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Effect of Reactive Agility Training Drills on Speed and Agility in Indonesian University Students

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Abstract

The purpose of this research was to determine the potential training effect of reactive agility in improving speed and agility. This study was conducted on 36 students and divided into 3 groups with 12 students per groups. Group 1 was given lateral mirror drill, Group 2 sprint mirror drill, and Group 3 conventional training for a period of 8 weeks, 3 times/week with a day off. Performance measures of agility and speed were assessed via the T-test for agility and 30m sprints for speed, respectively. Data was analyzed using paired sample t-test and multivariate analysis of variance. The result of this study found that there was a significant effect of sprint mirror drill to improve speed and agility; there was a significant effect of lateral mirror drill in improving speed and agility; there was a difference effect of lateral mirror drill and sprint mirror drills in improving speed and agility. Conclusion: these data provide preliminary support of incorporating reactive agility drills such as the sprint mirror and lateral mirror drills in improving performance measures of speed and agility.

Keywords: Training; Reactive agility; Physical fitness; Speed; Agility.

1. Introduction

Reactive Agility Training (RAT) is an exercise method often used in an attempt to improve agility and speed. The used of RAT is suggested to improve an athlete ability to read and react to stimuli, which in turn may increase the aspects of agility performance (Holmberg, 2009), by improving anticipatory and/or decision-making responses to movement (Sheppard *et al.*, 2006). Therefore, may be described as anticipation and/or decision-making ability with a rapid change of pace or direction in response to stimuli (Oliver and Meyers, 2009). RAT can be used to improve agility with model of exercises lateral mirror drill and sprint mirror drill (Holmberg, 2009). Agility is the ability to maintain and control the position of the body when changing direction quickly (Sporis *et al.*, 2010a). In addition, the ability of an athlete's agility to change direction, make a quick stop and do a quick movement, smooth, efficient and repetitive (Sporis *et al.*, 2010b). Furthermore, agility is the ability to maintain control of the position of the body when changing direction quickly during a series of movements (Bal *et al.*, 2011).

A good agility must be supported by the ability of speed, flexibility, and balance (Bompa, 2015). Agility is the product of a complex combination of speed, coordination, flexibility, and power. Agility is a product of complex combination between speed, coordination, flexibility, and strength. Can be interpreted, agility (agility) is a product of a complex combination of speed, coordination, flexibility, and strength. Agility is a person's ability to be able to change body position and movement direction quickly and precisely without losing his balance while on the move. Agility is closely with levels of speed, flexibility, and balance. Without the support of these three aspects, someone is not going to move with good agility. Speed is the ability of a muscle or group of muscles to respond to stimuli in the fastest time or shortest possible. Velocity or speed is the ability to perform continuous motion, in the same form in the shortest possible time (Bompa, 2015). So it can be said that speed is the ability to perform similar movements in a row in the shortest possible time, or the ability to travel a distance in the shortest possible time.

RAT is a method of training to improve agility. RAT could be used as a suggestion to train athletes in reading and reacting to stimuli key, which will ultimately improve agility (Holmberg, 2009). RAT is a training of anticipation and decision-making in response to the movement (Sheppard *et al.*, 2006). So it can be stated that the method of RAT is not only to increase agility, but also can improve the anticipation and reading the movement of the target. There are some models training methods of RAT such as lateral mirror drill and sprint mirror drill. Training model of lateral mirror drill is a form of exercise to improve agility and speed. Exercises that emphasize movements changing direction, stop, and move abruptly, which in turn will increase the agility and speed. Exercise sprint models mirror drill is a form of exercise to improve speed and agility. The form of exercise is to train athletes to run and stop quickly. However, in this study the researchers modified two lateral mirror forms of the exercise drill and sprint drill with unpaired mirror so it is easy to control the speed at the time of exercise. Because if paired, the speed will be difficult to control when athletes act as a leader and partner during training. In addition, ladder speed run and

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repeated sprint ability training can improve agility and speed (Kusnanik and Hartati, 2017). Therefore, the aim of the present study is to examine alternative training methods to improve agility and speed through the use of lateral mirror drill and sprint mirror drill. The main purpose of this study was to analyze the difference effect of Reactive Agility Training (RAT) using lateral mirror drill and sprint mirror drill in increasing speed and agility.

2. Materials and Methods

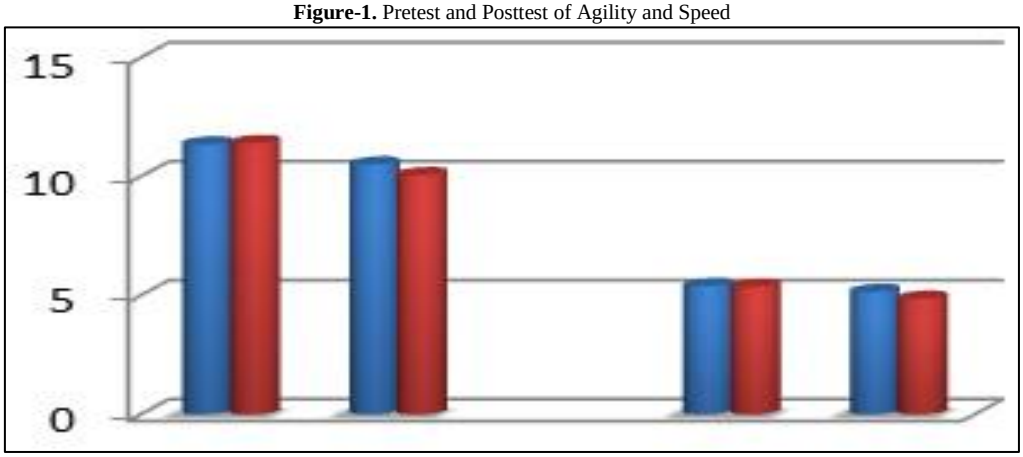
This study was conducted at 36 male university students with mean aged of ± 20,23 years old, then it was divided into 3 groups with 12 students each groups using ordinal pairing system. Group 1 was given RAT treatment using lateral mirror drill; Group 2 using sprint mirror drill, and Group 3 was given conventional training. Participants were asked to fill the informed consent for the research project. In addition, participants have to attend the exercise for training program (treatment) that have been made for three times a week during 8 weeks periods (24 times).

Instruments of this research were T-test (Miller *et al.*, 2006) for agility and 30m sprints test (Newman, 2007) for speed. Data was analyzed using paired sample t-test with α= 0,05, and multivariate analysis of variance with significant level of 5% using SPSS program 25.0.

3. Results

Group1 displayed an increase in agility after giving treatment for eight weeks. It can be seen from the mean values of 11.34±0.46 seconds for pretest and 10.50±0.29 seconds for posttest. The result of the speed showed that there was an increase in speed with mean value of 5.39±0.29 seconds for pretest and 5.14±0.23 seconds for posttest. In addition, Group 2 showed an increased in agility with mean time decreasing from 11.40±0.72 seconds to 10.05±0.52 seconds. In addition, there was an increased of speed with sprint time decreasing from 5.36±0.19 seconds to 4.86±0.12 seconds, as presented in Figure 1.

Figure-1. Pretest and Posttest of Agility and Speed



To determine the effect of exercise reactive agility training (RAT) models using sprint lateral mirror drill and sprint mirror drill, then using the t-test in SPSS called a paired t-test. The results of data showed that there was a difference before and after treatment of each dependent variable (agility and speed) in both experimental Group 1 and Group 2. This indicated that the significant level of each variable of 0.000,

$p<0.05$. It can be stated that there was a difference after giving RAT models of drill lateral mirror drill and sprint mirror drill. However, in the control group there was also differences, although the difference was relatively small when compared to the second experimental group.

To determine differences in dependent variables between groups used analysis of variance. As was explained earlier that to test the hypothesis could be done after the data were normally distributed and homogeneous. Therefore, these criteria have been met; the next step can be used multivariate analysis of variance. For the purposes of multivariate analysis of variance, the data of the control groups were tested together with the data in the two experimental groups. MANOVA was to test differences result from the dependent variables (speed and agility) in the group based on the independent variables could be done by using multivariate test. The results of multivariate tests can be seen in the Table 1.

Table-1. Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.967	471.185[b]	2.000	32.000	.000
	Wilks' Lambda	.033	471.185[b]	2.000	32.000	.000
	Hotelling's Trace	29.449	471.185[b]	2.000	32.000	.000
	Roy's Largest Root	29.449	471.185[b]	2.000	32.000	.000
Methods	Pillai's Trace	.896	13.389	4.000	66.000	.000
	Wilks' Lambda	.110	32.200[b]	4.000	64.000	.000
	Hotelling's Trace	8.020	62.152	4.000	62.000	.000
	Roy's Largest Root	8.013	132.210[c]	2.000	33.000	.000

Table 1 displays the Wilks' Lambda data set. Differences increased of dependent variables (agility and speed) together in the study groups. The results found that the value Sig of Wilks' Lambda was 0,000. Thus for the Sig <0.05, there was a difference increased of agility and speed in all three study groups. If there is a difference effect between groups it was continued using post hoc multiple comparisons with least significant analysis of a difference (LSD) in the SPSS program series 20 in an attempt to see the independent variables which provide significant effect on the increase of the dependent variable. The results of the LSD post hoc test for agility can be seen in the following Table 2.

Table-2. Post-Hoc Test with LSD for Agility

Groups		**Mean difference**	**Significant (p)**
Group 1	Experiment 2	-0,5150	0,001
	Control	0,4858	0,001
Group 2	Experiment 1	0,5150	0,001
	Control	1,0008	0,000
Control Group	Experiment 1	-0,4858	0,001
	Experiment 2	-1,0008	0,000

Another finding depicted in Table 2 displays significant differences among the three groups. It can be seen from the mean difference, that the experimental Group 2 more optimal on speed improvement compared to the experimental Group 1 or control group. Similarly, in speed showed that the experimental Group 2 is more optimal than other groups, as shown in the Table 3.

Table-3. Post-Hoc Test with LSD for Speed

Groups		Mean difference	Significant (p)
Group 1	Experiment 2	-0,2450	0,000
	Control	0,1533	0,008
Group 2	Experiment 1	0,2450	0,000
	Control	0,3983	0,000
Control Group	Experiment 1	-0,1533	0,008
	Experiment 2	-0,3983	0,000

Another important finding in Table 3 showed that there were significant differences among the three groups. The difference can be seen in the mean difference, so from these differences it gave a meaning of differences effect to increase of agility between the study groups. This conveys an important messages that from different test results between groups from dependent variables (agility and speed) can be concluded that sprint mirror drill gave a larger increased than the lateral mirror drill and training in the control group.

4. Discussion

Agility and speed are important components of fields and court of sport athletes. Most of sports require good agility and speed. Agility has important role to change direction, either to pursue or avoid opponents and react to the movement of the ball (Young *et al.*, 2001). Furthermore, agility is also supported in combination of the other components of successful running-based sports, such as speed. Agility is a product of a complex combination of speed, coordination, flexibility, and strength (Bompa, 2015). The finds suggest that the ability of speed, agility in the current cohort of Indonesia University students may be improved in order to improve aspects of changing (Kusnanik and Rattray, 2017). Activities that involve short and more intense in running periods require an equal proportion of energy system not only aerobic but also anaerobic energy systems (Kusnanik *et al.*, 2018). The exercise program reactive agility training (RAT) models using lateral mirror drill and sprint mirror drill can be used to improve the ability of agility and speed. The results of this study are relevant to the study results from (Holmberg, 2009; Oliver and Meyers, 2009; Sheppard *et al.*, 2006; Young *et al.*, 2001).

Group exercise program reactive agility training (RAT) model of lateral mirrors showed an improvement in agility and speed. Ability of agility and speed group of lateral mirror drill exercise increased from pretest to posttest. The results of these studies can be said that lateral mirror drill exercises have significant effect to increase agility and speed. Reactive agility training (RAT) is an exercise to develop motor skills with the aim to improving the movement coordination to achieve maximum movement (Holmberg, 2009). In general, the speed performance can be optimized with effective training programs that improve both the nerve and muscle characteristics (Johnson and Bujjibabu, 2012). These results provide clear evidence that the practice of reactive agility training (RAT) model of lateral mirror drill is one form of exercise in order to increase agility and speed.

Performance on agility and speed group exercise program of reactive agility training (RAT) models sprint mirror drill increased from pretest to posttest. The findings in this study supported by some studies before Miller *et al.* (2006), Young *et al.* (2001). Exercises with stops, starts to move and change direction explosively need components that can assist in developing agility. In sports, athletes are required to accelerate, slow down and change direction throughout the game (Sheppard *et al.*, 2006).

A good agility must be supported by several components such as speed. Agility is also supported by two key components: speed in changing direction and cognitive factors (Sheppard *et al.*, 2006). The increased of power

could provide a partial explanation for the observed increase in speed. Therefore, it has been shown that muscle strength associated with running performance (Young *et al.*, 1995). By improving balance and body control position during movement, agility must increase theoretically (Bal *et al.*, 2011). Theoretically reactive exercises agility training (RAT) besides to increase agility also to increase speed. In practice reactive agility training (RAT) models sprint mirror drill is required to run quickly in accordance with a specified distance, then turned quickly without losing balance and so on until the specified limits. This suggests, that in theory, training reactive agility training (RAT) can increase aspects of agility and speed.

In agreement, previous research report that in reactive agility training (RAT) models, sprint mirror drills, are one training that aims to improve agility and speed. This is supported by studies from Bal *et al.* (2011), reactive agility training (RAT) is one form of exercise agility for programming the motor through the enhancing, neuromuscular and neurological adaptations (muscle spindles, golgi tendon organs, and joints proprioceptors). In the current study, the control group demonstrated, no significant difference, although there was some improvement in agility and speed. When comparing the three groups (Group 1) demonstrated the greatest improvement in agility and speed.

5. Conclusion

The result of this study provide preliminary support of the positive effect of RAT, model lateral mirror drill and sprint mirror drill to increase agility and speed. Secondly, the sprint mirror drill is more effective in increasing agility and speed than lateral mirror drill.

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