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The Effect of Plyometric Training and Resistance on Movement Speed in Jombang Basketball Club Players

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ABSTRACT
Basketball is a team sport that requires optimal physique; many training models that improve physique include plyometrics and resistance. The purpose of this study was to determine the effect of plyometric training and resistance on movement speed in basketball club players. This type of research is quantitative research with experimental methods and designs using a pretest-posstest design. The subjects of this study consisted of 20 athletes who participated in training at the Jombang Basketball Club and would be given plyometric and resistance training treatments. Data analysis techniques in the study using the T test Based on the results of uji-t obtained in the group given plyometric training, the t count was 1.140 > 1.833, while in the resistance exercise group, the t count was 9.085 > 1,833. From the results of variables tied to each research group, it can be interpreted that there are differences between pre-test and post-test. Based on this study, it can be concluded that plyometric and resistance training have a significant influence on increasing the movement speed of basketball club players.

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INTRODUCTION

Sport is an inseparable part of the needs of everyday human life. In general, exercise is an activity carried out to improve body fitness and maintain a healthy body. Sports are practised by all age levels and groups in society in general. Sports coaching is specifically aimed at optimal performance improvement.

Sports achievements cannot be achieved in an instant; they require programmatic, regular, and measurable training involving various disciplines of science and technology. This is in line with the opinion of Ambarukmi et al. (2007) that to achieve maximum achievement, exercise theory supported by various sciences is required, and coaches play

an active role in the achievements obtained by athletes. A coach is someone who has the professional ability to help reveal the potential of sportsmen into real abilities optimally in a relatively short time (Sukadiyanto & Muluk, 2011).

Physical condition is very important to pay attention to because it will affect the biomotor ability of athletes. One of the prerequisites needed to improve an athlete's achievements is physical condition. This is in line with the opinion of Bompa (2009), which states that achieving achievements is determined by four training factors: physical preparation, technical preparation, tactical preparation, and mental preparation. The pyramid of exercise factors according to Bompa, which is the relationship of the four factors, can be reviewed in the figure.

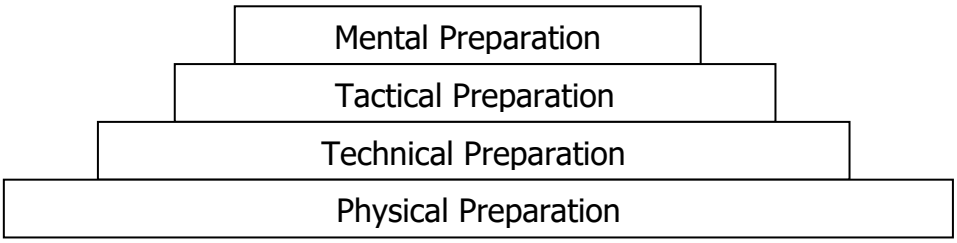

Figure 1. Image of the Exercise Factor Pyramid (Bompa, 2009)

Basketball is one sport that requires good physical condition for each player or athlete. Basketball can be said to be a complex sport because playing it requires special techniques and tactics. The JBC basketball club (Jombang Basketball Club) not only emphasises tactical and tactical training, but physical training also plays a role in training activities. In the championship conducted by East Java Province for the 15th age group, JBC is only ranked in the top 4. In jurprov, the result of the coach's evaluation is that the athletes' physique is lacking, so the movements when defensive are slow and the opponent's movements are not anticipated when offensive. One of the steps needed to support the physique is excellent movement speed training.

Movement speed is one of the basic biomotor skills needed in every sport. Speed is the ability of muscles to answer stimuli in the shortest possible time (Sukadiyanto and Muluk, 2011). According to Sajoto (1988), speed is a person's ability to perform continuous movements in the same form in the shortest possible time. Speed is the rate of muscle movement in a short time, both for body parts (arms, hands, and legs) and for the whole body to move. Speed is highly dependent on strength because, without strength, speed cannot be developed. There are many kinds of speed training, including plyometric exercises and resistance exercises.

Plyometric training was originally a training programme to increase the speed of elite athletes (Chu, 2013). The definition of plyometric exercise is a form of exercise that allows muscles to reach maximum strength in the shortest time. The nature of muscle elasticity is also needed to obtain functional adaptations in muscles so that muscle coordination becomes better and can make strength more explosive (Nabizadeh, 2013). Meanwhile, according to Kumar (2013), plyometrics is a type of exercise made to produce speed and strong movements and improve nervous system function, generally for the purpose of improving performance in certain sports. In this case, there are two plyometric exercises used: the Lateral Cone Hop and Zigzag Drill.

Resistance training is an integral part of almost every form of athletic exercise and has become a popular mode of recreational exercise for many physically active individuals (Volek 2004). According to Bird, Tarpenning, and Marino (2005), resistance training is also known as strength training or weight training and is often used as an effective exercise method to

develop muscle fitness. Weight training is now recognised as an exercise programme that will effectively improve strength, jumping ability, endurance, and movement speed (Ahmadi, 2007). In resistance training, there are two kinds of training models used, namely squats and lying leg curls.

Based on the explanation of the background above, the author feels interested in taking on the problem of the effect of plyometric training and resistance on movement speed in Jombang Basketball Club (JBC) players.

MATERIALS AND METHODS

This type of research is pseudo-experimental. Experimental research is research that is carried out strictly to find cause and effect among variables. One of the main characteristics of experimental research is the presence of treatments (Maksum, 2012). The design used in this study is Arikunto's (2010) "two-group pretest-posstest design". In this study, two variables were formed, namely the independent variables of plyometric exercise and resistance, while the other variables were bound to the speed of motion. The subjects in this study were basketball players at the Tri Darma Jombang basketball club, totaling 20 players, who actively participated in training and were aged between 15 and 16 years. The data collection technique in this study is a test. In this study, both the pretest and posttest methods used a 30-metre running test.

RESULTS AND DISCUSSION

Result

Description data from pretest and posttest results resulting from plyometric training and resistance to movement speed using the 30 metre running test will be presented in the table below, which includes the highest value, lowest value, average value, and standard deviation.

Table 1. Description of 30 Meter Running Test Results

Data Description	Pretest plyometric	Postest plyometric	Pretest	Postest
			Resistance	Resistance
Top marks	4,76	4,64	4,79	4,88
Lowest score	4,31	4,23	4,36	4,24
Average	4,57	4,42	4,59	4,49

Based on the table above, it can be seen that the results of the 30-metre running test at the time of the plyometric group pretest had an average of 4.57, the lowest value was 4.31, and the highest value was 4.76. In the plyometric group with an average of 4.4 2, the lowest value is 4.23 and the highest value is 4.64, while in the resistance group with an average of 4.5 9, the lowest value is 4.36 and the highest value is 4.79. Posttest resistance group with an average of 4.4 9. The lowest value is 4.24 and the highest is 4.88.

A paired sample t-test is a statistical analysis technique used to see whether there is a difference in the mean of two groups of paired samples. The paired sample in question is the same sample used in the test, but the sample is carried out twice at different times. In this case, what is tested is data from the pretest and posttest of the 30-metre running test. The results of the data analysis are as follows:

Table 2. Paired samples test

Paired Differences		plyometric Pretest_Postest_	Pretest_Postest_ resistance
Mean		0,125	0,100
Std. Deviation		0,060	0,028
Std. Error Mean		0,019	0,009
95% confidence interval	Lower	0,081	0,069
of the differenc	Upper	0,168	0,120
T		11,140	9,085
Df		9	9
Sig. (2-tailed)		0,000	0,000

When testing one-sided, the decision is that if tcounts> t table, then it can be interpreted that H 0 is rejected and H 1 is accepted, and vice versa. With a significance level of α = 0.05 and a degree of freedom (df: degree of freedom) = n – 1, and the α value used is 0.05 and df = 9 (10 – 1), then the magnitude of ttable is 1.833. Based on table 4.4 above, in the plyometric exercise group, t count>ttable (1, 1.140>1.833), H0 is rejected, meaning that there is a partial significant influence between the pre-test and post-test results of resistance training, while in the resistance training group, t count>ttable (9.0, 8, 5>1.833), H0 is rejected, meaning that partially there is a significant influence between the pre-test and post-test results of resistance training on the movement speed of Jombang Basketball Club players.

DISCUSSION

Based on the explanation above, it shows that plyometric training can increase the speed of movement of athletes, in accordance with the research of Haghighi (2012), which examined the effects of plyometric training and resistance training on the speed of young soccer players. That results from research reporting that both plyometric and resistance forms of exercise can improve the speed of young soccer players. Likewise, the results of research conducted by Zaerei (2013) showed that plyometric training has a significant effect on increasing 60-metre sprints in young female Taekwondo players. Plyometric exercises change the speed of eccentric and concentric contraction stages in a stretch-contraction cycle; improvement in these two stages can result in a decrease in the time interval between eccentric and concentric contractions (Zaerei, 2013). With the support of previous studies, it shows that there is an increase in movement speed as a result of the provision of plyometric exercises.

Resistance training can increase the speed of movement, in line with the results of Zaerei's research (2013), which explains that strenuous exercise can increase the speed of message transfer from nerve muscles and vice versa. This increases the transfer rate when stimuli are converted into nerve currents and speeds up nerve flow from efferent neurons to muscles, so that strenuous exercise can reduce performance time and increase speed. Kraemer and Ratamess (2003) add that resistance training plays a role in improving athletic performance by increasing muscle strength, speed, hypertrophy, local muscle endurance, motor performance, balance, and coordination. The key to success in resistance training at any fitness level or age is the design of an appropriate programme. Ronnestad in Zaerei (2013) examines the effect of plyometric training and resistance on the speed of professional soccer players. They reported that training increased the speed of players in both the plyometric training group and the resistance training group. Lyttle in Zaerei (2013) shows that resistance training exerts a significant effect on the speed of athletes. With the support

of previous studies, it shows that there is an increase in movement speed as a result of the provision of resistance training.

The plyometric training process has a greater influence on increasing the speed of movement when compared to resistance training. This is because plyometric exercises produce elastic energy, which causes better muscle functional adaptation and muscle coordination, while in resistance training there is no elastic energy.

CONCLUSION

The conclusion in this study is based on the results of testing the hypothesis that has been obtained that there is an effect of plyometric training and resistance on movement speed in Jombang Basketball Club players.

CONFLICT OF INTEREST

There is no conflict of interest in the elements of the data or research being carried out.

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