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The Effect of Plyometric Exercise and Ladder Drill on Power, Agility, and Resting Pulse in Taekwondo Athletes at State Colleges

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Abstract

Sport Taekwondo development in Indonesia, a lot progress, marked by the creation of some new record or increasing sports performance. but the achievement of this sport more and more degenerate. Here are many factors that cause deterioration of the Taekwondo homeland achievement. Leg muscle power, Agility is a physical condition that is needed in taekwondo. Different from abroad, mostly the game played taekwondo athletes overseas (Korea) relies Power, Agility. When viewed in logic, people who do kick, dodge or attack will increase the strength and speed and flexibility. It is expected to make the opponent difficulty in attacking or being attacked to make points. The purpose of this study was to determine: (1) the effect of plyometric training on power (2) the effect of plyometric training on agility (3) the effect of plyometric training on resting pulse rate (4) the effect of exercise Ladder Drill to power, (5) the effects of exercise Ladder against agility drill (6) the effect of exercise on the Ladder Drill resting pulse rate (7) differences in the effect of plyometric training and Ladder Drill on Power, Agility and resting pulse. Objectives of this study were students of Taekwondo Unesa SMEs and number of samples taken as many as 30 people were divided into 3 groups (2 experimental groups and 1 control group), the number of each group of 10 people.

Keywords: *Exercise; Plyometric; Ladder Drill; Plyometric*

Introduction

The development of physical condition is a necessity for athletes in order to increase higher achievement. To achieve optimal performance, an athlete must be supported by excellent physical condition. These conditions can only be achieved through regular and well-planned training and compared to achieve goals. Bompa (1994: 45) states that training is a process which is programmed systematically in preparing athletes at the highest level of performance that is carried out repeatedly with an increasing training load.

To achieve good performance in taekwondo, athletes must have a good physical condition, because physique is fundamental in achieving optimal skills. Without a good physical condition, it will be difficult to run a training program and to achieve the skills. Physical condition is one of the requirements to achieve accomplishments. To produce highest accomplishment in athletes, it is necessary to implement

systematic physical training. This is stated by Bompa (1988: 2) that physical preparation must be considered as a necessary element in training to achieve the highest achievement.

Based on the several components that affect the physical qualities mentioned above, strength, speed, agility, and muscle endurance coordination will be the main focus in training, in which these aspects play an important role in the problems faced by the Taekwondo Student Activity Unit of The State University of Surabaya.

There are several training methods to improve physical condition using self-weight, called the plyometric training method. According to Chu (1998; 10), plyometric is a technique in training used by athletes to increase strength and explosive power. Radcliffe and Farentinos (1985:2) states that plyometric training is a type of training that develops muscle ability to produce explosive power. While Kukolj, Ropret, Ugarković & Jaric (in Sporis: 2010:133) states that jumping and maximum running are generally considered to be dynamic movements that require high muscle strength and closely related to agility. Agility performance is also a dynamic movement which requires high muscle strength, jumping and direction shift is closely related. This is in line with Pour's research (2011: 34) which states that plyometric exercises can affect the speed, agility, flexibility, leg strength and explosive power of taekwondo players.

To achieve these various movements, many factors need to be considered such as adequate physical conditions to get increasing strength in taekwondo athletes. This factor is considered as an important thing which is decisive in determining a person's achievement. In general, experts classify physical fitness into two groups, namely physical fitness related to health (pulse, haemoglobin, height, weight, blood pressure), and physical fitness related to movement skills (speed, strength, endurance, explosive power, flexibility, agility, coordination, balance, accuracy, and reaction). In line with the above opinion, all sports are required to have components of those physical conditions, including Taekwondo to increase power, agility, and resting pulse, specifically for Taekwondo athletes.

The reality on the field is that the training carried out until now is still conventional. Conventional means that athletes come to the field, warm-up and immediately practice kicking. Plyometric and ladder drill training program have never been trained before in the Taekwondo Student Activity Unit. Plyometric and ladder drill training is a form of exercise that is often used to increase power and agility. For this reason, researchers are interested in applying this plyometric and ladder drill training program to athletes in Taekwondo Student Activity Unit of the State University of Surabaya. In addition, researchers want to prove the existing theory, it is said that plyometric and ladder drill training programs can increase power, according to Zeray and Young (2012).

Research Methods

The type of research used in this study is quantitative research with a quasi-experimental method. The study is designed using randomized control group pre-test post-test design (Anshori, 2009). The samples are thirty students in Taekwondo UKM in UNESA who are divided into two groups. That is the experimental group and the control group. The data collection techniques are measuring the of power, agility, and resting pulse. Afterward, the data collection is analysed using SPSS series 20.0.

A quasi-experimental approach (quasi-experimental), using a matching-only design, is to pair subjects with one another, to obtain certain variables (Mustafa, 2019).

Results and Discussion

Based on the research on the effect of plyometric and ladder drill exercises on power, agility, and resting pulse rate in taekwondo athletes at state universities, the results are as follows:

Table 1. The Data of Power Variable Pre-test and Post-Test

No	Name	Power		*Agility*		Resting Pulse Rate	
		Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test
1.	BRY	93,6	98.7	11.42	10.99	58	54
2.	NR	92.5	96.6	12.3	11.97	76	71
3.	SM	74.5	84.5	12.63	12.36	62	58
4.	MYH	86.2	93.2	12.44	12.16	76	69
5.	ADY	67.8	75.8	12.73	12.26	69	63
6.	SM	74.8	84.2	12.69	12.5	77	74
7.	MK	70.39	75.7	13.72	13.37	73	65
8.	FR	58	69.7	12.76	12.41	87	76
9.	Average	74.35	82.46	12.54	12.15	71.9	65.7
Standard Deviation		1.2609	1.0621	0.6612	0.6608	8.1438	6.8968
Improvement%		10.9%		3.80%		9.43%	

The data taken from the pre-test and post-test on the variables of power, agility, and resting pulse in the plyometric group above, it is obtained a final test average of 82.46 and an initial test average of 74.35. The increase in power variables from pre-test to post-test was percentageed by 10.9%. Based on this percentage, it can be concluded that there is an increase in the plyometric group, the value of the power is greater than the agility.

Results of Descriptive Analysis of pre-test and post-test data on power, agility, and pulse variables:

Table 2. The Data of Agility Variable Pre-test and Post-Test

No	Name	*Power*		*Agility*		Resting Pulse Rate	
		Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test
1	ARS	80.3	84.5	12.34	11.79	57	55
2	ADT	88.2	92.1	12.05	11.39	76	73
3	YDH	62.5	67.14	12.03	11.27	63	58
4	AA	87.8	91.5	12.42	11.71	77	67
5	MNR	75.3	78.5	12.66	12.17	68	64
6	IPT	83	87.11	13.01	12.36	75	69
7	DA	74.5	79.2	12.62	11.89	78	69
8	M.A	66.1	72.5	13.65	13.07	67	58
9	IKH	60.7	66.3	13.03	12.37	73	68
10	MF	52.3	56.5	14.01	13.36	58	56
	Average	73.07	77.53	12.78	12.13	69.2	63.7
Standard Deviation		12.24065	11.80000	0.65352	0.66145	7.82872	6.42996
Improvement%		6.11%		5.30%		7.94%	

Based on the agility test, the average final test was 12.13 and the initial test average was 12.78. The increase in the agility variable from pre-test to post-test is 5.30%. Based on this percentage, it can be concluded that there is an increase in the plyometric group, getting a power value greater than agility.

Table 3. The Data of Resting Pulse Rate Variable Pre-test and Post-Test

No	Nama	*Power*		*Agility*		Resting Pulse Rate	
		Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test
1	ARS	80.3	84.5	12.34	11.79	57	55
2	ADT	88.2	92.1	12.05	11.39	76	73
3	YDH	62.5	67.14	12.03	11.27	63	58
4	AA	87.8	91.5	12.42	11.71	77	67
5	MNR	75.3	78.5	12.66	12.17	68	64
6	IPT	83	87.11	13.01	12.36	75	69
7	DA	74.5	79.2	12.62	11.89	78	69
8	M.A	66.1	72.5	13.65	13.07	67	58
9	IKH	60.7	66.3	13.03	12.37	73	68
10	MF	52.3	56.5	14.01	13.36	58	56
Average		73.07	77.53	12.78	12.13	69.2	63.7
Standard Deviation		12.24065	11.80000	0.65352	0.66145	7.82872	6.42996
Improvement%		6.11%		5.30%		7.94%	

Table 4. The Data of Pre-Test and Post-Test in Control Group

No	Name	Power		Agility		Resting Pulse Rate	
		Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test
1	MF	68.2	70.7	12.02	11.75	56	54
2	AAS	75.9	76.15	11.67	11.43	72	68
3	MLY	78.7	81.5	12.53	12.3	68	66
4	MNZ	79.2	80.4	12.19	11.94	73	70
5	ASN	98.1	98.15	13.48	13.29	77	74
6	DNY	71.6	75.6	13	12.77	67	64
7	MWC	74.2	76.8	12.74	12.47	79	75
8	AC	66.4	69.8	12.12	11.96	85	77
9	BY	59.6	64.8	12.89	12.78	77	73
10	JP	52	56.7	12.67	12.38	75	73
Average		72.39	75.06	12.53	12.30	72.9	69.4
Standard Deviation		12.45520	11.03871	0.53749	0.50782	7.93655	6.80196
Improvement%		1,36%		1,82%		5,49%	

Considering that the control group here only aims as a controller in the two experimental groups, the increase in the dependent variable is really caused by the form of treatment given to the two experimental groups. So, based on the table above, the increase in the two variables is relatively small.

Discussion

Plyometric is a type of exercise that aims to increase the power of an taekwondo athlete. If an athlete is going to kick, he must be able to jump or kick with his power to get points in his kick. The kick can be achieved when the leg muscle power of an athlete is good. According to Sukadiyanto (2011: 90) if a person carries out strength training correctly and in accordance with the training program, he will obtain

maximum kick technique results and increase bio motor components (speed, muscle endurance, coordination, power, flexibility and agility). To increase power in taekwondo matches, it is fundamental to find training methods which is capable to increase that strength.

Ladder drill is a type of exercise used to increase agility. This exercise is also very important not only for taekwondo athletes but also for other sports. By having good agility, they will be able to easily take kicks and other movements quickly and precisely. Good agility will make it easier for players to change direction to the opponent or avoid by the opponent's attack.

Based on the research of the effect of plyometric and ladder drill exercises on power, agility and resting pulse rate of UNESA Taekwondo UKM athletes, it is obtained that plyometric exercises turns out to have a better effect compared to ladder drill exercises in increasing power. On the other hand, ladder drill exercises have a better effect than plyometric in increasing agility. While the resting pulse rate of the two exercises did not have a significant difference.

This is in line with (Fajar & Iswahyudi, 2018) that plyometric exercises can increase from pre-test to post-test in which the performance of leg muscles increases significantly. The results of research conducted (Craig, 2004: Miller et al) in Yap (2006) that plyometric movements can increase power and agility. And plyometric training can be used in many sports such as wrestling, tennis, boxing, taekwondo and other sports. A plyometric exercise program using the circuit method which is carried out for eight weeks can significantly improve the vertical jump ability (Tukel, 2004). Nugroho (2009), in his research, found that circuit training can increase the ability to consume maximal oxygen (VO2 max).

Johnson explains that agility training results in neuromuscular adaptation, increases strength and power, reduces contact time with surfaces to produce higher strength. Another opinion is also explained by Yeh Joung et al (2009) who find that ladder drill exercises are effective in the condition of taekwondo athletes because of a significant increase in agility. Ladder drill training must be seen as an ability that can increase agility which can result a more specific influence. Milanovic (2013). This is also in line with the findings of Sherpard et al., (2005) that in speed, agility, and quickness exercises, one of the exercises on agility uses a ladder drill which contributes a lot to agility.

Dammon P.S (2011) argues that side hop plyometric exercises can increase leg muscle power. This exercise is excellent for improving the ability of sideways kicking, dodging, or attacking in the sport of taekwondo, whereas ladder drill which can increase agility which is supported by the results of previous research. According to Sherpard (2005), in his research, states ladder drill training by crossing the stairs quickly can increase the agility of athletes.

Pulse can be used as an indicator to measure the level of someone's physical condition. In daily practice the pulse rate is also often used as a standard for intensity (Janssen, 1993: 20). Resting pulse is a palpable wave in the arteries when blood is pumped out of the heart when the body is not doing strenuous activities, Syaifudin, 2006:126 (in Budiarsa, 2012). Resting pulse rate and physical condition can be related that the lower the pulse rate at rest, the better the physical condition.

From the result of the research and supported by the results of previous studies, it shows that power and agility can contribute to the plyometric. Ladder drill can also contribute to increase agility if the training programs have been applied based on training principles and adapted to the athlete's needs. They can contribute specially to increasing power, agility in taekwondo athletes in particular. Thus, it can be concluded that to increase power and agility in taekwondo athletes, plyometric and ladder drill exercises can be given.

Conclusion

Based on the results of the research and discussion that have been described in the previous chapter, the conclusions in this study can be stated as follows:

1. Plyometric training has a significant effect on increasing leg muscle power by 10.9%
2. Plyometric training has a significant effect on increasing agility by 3,08.%.
3. Plyometric training has a significant effect on resting pulse rate of 9.43%.
4. Ladder drill training has a significant effect on increasing leg muscle power by 6.11.1%.
5. Ladder drill training has a significant effect on increasing agility by 5.35%. Ladder drill training has a significant effect on increasing pulse rate by 7.94%.
6. Plyometric training and ladder drill have different effects on increasing leg muscle power and agility. Plyometric training is more effective than ladder drill and control group, while for the resting pulse rate, there was no significant difference in both exercises

Short Biography

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