EFFECT OF LADDER SPEED RUN AND REPEATED SPRINT ABILITY IN IMPROVING AGILITY AND SPEED OF JUNIOR SOCCER PLAYERS

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Abstract

The main purpose of study was to analyse the effect of ladder speed run and repeated sprint ability exercise in improving agility and speed. The research was conducted on 33 junior soccer players in Surabaya with age between 15 – 17 years old. There were three groups with 11 participants in each group: Group 1 was given treatment of ladder speed run, Group 2 repeated sprint ability, and Group 3 control group. Data was collected by testing of speed and agility using 30m sprint and Illinois agility test. Data was analysed using paired t-test and One Way Anova with α = 0,05. Results: There was a significant effect of ladder speed run exercise on speed and agility with $t_{7.302} > t_{1.833}$ and $t_{7.872} > t_{1.883}$, respectively. In addition, there was a significant effect of repeated sprint ability on speed and agility with $t_{7.934} > t_{1.833}$ and $t_{8.693} > t_{1.833}$, respectively. There were significant differences between the three of groups in speed with $t_{6.281} > t_{3.35}$. Furthermore, there were significant difference between the three of groups in agility with $t_{3.473} > t_{3.35}$. Group 2 was better than Group 1 and Group 3 in increasing agility and speed. Conclusion: There was significant effect of ladder speed run and repeated sprintability in increasing agility and speed.

***Key words**: ladder speed run, repeated sprint ability, agility, speed, soccer players*

Introduction

Physical fitness is very important for athletes in order to get high performance in their sports. There are some methods to improve agility and speed including ladder drills and repeated sprints. Ladder drillis a training method that can be used to improve speed, agility, and quickness. Athletes run or jump quickly using ladder equipment in order to increase speed, agility, and quickness. Standard equipment of ladder is about 10 yards length with using 18 inches each square, it can be constructed by using rope, stick, or tape. The activities using ladder drills can make the body to respond rapidly some level of movements that are used in the competition. Enhancement of athletes speed, agility, and quickness can be done with some exercises including ladder drills. The advantages of ladder drill exercises are speed legs that are needed by athletes in order to change direction quickly. In addition, it can prevent of injury, stabilisation, coordination and explosiveness. There are so many types of ladder drills, however in this study using ladder speed run. Ladder speed run is a drill ladder forms of exercise by running, alternating feet into the ladder. Runners landed right leg and left foot alternately into the ladder without any ladder box is missing. Repeated sprint ability (RSA) have the same meaning as short sprint training which one form of exercises to improve running speed with emphasis on the development of speed (ATP-PC energy system) and muscle strength. Type of repetition sprints exercise consist of repeat sprints at the maximum speed. The maximum speed can be reached at (~15-20 m or steps 8-10), trunk upright position, speed and step length contributes to the speed of movement (Bompa and Haff, 2009). Repeated sprint ability

can be described as the ability of athletes to recover or maintain maximal effort during subsequent sprints, which is an attribute considered interspersed with brief recovery bouts (≤30 seconds) (Turner, 2013). Repeated sprint ability is running at maximal speed with complete recovery between repetition. It means that the practice of repeated sprint ability is a form exercise with repeated sprint at maximum speed with complete recovery period between the repetition. A practice running sprint are performed with maximum speed repeatedly interspersed with periods of recovery of origin between replicates perfectly done. Exercise repeated sprint ability increase ATP-PC energy system by 90%, energy systems LA and O_2 of 6%, energy system by 4% O_2 (McKeag and Moeller, 2007).Practice repeated sprint abilityis a form of sprint exercises conducted by the repeated sprint ability with maximum speed, repeatedly punctuated by perfect rest periods (recovery) on every repetition. Speed drills can make huge physiological stress in athletes. Various factors that influence the speed is flexibility, body type, age, and body mass. In addition, the speed can be built with sprint short distances (20-80 m) done with high intensity (90-100% of the maximum) with a long break of 3-5 minutes between repetitions, and 6-8 minutes between sets (Bompa and Haff, 2009). To measure the speed of the participants using 30 m sprint. Ladder speed run and repeated sprint ability are the training methods that can increase physical fitness including agility and speed. Therefore, the main purpose of study was to analyzed the effect of ladder speed run and repeated sprint ability to improve agility and speed in junior soccer players.

Material and methods

The research was conducted at soccer field in Surabaya during 8 weeks periods with frequency of 3 times a week. The participant of this study was 33 junior soccer players with mean age of 16.6±1.2 years old and range between 15 – 17 years old. There were three groups with 11 participants in each group using ordinal pairing system. Group 1 was given treatment of ladder speed run, Group 2 repeated sprint ability, and Group 3 control group. The treatment was 5 times at week 1-2, then it was increased 6 times at week 3-4, 7 times at week 5-6, and 8 times at week 7-8. Set of the training was 3 set with interval recovery 1:12. Group 2 was given repeated sprint ability with intensity of 90-100% (weeks 1-4 were 90%; weeks 5-8 were 100%). Participtans did maximum sprint of 40m metres length with 10 repetitions and interval of 15 seconds at each repetition. Group 3 was given conventional exercise. Data was collected by testing of speed using 30m sprint and testing of agility using Illinois agility test. The best time of 3 times trial was used as the data of agility and speed. One Sample Kolmogorov Smirnov was used to test the normality of the data. Lavene's Test was used to test the homogenity of the data. Paired sampel t-test was used to analysis whether there was any difference in the mean of the two groups of samples in pairs. One Way Anova was used to test the average of more than two samples differ significantly or not.

Results

It is very crucial to know that results showed the mean speed of Group 1 was 4.65±0.23 seconds with a range of 5.08 – 4.12 seconds (pre test) and 4.45±0.19 seconds with a range of 4.78 – 4.10 seconds (post test). The mean agility of Group 1 was 18.40±0.85 seconds with a range of 19.54 – 17.01 seconds (pre test) and 17.57±0.85 seconds with a range of 18.68 – 16.22 seconds (post test). The results also found that mean speed of Group 2 was 4.66±0.20 seconds with a range of 5.10 – 4.31 seconds (pre test) and 4.43±0.18 seconds with a range of 4.85 – 4.22 seconds (post test). The mean agility of Group 2 was 18.44±0.84 seconds with a range of 19.84 – 17.03 seconds (pre test) and 17.52±0.78 seconds with a range of 18.86 – 16.28

seconds (post test). In addition, the results found that mean speed of Group 3 was 4.73±0.20 seconds with a range of 4.98 – 4.36 seconds (pre test) and 4.71±0.19 seconds with a range of 4.94 – 4.34 seconds (post test). The mean agility of Group 3 was 18.39±0.78 seconds with a range of 19.79 – 17.40 seconds (pre test) and 18.37±0.77 seconds with a range of 19.76 – 17.38 seconds (post test). Those data showed that all the data increased from pre test to post test not only data for speed but also agility. However, Group 3 was only slightly increased compared to Group 1 and Group 2 in both speed and agility. The results of paired sample t-test found that speed variable was $t_{7.302} > t_{1.833}$. It means that there was a significant effect of ladder speed run exercise on speed. In addition, agility variable was $t_{7.872} > t_{1.883}$, it can be said that there was a significant effect of ladder speed run exercise on agility. Furthermore, data of speed variable showed that $t_{7.934} > t_{1.833}$, it means that there was a significant effect of repeated sprint ability on speed. Data on agility variable was $t_{8.693} > t_{1.833}$, it can be said that there was a significant effect of repeated sprint ability on agility. This conveys an important finding that ladder speed run and repeated sprint ability have significantly effect to improve agility and speed.

Table 1. One Way ANOVA Post-Test for Speed between Groups

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,484	2	,242	6,821	,004
Within Groups	,957	27	,035		
Total	1,441	29			

As clearly show in Table 1 that difference between three groups for speed was $t_{6.281} > t_{3.35}$, it can be said that there were significant differences between three of groups in speed. Clearly depicted in Table 2 that post hoc test using Least Significant Difference (LSD) showed that there were significant difference between the three of groups. Group 2 (repeated sprintability) was better than Group 1 (ladder speed run exercise) or Group 3 (control group) in increasing speed.

Table 2. LSD Test for Speed

Multiple Comparisons						
Dependent Variable: Post test for speed LSD						
(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Ladder Speed Run	Repeated Sprint Ability Group	-,03600	,03374	,295	-,1052	,0332
	Control Group	,17700*	,03374	,000	,1078	,2462
Repeated Sprint Ability	Ladder Speed Run	,03600	,03374	,295	-,0332	,1052
	Control Group	,21300*	,03374	,000	,1438	,2822
Control Group	Ladder Speed Run Group	-,17700*	,03374	,000	-,2462	-,1078
	Repeated Sprint Ability Group	-,21300*	,03374	,000	-,2822	-,1438
*. The mean difference is significant at the 0.05 level.						

Table 3. One Way ANOVA Post-Test for Agility between Groups

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4,525	2	2,263	3,473	,045
Within Groups	17,590	27	,651		
Total	22,115	29			

Table 4. LSD Test for Agility

Multiple Comparisons						
Dependent Variable: Post Test for Agility LSD						
(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Ladder Speed Run Group	Repeated Sprint Ability Group	-,09900	,05919	,106	-,2204	,0224
	Control Group	,34300[*]	,05919	,000	,2216	,4644
Repeated Sprint Ability Group	Ladder Speed Run Group	,09900	,05919	,106	-,0224	,2204
	Control Group	,44200[*]	,05919	,000	,3206	,5634
Control Group	Ladder Speed Run Group	-,34300[*]	,05919	,000	-,4644	-,2216
	Repeated Sprint Ability Group	-,44200[*]	,05919	,000	-,5634	-,3206
*. The mean difference is significant at the 0.05 level.						

Another crucial finding as clearly depicted in Table 3 showed that the results of one way Anova for agility between groups was $t_{3.473} > t_{3.35}$.

Table 4 indicated that there were significant differences between the three of groups in agility.

Group 2 (repeated sprint ability) was better than Group 1 (ladder speed run exercise) or Group 3 (control group) in increasing agility.

Disscussion and Conclusion

Speed is one component of physical condition that is very important to be improved because it comes to an athlete's ability while using his mucles or receives loads in particular work. While, agility is the ability of a person to be able to do some quickly movements at the time of transfer from one type of movement to other movements mainly to change the direction of movement without losing balance. Agility is very important for a sport that requires a high adaptability to changes in the situation of the game including soccer. In this agility components already included elements of dodge quickly, changing the position of the body quickly, moving then stop and continued to move quickly. Agility and balance are the two factors which are interrelated and needed to do sports activities (Ghosh, 2012). Agility is a component of physical condition that is very important in sport skills in which require rapid movements, stop quickly and changes direction quickly. Agility is the basis for a good performance in all kinds of sports. Ladder speed run repeated sprint ability are the training methods that can increase speed and agility. These exercises can be applied for soccer players in order to have good performance during the games especially for speed and agility. To develop agility performance should be based on applying the ability to change direction of the body in a certain position (change of direction) quickly so that a soccer player can move faster and more agile while still maintaining control to the ball (Sporis, et al, 2010).Repeated sprintability was better than ladder speed run, it because of the training pattern of movement seen that running with repeated sprints at the maximum speed. Maximum speed can be reached with trunk upright position, running speed and stride length quickly. It is supported by Bompa and Haff (2009)that describes the maximum speed reached at (~15-20 m or steps 8-10), trunk upright position, speed and step length contributes to the speed of movement. Short duration of sprints that less than 10 seconds, interspersed with brief recoveries less than 60 seconds are very common during the game situation at most team or sports that use racket. Therefore, the ability to recover and to reproduce performance in subsequent sprints is probably an important fitness requirement of athletes engaged in this disciplines (Girard, et al, 2011). Agility with speed represents the first step most significant motor skills of soccer players. Furthermore, soccer players requires to perform numerous actions that require strength, power, speed, agility, balance, stability, flexibility, and endurance (Milanovic, et al, 2013). Both exercises can provide significant impact on the speed and agility which are very important to have for soccer players. Soccer as a typical intermittent type sport, incorporates various explosive ballistic motions such as sprinting, kicking, jumping, accelerations or decelerations, tackling, changes of direction, and turning (Michailidis, et al, 2013).In soccer games such as tackle, block opponents and overcome physical challenges to make the speed and agility so important in soccer (Reilly, 2007). In constant body will be required to perform the movement of various degrees and joints. Therefore, the speed and agility can be regarded as the dominant element in the game of soccer. Some of the ways or methods of training can be used to support both to improve the speed and agility of an athlete

including ladder speed run and repeated sprint ability. It can be said that the two training methods that are ladder speed run and repeated sprint ability have a significant effect is true accordance the existing theories. Of course, in practise can't be separated from the manifestation of the training principles applied in training of a specialized training program in order to improve the speed and agility of the soccer players. It can be concluded that there was significant effect of ladder speed run and repeated sprint ability exercise in increasing agility and speed. Repeated sprint ability was better than ladder speed run in improving speed and agility. These findings highlight that repeated sprint ability can be important as training method to improve agility and speed for junior soccer players.

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UTJECAJ BRZINE OKRETAJA LJESTVICE I PONAVLJANE SPRINTNE SPOSOBNOSTI U POBOLJŠANJU AGILNOSTI I BRZINE MLADIH NOGOMETAŠA

Sažetak

Glavna svrha istraživanja bila je analizirati učinak pokretanja brzine ljestvice i vježbanje vježbanja u sprintu u poboljšanju agilnosti i brzine. Istraživanje je provedeno na 33 mlađeg nogometaša u Surabayi u dobi između 15 i 17 godina. U svakoj skupini bilo je tri skupine sa 11 sudionika: 1. skupini je dana obrada brzine za ljestvicu, sposobnost ponovnog sprinta u skupini 2 i kontrolnoj skupini grupe 3. Podaci su prikupljeni testiranjem brzine i agilnosti pomoću 30m sprinta i Illinois agility testa. Podaci su analizirani pomoću uparenog t-testa i One Way Anova s α = 0,05. Rezultati: Bilo je značajan učinak vježbe brzine pokretanja ljestvice na brzinu i agilnost sa 7,302> t 1,833 i t 7,872> t 1,883. Osim toga, bio je značajan učinak ponovljene sprint sposobnosti na brzinu i agilnost s t7.934> t 1.833 i t8.693> t 1.833. Postoje značajne razlike između tri skupine brzina s t 6.281> 3.35. Nadalje, bilo je značajne razlike između tri skupine u agilnosti s t 3.473> 3.35. Grupa 2 bila je bolja od grupe 1 i grupe 3 u povećanju agilnosti i brzine. Zaključak: Postoji značajan učinak pokretanja brzine ljestvice i ponovne sprintabilnosti u povećanju agilnosti i brzine.

Ključne riječi: *pokretanje brzine ljestvice, sposobnost ponovnog sprinta, agilnost, brzina, nogometaši.*

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