

The effect of ladder drill exercises on some physical abilities in male junior high school students

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ABSTRACT

This study aimed to determine the effect of ladder drill 1 foot in each on the upper and lower extremities training carried out for 8 weeks on strength, speed, power, and agility. The type of the study was a quasi-experimental. Ladder drill exercises were carried out with an intensity of 80-90% HRmax, a frequency of 3x/week, for 8 weeks. Strength was measured using back and leg dynamometers, power was measured using the Force Plate/Accupower Test, speed with the 30-meter Running Speed Test, and agility with the Side Step Test. For statistical analysis, the researcher used the Statistical Package for Social Science (SPSS) version 21. The significance level was established at 0.05. The results of the analysis comparing pretest to posttest strength were as follows: strength pretest vs posttest (78.00 ± 21.69 vs 122.10 ± 22.16 seconds; $p=0.000$). For power, the comparison between pretest and posttest showed (42.40 ± 11.92 vs 60.72 ± 22.16 Joules; $p=0.338$). In terms of speed, the pretest vs posttest results were (5.13 ± 0.24 vs 5.19 ± 0.23 seconds; $p=0.000$), and for agility, the comparison between pretest and posttest revealed (15.00 ± 4.35 vs 22.60 ± 3.86 seconds; $p=0.000$). Executing ladder drill exercises at an intensity ranging from 80-90% of the maximum heart rate (HRmax), with a frequency of three times per week over an eight-week period, resulted in enhanced strength, speed, and agility among male junior high school students. Nevertheless, there was no notable impact observed in the power variable.

KEYWORDS

Ladder Drill; Strength; Speed; Power; Agility

1. INTRODUCTION

Improved aspects of physical condition are very important to increase muscle power output and the ability of athletes and are important aspects of success in sports (Suchomel et al., 2016; Eduardo et al., 2013). Improving the aspect of physical condition is carried out by various training methods such as weight training, speed training, a combination of speed, agility, strength, and explosive training and plyometric training (Putera et al., 2023; Puspodari et al., 2022; Slimani et al., 2016; Rimmer & Sleviert, 2000). Meanwhile, maintaining and improving physical condition requires proper and programmed training (Pranoto et al., 2023). One of the exercises that can be applied to improve physical condition is plyometric training such as ladder drill exercises (Ramírez-delaCruz et al., 2022). A ladder drill is a form of training up and down stairs which functions to train the speed and agility of the leg muscles (Hadi et al., 2016). Ladder drills are the best way to increase strength, power, speed, and agility (Rajendran, 2016).

Strength is defined as the maximum work (maximal force) or torque (rotational force) produced by a muscle or group of muscles (Simpson et al., 2019). In addition, strength is defined as the ability of the neuromuscular system to produce a force against external resistance (Hughes et al., 2018). Good muscle strength will increase the performance of an athlete (Bompa & Haff, 2009). Power is the result of both maximum speed and maximum strength in the shortest possible time (Bompa & Haff, 2009). Speed is the ability to cover a certain distance in the shortest possible time (Maamer et al., 2016). Agility is the ability to change the direction of the body efficiently and effectively and to achieve this requires a combination of several other motor components, namely: balance both static and dynamic, speed, strength, and coordination (Xiao et al., 2021). Agility is very dominant in sports whose characteristics require high speed of movement and the ability to change direction according to the situation at hand and arrive (Sheppard & Young, 2007).

Pramod & Divya (2019) explained that ladder drill exercises carried out for 6 weeks can affect strength, power, balance, agility, coordination, joint stability, foot speed, eye-hand coordination and reaction time. Many researchers discuss about ladder drills practice. In addition, there are various kinds of ladder drills, there are ladder drills single punch, 1 foot in each, double punch, 2 feet in each, 1 foot lateral push up, 1 in lateral, 2 feet lateral push up, 2 in lateral. However, the explanation of

each is not clear, so in this study we will discuss only one type, namely the ladder drill single punch, 1 foot in each.

2. METHODS

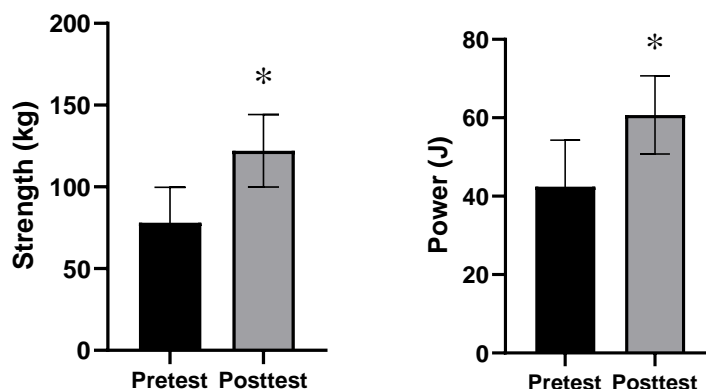
This study aimed to find out the effects of ladder drill exercises for 8 weeks and their impact on some physical abilities for male junior high school students. The type of research used in this study was a quasi-experimental with a quantitative approach. The number of samples amounted to 10 male junior high school students. Ladder drill exercises are carried out with an intensity of 80-90% HRmax, a frequency of 3x/week, for 8 weeks (exercise is done 24 times). Ladder drill exercises are carried out with hand and foot exercises using a single punch ladder drill 1 foot each.

Researchers conducted a pretest with five measurements, namely agility, 30-meter running speed, arm strength, leg muscle strength, and arm muscle power, and leg muscles. Finally, they performed a posttest with four measurements, assessing strength using back and leg dynamometers, measuring power using the Force Plate/Accupower Test, determining speed using the 30-meter Running Speed Test, and evaluating agility using the Side Step Test.

For statistical analysis, we used the Statistical Package for Social Science (SPSS) version 21 (SPSS Inc., Chicago, IL, USA). The data includes the number of samples, average, minimum value, maximum value, and standard deviation. Shapiro-Wilk was used to test for normality, while Levene's test was used to test for homogeneity and the hypothesis test used Paired Sample T-Test. The significance level was set at 0.05.

3. RESULTS

The results of the descriptive analysis and paired sample t-test data on strength, power, speed, and agility between the pretest and posttest are presented in Figure 1.



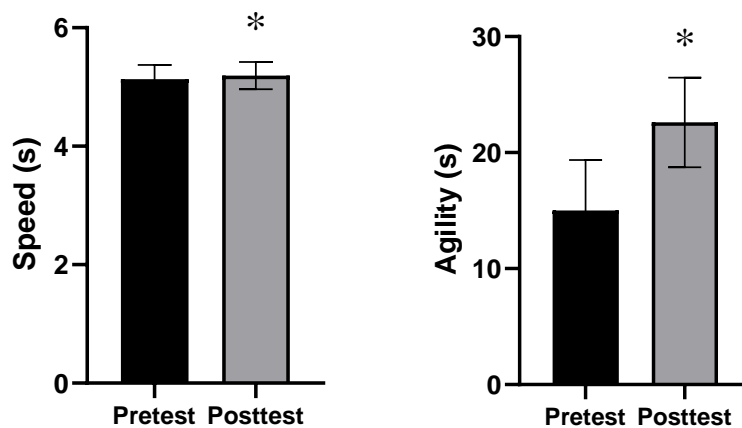


Figure 1. The results of the analysis of strength, power, speed, and agility

The results of the analysis comparing pretest to posttest strength were as follows: strength pretest vs posttest (78.00 ± 21.69 vs 122.10 ± 22.16 seconds; $p=0.000$). For power, the comparison between pretest and posttest showed (42.40 ± 11.92 vs 60.72 ± 22.16 Joules; $p=0.338$). In terms of speed, the pretest vs posttest results were (5.13 ± 0.24 vs 5.19 ± 0.23 seconds; $p=0.000$), and for agility, the comparison between pretest and posttest revealed (15.00 ± 4.35 vs 22.60 ± 3.86 seconds; $p=0.000$).

4. DISCUSSION

Based on the results of this study, it is evident that there was a significant effect of 8 weeks of ladder drill single punch, 1 foot in each training on the variables of strength, speed, and agility ($p < 0.05$). However, no significant effect was observed on the power variable ($p > 0.05$). Strength, speed and agility variables show significant results in the possibility of movement on a single punch ladder drill, 1 foot in each training, which is appropriate in increasing strength, speed and agility. However, the power is not significant, the possibility of the power element in the single punch ladder drill, 1 foot in each training is still not fulfilled. Ladder drill in the exercise movement there are elements of strength, power, balance, agility, coordination, joint stability, foot speed, hand eye coordination and reaction time (Pramod & Divya, 2019). However, in this study, ladder drill exercises carried out for 8 weeks increased strength, speed and agility, but not power.

Strength is one of the basic components of biomotor needed in every sport. To be able to achieve optimal performance, strength must be increased as the underlying basis for the formation of other biomotor components. The goal of strength training is to increase muscle power in dealing with loads during sports activities. Therefore, strength training is one of the basic biomotor elements that

are important in the process of producing athletes (Sukadiyanto, 2011). Speed is the ability to cover a certain distance in the shortest possible time (Maamer et al., 2016). Previous research has stated that training using an agility ladder can increase speed (Brown, 2005). Research ladder drill for 6 weeks can increase the speed significantly (Pramod & Divya, 2019). Agility can be trained in many ways to improve it, one of which is ladder drills. Ladder drills are movements including fast steps, small jumps, and high jumps, with one or two feet per box and two feet per box, zig-zag movements, and two legs jumping low and jumping high, ladder drills are one of the a form of agility training (Hanif & Tohidin, 2020). Previous research in 2020 stated that ladder drill exercises can increase agility.

Ladder drill is a practice movement that changes direction from one position to another combined with high speed and coordination of movements so as to increase agility (Pradana et al., 2020). According to Brown (2005) states that various types of training using an agility ladder can increase agility. Agility is a perceptual-cognitive ability to react quickly with physical abilities to a stimulus (Sheppard & Young, 2007).

The power variable shows no significant effect, possibly because the ladder drill exercise is still not optimal and the duration of 8 weeks may still be lacking, because power requires maximum strength and speed. Power is the result of both maximum speed and maximum strength in the shortest possible time (Bompa & Haff, 2009).

5. CONCLUSIONS

Based on the results of the study, we conclude that ladder drill exercises, when carried out with an intensity of 80-90% HRmax, a frequency of 3 times per week, for 8 weeks, led to an increase in strength, speed, and agility in male junior high school students. However, in the power variable, there was no significant effect observed.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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