6417. This finding shows that the endurance training based on small-sided games programs has a significant effect on the performance variables of endurance in Padang Futsal Academy athletes in Padang City.

Keywords: endurance; Vo_2max; small-sided games; women's futsal

Introduction

Futsal is a popular sport among Indonesians. Almost all Indonesians, men and women from cities or villages loved this sport. Futsal game is a high-intensity sports game. Each player must be able to move and recover quickly to play to the fullest. Physical condition is the most basic component that must be prepared for athletes in order to perform to the fullest. Futsal players should be able to recover stamina quickly because the intensity and rhythm of futsal games are very high and constant during the match (Barbero-Alvarez JC et. Al in (Ramos-Campo et al., 2016).

According to Nakamura, F.Y in (Sekulic et al., 2019)) Futsal is a sport that involves periods of high-intensity physical play for two periods of 20 minutes per game. Individual aerobic fitness status is critical to the success of this game because of its apparent role during recovery, which helps by delaying the onset of fatigue, allowing high intensity training to be maintained during play (Tomlin DL, Wenger HL: (Harrison et al., 2015). Technique and tactics are not ideal If a

futsal player has a poor physical condition (Robiansyah & Amiq, 2018).

Experts analyze the demand for movement in futsal that players run more than 4500 meters during a match (Barbero-Alvarez et al., 2015). The futsal average intensity of maximum heart rate is 85-90% and VO2max is 75% (Barbero-Alvarez et al., 2015). Futsal players sprint 3-4 times every 20-30 seconds during the match (Freitas et al., 2019). Futsal games require high aerobic fitness along with a well-developed anaerobic pathway (Barbero-Alvarez et al., 2015). Maximum aerobic capacity (VO_2Max) is an important factor in aiding recovery between intermittent sprinting in professional soccer players (Esco et al., 2014).

Aerobic endurance is a person's ability to do work in an aerobic atmosphere or also called the ability of the heart, lungs, and blood vessels to use oxygen when doing a work activity for a long time. Maximum aerobic capacity, measured as maximal oxygen uptake (VO2max), is an indicator of physiological functional capacity (Kusy & Zieliński, 2014). The units of maximum oxygen intake are liters/minute/ and ml/kg/minute (Wiley & Shaver, 2015). Vo2Max represents a fundamental measure in exercise physiology and often serves as a standard for comparing estimates of aerobic capacity performance and endurance fitness (Swanwick & Matthews, 2018). Someone who has good physical fitness has a higher VO2 MAX value so that they can do stronger activities than those who do not (Safitri & Dieny, 2015).

The ability of aerobic endurance can be increased by providing a proper and appropriate exercise program for each person. Because the ability to respond to training stimuli is different. Aerobic endurance can be increased by an exercise program designed according to the principles of exercise (Karahan, 2012). Endurance training consists of low-intensity and high-intensity aerobics, which are effective methods for increasing physical endurance (Chovanec & Gröpel, 2020). High-intensity exercise can increase vo2 max athlete's (Moffatt et al., 2013). Kalva- Filho et al. (2013 found a positive correlation between the relative intensity of VO2max and performance in repeated sprints in soccer players (Kalva-Filho et al., 2013).

To acquire abilities that involve physical components and technical components, you can use a small games-based training model. The use of the small-sided games model provides more benefits in the form of more efficient time for technical, tactical and physical training specifically for the futsal game (Amani-

Shalamzari et al., 2020). Research conducted by (Zamzami et al., 2020) exercises based on small-sided games can be implemented as an exercise to increase the anaerobic capacity of basketball athletes. (F. M. Clemente et al., 2014) Recommend small-sided game exercises to improve aerobic and anaerobic soccer athletes. (Honório et al., 2021) Small-sided games are a method used by coaches for technical and tactical development that can promote increased physical fitness. In his research Halouani (2014) in (Amani-Shalamzari et al., 2020) A trend in team sports, small sided games (SSG) is used not only to improve technical and tactical aspects but also to improve the physical condition of futsal players.

Giving an endurance training model based on small-sided games is a fun exercise but can give maximum results. So far, the training model used by the coach is a conventional training model that does not focus on the special needs of the futsal game. Thus, the purpose of this study is to implement an endurance training model based on small-sided games for female futsal beginners.

Method

The process of developing an endurance training model based on small sided games (SSG) researchers used the training and development model by Robert Maribe Branch, namely the ADDIE model (Analysis, design, development, implementation, and evaluation). The result of the research on endurance training models based on small sided games for women's futsal will produce a product in the form of a complete and varied book of training models with product specifications, as well as testing the usability and effectiveness of the exercise models.

The subjects in this study were 12 players of Padang futsal academy angels who were female futsal athletes aged 19-23 years from the Padang Futsal Academy club, Padang City. All subjects are athletes who will take part in the 2021 PFA Cup in Padang City. The endurance training model based on small-sided games is implemented for 6 weeks, which is 3 meetings/week. The total meeting is 18 times. Exercise intensity 65-90%. The data analysis aimed to see how much improvement was achieved from giving an endurance training model based on small-sided games for 6 weeks.

Data analysis using the Kolmogorov-Smirnov normality test using the Statistical Package for Social Science (SPSS) VER application 26. The normality test showed that all data were normally distributed. The data were further analyzed descriptively through the following steps: data recapitulation, data description, and

data interpretation. The presentation of this data is then displayed in tabular form. While the inferential analysis was carried out using the T-test, with a significance test (α) = 0.05.

RESULTS AND DISCUSSION

Result

Model Eligibility

After the model design is completed, expert judgment tests the feasibility of the model. This is useful for determining whether the endurance training model based on small-sided games is can be done or not. Validation of model products by three futsal experts who have AFC level 1 licenses who have been in futsal for 10 years.

Table 1. Results of the First Stage of Futsal Expert Assessment

Model name	Expert 1	Expert 2	Expert 3	Percentage
Model 1	1	1	1	100 %
Model 2	1	1	1	100 %
Model 3	1	0	1	100 %
Model 4	1	1	1	66.7%
Model 5	1	0	0	33.3 %
Model 6	1	1	1	100 %
Model 7	1	0	1	66.67 %
Model 8	1	1	1	100 %
Model 9	1	1	1	100 %
Model10	1	1	1	100%
Model11	0	1	0	33.3 %
Model12	1	1	1	100 %
Model13	1	1	1	100 %
Model14	1	1	0	66.7 %
Model15	1	1	1	100%
Model16	1	1	1	100%
Model17	1	1	1	100 %
Model18	1	1	1	100 %
Average Percentage				**84.04 %**

Based on the results of the futsal expert's assessment in the first stage in table 1., there are three experts who evaluate the product of the endurance training model based on small sided games. Based on the data presented above, the average percentage of expert validation is 87.04% with the "Good" category. This result states that the product is feasible but needs to make some revisions according to comments by experts/expert judgments.

Second stage expert validation

Based on the results of the assessment and suggestions from expert judgment, the small-sided games-based endurance training model for female futsal beginners was revised. The improvement results from this model product are then reassessed by experts to ensure that the overall model product is suitable for use. Table 2. is the result of the second stage futsal expert assessment.

Table 2. Results of the First Stage of Futsal Expert Assessment

Model Name	Expert 1	Expert 2	Expert 3	Percentage
Model 1	1	1	1	100 %
Model 2	1	1	1	100 %
Model 3	1	1	1	100 %
Model 4	1	1	1	100 %
Model 5	1	1	1	100 %
Model 6	1	1	1	100 %
Model 7	1	1	1	100 %
Model 8	1	1	1	100 %
Model 9	1	1	1	100 %
Model10	1	1	1	100%
Model11	1	1	0	66.7%
Model12	1	1	1	100 %
Model13	1	1	1	100 %
Model14	1	1	1	100 %

Model Name	Expert 1	Expert 2	Expert 3	Percentage
Model15	1	1	1	100%
Model16	1	1	1	100%
Model17	1	1	1	100 %
Model18	1	1	1	100 %
Average Percentage				**98.15%**

Based on the results of the futsal expert's assessment in the second stage in table 2. there are three experts who evaluate the product of the endurance training model based on small sided games. Based on the data presented above, the average percentage of expert validation is 98.15% with the "Very Good" category. Thus, the endurance training model based on small sided games is “feasible” and can be implemented.

Model Effectiveness Test

Pre-test data

From the results of aerobic endurance (VO2max) of Padang futsal academy athletes in Padang City, the highest result was 31.4 ml/kg/minute, the lowest value was 25.2 ml/kg/minute, the mean (average) was 28.6 and the standard deviation was 2 ,0. The distribution of the aerobic endurance pre-test data for Padang futsal academy players in Padang City is in table 3:

Table 3. Distribution of aerobic endurance pre-test data for Padang futsal academy athletes, Padang city (N=12)

Interval Class	Category	Frequency	Percentage
Excellent	>31.7	0	0 %
Good	29.7-31.6	4	33.3 %
Enough	27.7-29.6	3	25.0 %
Low	25.6-27.6	5	41.7 %
Very Low	<25.5	0	0 %

Based on table 3. there are no (0%) female futsal athletes who have aerobic endurance (VO2max) at intervals >31.7 ml/kg/min, as many as 4 people (33.3%) have aerobic endurance (VO2max) at intervals of 29.7-31.6 in the Good category, as many as 3 people (25%) had aerobic endurance (VO2max) at intervals of 27.7-29.6 in the sufficient category, as many as 5 people (41.7%) had aerobic endurance (VO2max) at intervals of 25.6 – 27.6 in the low category and none (0%) female futsal athletes who have aerobic endurance (VO2max) at intervals <25.5 in the very low category.

Post-test Data

From the results of aerobic endurance (VO2max) of Padang futsal academy athletes in Padang City, the highest result was 41.1 ml/kg/minute, the lowest value was 30.2 ml/kg/minute, the mean (average) was 36.2 and the standard deviation was 3 ,6. Distribution of post-test data on aerobic endurance (VO2max) of futsal players from Padang futsal academy in Padang City in table 4:

Table 4. distribution of post-test data on aerobic endurance (VO2max) for athletes at Padang futsal academy, Padang city (N=2)

Interval Class	Category	Frequency	%

Excellent	> 41,6	0	0,0
Good	38,1-41,5	6	50,0
Enough	34,4-38	2	16,7
Low	30,9-34,3	3	25,0
Very Low	< 30,8	1	8,3

In table 4. there are no (0%) female futsal athletes who have aerobic endurance (VO2max) at intervals >41.6 ml/kg/min, 6 people (50%) have aerobic endurance (VO2max) at 38 intervals, 1-41.5 in the Good category, as many as 2 people (16.7%) had aerobic endurance (VO2max) at intervals of 34.4-38 in the sufficient category, as many as 3 people (25%) had aerobic endurance (VO2max) at intervals of 30.9 – 34.3 in the low category and as many as 1 person (8.3%) had aerobic endurance (VO2max) at intervals <30.8 in the very low category.

Table 5. Summary of Pre-Test and Post Test Comparison Results

Group Statistics

	class	N	Mean	Std. Deviation	Std. Error Mean
Results	Pre-test	12	28.575	2.0069	.5793
	Post-test	12	36.217	3.5654	1.0293

In table 4. This data is the result of pre-test and post-test measurements of 12 athletes from Padang futsal academy in Padang city. The mean pre-test value was 28.575, the standard deviation was 2.0069 and the mean standard error was 0.5793. Meanwhile, in the post-test, the mean value was 36.217, the standard deviation was 3.5654 and the mean standard error was 1.0293.

Analysis Test Requirements

Normality Test

Normality test using Shapiro-Wilk through SPSS application.26 obtained results in table 6:

Table 6. Aerobic endurance Normality Test Result (VO2max)

Tests of Normality

	kelas	Shapiro-Wilk Statistic	df	Sig.
Hasil	Pre-test	.931	12	.392
	Post-test	.949	12	.617

Based on the data in table 6. The results of the Shapiro-Wilk statistic for the pre-test were 0.931 and the value of sig. or p-value 0.392 > 0.05, the conclusion that the pre-test class data is normally distributed. The results of the Shapiro-Wilk statistic for the post-test were 0.949 and the value of sig. or p-value 0.617> 0.05, so the conclusion that the post-test class data is normally distributed.

Paired Sample T-Test

Test paired Sample T-Test through SPSS.26 application obtained results in table 7.

Table 7. Test Results paired T-Test aerobic endurance (VO2max)

Paired Samples Test

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std.	Std. Error Mean			
pre-test - pos-test	-7.6417	2.96902	.8545	-8.943	11	.000

Based on table 7. obtained the value of Sig. (2-tailed) of 0.000 < 0.05, the conclusion is that there is a difference in the average training results of athletes for the

pre-test with the post-test athletes of Padang Futsal academy Padang City. Based on the output of pair 1, there is an effect of 6-week small-sided games-based endurance training on the aerobic endurance (VO2Max) of beginner athletes at the Padang Futsal academy, Padang City.

Uji Independent Sample T-Test

Independent Sample T-Test test through SPSS.26 application of statistics results in table 8:

Table 8. Summary of Independent Sample T-Test Results

Independent Samples Test					
	t-test for Equality of Means				
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	-6.470	22	.000	-7.6417	1.1811

Based on table 8. the value of Sig. (2-tailed) of 0.000 <0.05, in conclusion, there is an average difference between the pre-test and post-test of Padang Futsal academy athletes in Padang City. Then, the mean difference between pre-test and post-test is 7.6417. In other words, there was an increase of 7.6417 from the exercise model using an endurance training program based on small-sided games for 6 weeks.

Evaluation

The evaluation stage is the final stage in the ADDIE development model. The evaluation was carried out when implementing the training model for female athletes at the Padang futsal academy, Padang city. The result is an effective small-sided games-based endurance training model that meets the requirements for application to female futsal athletes aged 19-23 years.

Discussion

The development of an endurance training model based on small-sided games for female futsal players aged 19-23 uses a research and development design developed by Robert Maribe Branch, commonly known as ADDIE (Analysis, Design, Development, Implementation, Evaluation). Based on the data from the model feasibility test by futsal experts, it was found that several parts of the product had to be revised. This aims to optimize the results and benefits of developing an endurance training model based on small-sided games.

After revision, the product model is re-tested by the futsal expert judgment. Then, the model is ready to be implemented. Based on the results of the implementation of the small-sided games-based endurance training model, this small-sided games-based endurance training model product is effective and meets the requirements for application to female futsal players aged 19-23 years.

During the analysis process, compiling an exercise model, testing the effectiveness of the model, and implementing the model, there were several

obstacles in completing the process of developing this small-sided games-based endurance training model. The following are inhibiting factors in the preparation and implementation of model products:

1. Pandemic covid-19 makes it difficult for researchers to take care of research permits.
2. Some athletes do not regularly follow the exercise because of illness.
3. Some athletes have poor passing-control techniques, making it difficult to follow high-intensity workouts.

After implementing the product on the Padang futsal academy players in Padang city, the researcher again revised the product. As a result, this product has several advantages and disadvantages that need to be improved. Some of the advantages of this product are:

1. Improved aerobic endurance (Vo2max) futsal players.
2. Improve futsal game strategy.
3. The training model is like the situation of futsal games.
4. Model products can be used in other age groups by modifying the time and size of the field.
5. This model is in the form of a module or book.

The disadvantages of this exercise model product are:

1. The goal does not match the original goal of the futsal game.
2. Practice time is limited.
3. Explanations and regulations in this *endurance* exercise model are far from a word.

Conclusion

Based on data from the implementation and evaluation and discussion of research results, the conclusion that:

1. Small *sided games* based endurance training model for beginner futsal players aged 19-23 years can be developed and applied to train the endurance of female futsal athletes.
2. This *small sided games* based endurance training model is effectively and efficiently used to increase the endurance of novice female futsal players aged 19-23 years.

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