



Long-term resistance training improves speed and agility in young healthy males

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Abstract: This study aims to prove the effect of long-term resistance training on increasing speed and agility in young healthy males. This research method was a pre-experiment with one group pretest-posttest design. A total of 15 young healthy males, aged 19-22 years participated in the study. Long-term resistance training was carried out with maximum intensity, and frequency 3x/week for 6 weeks. The data collection technique was carried out using test instruments, namely the 20-meter sprint test to measure speed and the Illinois agility test to measure agility. Measurement of speed and agility was carried out twice, namely pretest and posttest. The data analysis technique used a Paired Sample T-Test with SPSS version 25 with a significant level of 5%. Based on the results of the statistical analysis show that there was a significant difference in average agility and speed between the pretest and posttest ($p \leq 0.001$). Based on the results of the study, it was concluded that the long-term resistance training intervention was effective in increasing the speed and agility of young healthy males.

Keywords: resistance training; speed; agility; young healthy males

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INTRODUCTION

Exercise is an important physical activity for all aspects of the human body which aims to improve the quality of health (Malm et al., 2019). Exercise is also one of the things that is most liked by everyone from children, and teenagers to adults, and the games can be played by both men and women (WHO, 2022). Exercise also has various functions in addition to nourishing the body and can also be a means to relieve stress (Mahindru et al., 2023). Futsal is one of the most popular and widely enjoyed sports (Berdejo-del-Fresno, 2014). Futsal is a game with five players from each team and the futsal court is similar to a basketball court when viewed structurally and from certain court lines (Berdejo-del-Fresno, 2014). Although the way of playing is similar to football, futsal matches are played with a higher speed or intensity than soccer because it is played on a smaller field than soccer (Tanyeri & Oncen 2020). Exercise is an important physical activity for all aspects of the human body which aims to improve the quality of health (Malm et al., 2019). Exercise is also one of the things that is most liked by everyone from children, and teenagers to adults, and the games can be played by both men and women (WHO, 2022). Exercise also has various functions in addition to nourishing the body and can also be a means to relieve stress (Mahindru et al., 2023). Futsal is one of the most popular and widely enjoyed sports (Berdejo-del-Fresno, 2014). Futsal is a game with five players from each team and the futsal court is similar to a basketball court when viewed structurally and from certain court lines (Berdejo-del-Fresno, 2014). Although the way of playing is similar to football, futsal matches are played with a higher speed or intensity than soccer because it is played on a smaller field than soccer (Tanyeri & Oncen 2020).

Futsal is also a sport that has more and more fans with evidence of many futsal matches in the national sphere such as the pro futsal league, the highest caste futsal league in Indonesia. Futsal matches are also available among students and college students. In high school and above, there are quite big competitions in Indonesia, such as the Pocari Sweat Futsal Championship which is held every year, among students, there are also quite big championships such as the LIMA (student league) namely the futsal league between universities throughout Indonesia and this championship is in every year. Futsal has characters and components that must be prioritized in the game, namely dynamic movement, power, endurance, strength, speed, agility, and without neglecting other biomotor components (Mathisen, 2014). As the global interest in futsal continues to expand, a progressive approach

involving long-term resistance training has emerged as a means to optimize the physical capabilities of futsal players. This approach represents a potential paradigm shift in training methodologies and can enhance the overall standard of play. The integration of long-term resistance training in futsal stands as an intriguing and promising development with far-reaching implications for the future of the sport (Yiannaki et al., 2020).

Physical exercise is a very important component for every athlete to be in good physical condition. In the game of futsal, physical condition is one aspect that must be trained. Because of the better physical futsal players, some of the techniques and tactics (individual and team) needed in futsal can be applied properly and also reduce the occurrence of errors when playing. According to Ridwan (2020), physical condition is a component that must be owned by an athlete whose improvement is following the characteristics and needs of the sport, so that it can develop and improve performance. Speed and agility are physical skills that are needed by every individual, which coordinate the efficiency of changing direction, slowing down, and accelerating to react appropriately. According to Kardiawan & Kusuma (2017), speed is the basic ability to move at a certain speed with the mobility of the central nervous system and muscle apparatus. Speed is one of the physical conditions that match the characteristics of the futsal game where each player is required to move with good flexibility conditions so that players can perform tactics and game strategies optimally. According to Barasakti & Faruk (2019), speed is a combination of three units, namely the frequency of movement per unit of time, reaction time, and the speed of traveling a certain distance.

Agility is a component of physical condition that is no less important in futsal games because agility is included in the characteristics of futsal games which play very fast and dynamically. According to Bafirman & Wahyuri (2019), agility is the ability to move optimally in changing directions in a balanced manner, an example of agility movement is to move as quickly as possible to test points, move and then stop quickly and move quickly to the next point. There are many forms of exercise in the modern era as it is now found to improve certain components, and training models such as using hurdle drills, ladder drills, cone drills, line drills, and dot drills. The selection of the training model is also very important because in certain exercises there are special components to be targeted according to the characteristics of the futsal game. According to Akhmad (2015), the exercise model is a systematic plan that functions as a tool for sports training activities, which aims to improve a movement skill as a sports achievement.

Exercise using tools can help maximize the exercise you want to improve. According to Rasyono & Widowati (2019), the ladder drill exercise model is one of the many used in training to increase agility and speed where the position of the ladder is placed on the ground or sports venue as a variation of motion. According to Khorin & Umar (2018). There are various training patterns for ladder drills in increasing speed and agility, namely ladder drill exercises: 1 foot in each, 2 feet in each, 1 in lateral, 2 in lateral, in in out out, in out out, x-over lateral, carioca in each, icky shuffle, xover zig-zag. Speed and agility training are very helpful components of using this ladder drill pattern, where many movements are aimed at increasing speed and agility. The point is that the movement using the ladder drills training model focuses on increasing the speed and agility of motion. The ladder drill training model is a good way of teaching by instilling certain habits as well as a means for efforts to gain an increase in dexterity, accuracy, opportunity, and skills (Naser et al., 2017). The resistance band is a combination of weights in ladder drill exercises to improve such as strength, speed, agility, and endurance in players. The resistance band is an elastic rubber that is useful for increasing physical conditions such as strength, speed, and endurance (Yasin, 2020).

Among other components of physical condition, researchers discuss speed and agility more, because speed and agility are important components and are following the needs of the futsal game. Speed and agility are very much needed in futsal, considering that the futsal game is so fast and dynamic. Over time, developments in sports equipment have also changed to be more optimal when viewed from other aspects, therefore, researchers are very interested in using ladder drill training patterns that combine with resistance bands carried out with different training models according to the characteristics of the futsal game, especially in increasing speed and agility. This study aims to prove the effect of resistance training on increasing speed and agility in young healthy males.

MATERIAL AND METHODS

This research method was a pre-experiment with one group pretest-posttest design. A total of 15 young healthy males, aged 19-22 years participated in the study. The technique for selecting research subjects used consecutive sampling. For more details, see Figure 1.

Long-term resistance training was carried out with maximum intensity, and frequency 3x/week for 6 weeks (Akbar et al., 2024; Putera et al., 2023). Long-term resistance training in this study uses 12 training models, namely (1) one in ladder drill training model, (2) two in the

hole ladder drill training model, (3) two in lateral ladder drill training model, (4) Two in two out lateral ladder drill exercise model, (5) One lateral ladder drill exercise model, (6) Ickey shuffle lateral ladder drill exercise model, (7). Ickey shuffles backward ladder drill exercise model, (8). Ickey shuffle ladder drill exercise model, (9) Frontal in two out forwarding ladder drill exercise model, (10) Zig-zag crossover shuffle ladder drill exercise model, (11) Zigzag crossover shuffle backward training model, (12) Frontal ladder drill exercise model two in two out backward.

The data collection technique was carried out using test instruments, namely the 20-meter sprint test to measure speed and the Illinois Agility Test (IAT) to measure agility (Tomkinson et al., 2019; Salimi & Ferguson-Pell, 2020). Measurement of speed and agility was carried out twice, namely pretest and posttest.

The statistical analysis technique uses the Statistical Package for Social Science (SPSS) version 21 software. The normality test uses the Shapiro-Wilk test, while to compare the differences in speed and agility between the pretest and the posttest, the Paired Sample T-Test was used. All statistical analyses used a significant level ($p \leq 0.05$). All data displayed Mean \pm Standard Deviation (SD).

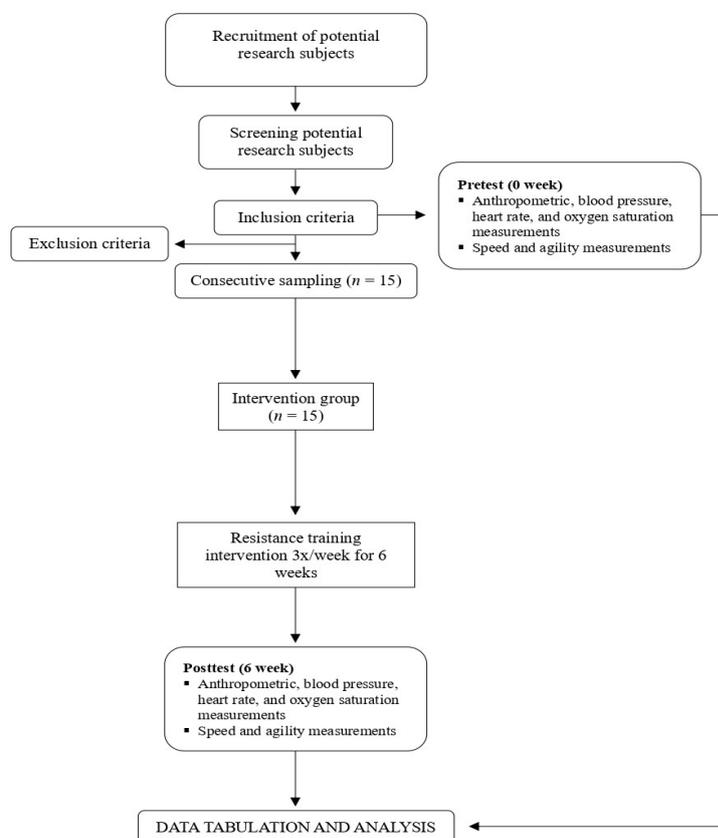


Figure 1. Flowchart of the study

RESULTS

The results of the statistical analysis of the average speed and agility between the pretest and posttest are presented in Figure 2 and Figure 3 below.

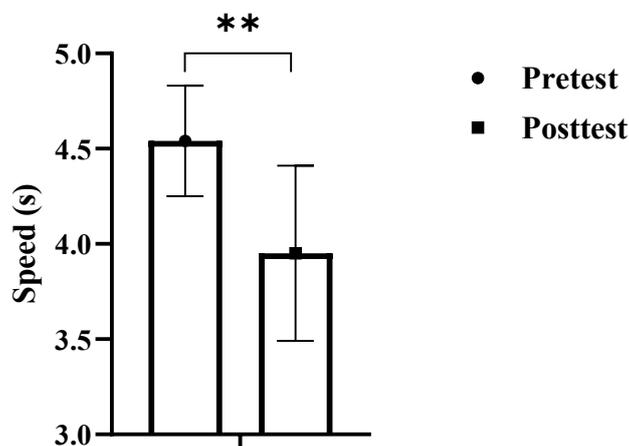


Figure 2. The results of the analysis of the average speed between the pretest and posttest

Based on the results of the Paired Sample T-Test analysis, shows that there is a significant difference in the average speed between the pretest and posttest (4.54 ± 0.29 vs. 3.95 ± 0.46 s, ($p \leq 0.001$)). The results of the statistical analysis of the average agility between the pretest and posttest are presented in Figure 2 below.

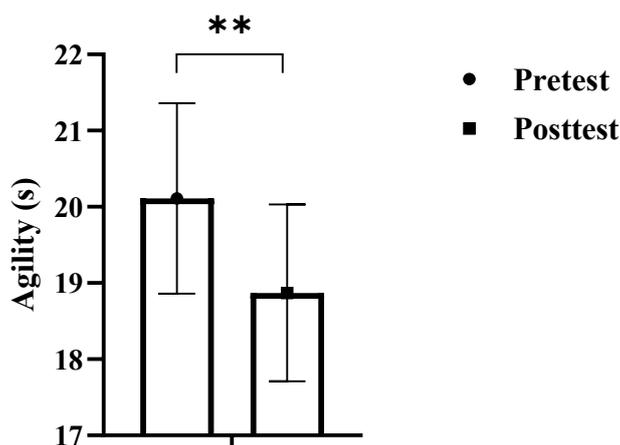


Figure 2. The results of the average agility analysis between pretest and posttest

Based on the results of the Paired Sample T-Test analysis, there is a significant difference in average agility between the pretest and posttest (20.11 ± 1.25 vs. 18.87 ± 1.16 s, ($p \leq 0.001$)).

DISCUSSION

Based on the results of the study, it was reported that there was a significant difference in the average speed between the pretest and posttest (Figure 1). Speed is an attempt to make a move against the load, distance, and within a short time. Royana (2017) argues that speed is the ability of a person or individual to move from one point to another through movements resulting from muscle contractions in a short time. According to Barasakti & Faruk (2019), the important role of speed in futsal games is to anticipate counterattacks from opponents, play short passes quickly, and create opportunities from breakthrough passes. Bafirman & Wahyuri (2019) explained that there are various types of speed training, namely: 1. Movement speed training must be done with maximum effort (Maximum Intensity/100%/maximum effort). 2. Can be done with a lot of repetition. 3. Movement speed exercise takes place at a short tempo. 4. Movement speed exercise requires a relatively long rest and varies in duration so that when doing the movement it always starts in a fit condition. This result is in line with the results by Vesci, et al., (2017); Hui, (2023) stated that long-term resistance training enhances speed and agility in males. Our findings offer a fresh outlook on the impact of prolonged endurance training on enhancing the speed and agility of futsal athletes. While we did not directly assess its influence on physical performance during futsal games, we utilized speed and agility parameters as indicators of enhanced athletic capabilities in futsal athletes.

Based on the results of the study, it was reported that there was a significant difference in average agility between the pretest and posttest (Figure 2). According to Young et al. (2015), agility is a change in direction speed by reducing the speed of acceleration to create opportunities to deceive the opponent. Agility in futsal is needed because the intensity of the game in futsal is quite high, forcing players to move flexibly so that it is profitable for both players and teams. Researchers agree with Barasakti & Faruk's research (2019) that players with good agility will be superior in terms of dribbling and tricking opponents so that they can disrupt the opponent's defense focus and can create more opportunities to put the ball into the opponent's goal. An important role in choosing and managing an exercise program is very important so that players can improve their physical condition to the maximum and follow the characteristics of their sport. The researcher agrees with Akhmad's research (2015) that the exercise model is a systematic plan that functions as a tool for assisting sports training activities, which aims to improve movement skills as a means of achieving sports achievement.

Resistance band ladder drills in this study using 12 training models, namely (1) one in ladder drill training model, (2) two in the hole ladder drill training model, (3) two in lateral ladder drill training model, (4) Two in two out lateral ladder drill exercise model, (5) One lateral ladder drill exercise model, (6) Ickey shuffle lateral ladder drill exercise model, (7). Ickey shuffles backward ladder drill exercise model, (8). Ickey shuffle ladder drill exercise model, (9) Frontal in two out forwarding ladder drill exercise model, (10) Zig-zag crossover shuffle ladder drill exercise model, (11) Zigzag crossover shuffle backward training model, (12) Frontal ladder drill exercise model two in two out backward. Hadi et al.'s research. (2016) stated that ladder drill exercises have a good effect compared to conventional exercises on increasing the agility of soccer players. In this study, the frequency was carried out 3x/week for 6 weeks because it would have a significant effect on increasing speed and agility.

The provision of exercise programs is carried out routinely by dividing every 2 weeks, changing training models with submaximal - maximum intensity. The ladder drill resistance band program, in addition to increasing the training load and intensity, also pays attention to sufficient recovery for players to have sufficient rest time between sets. A previous study by Ihtiarini & Widodo (2017) entitled "The Effect of Ladder Drill Exercise on Two Feet Each Square and Icky Shuffle on Movement Speed" stated that there was an effect of the two models of ladder drill training on movement speed. A previous study by Hadi et al. (2016) entitled "The Effect of Ladder Drills Training on Increasing Agility of U-17 Students at the Jajang Football Association, Banyuwangi Regency" stated that there was an increase in the ladder drill resistance band training method to increase agility.

Despite the favorable results of this study, it is essential to acknowledge certain limitations. Firstly, the study solely focused on young, healthy males, limiting the generalizability of the findings to other demographic groups such as females, older individuals, or those with underlying health conditions. Additionally, the study had a relatively short duration, with the resistance band ladder drills being implemented for only 6 weeks, which may not fully capture the long-term effects of the training. A more extended study could provide more comprehensive insights into the sustained effects of such training on speed and agility. To further expand on the findings of this study, future research could consider implementing similar resistance band ladder drills in female participants and older individuals to assess the transferability of the training effects across different demographics. Furthermore, conducting a longitudinal study with an extended training period could elucidate the long-term impacts on

speed, agility, and overall athletic performance. The results of this study have practical implications for coaches and trainers working with futsal athletes. By incorporating resistance band ladder drills into training programs, it is possible to enhance speed and agility, which are crucial for performance in futsal games. This could lead to the development of more effective training regimes tailored to the specific physical demands of futsal. In conclusion, the findings of this study highlight the positive influence of long-term resistance training, specifically using resistance band ladder drills, on improving speed and agility in young healthy males. While the results provide valuable insights into the potential benefits of such training for futsal athletes, it is important to recognize the study's limitations and consider avenues for further research to broaden the applicability of these findings.

CONCLUSION

Based on the results of the study, it was concluded that the intervention of long-term resistance training conducted 3x/week for 6 weeks was effectively increasing the speed and agility in young healthy males. Future research was recommended to provide other variations of long-term resistance training to support increasing the speed and agility of futsal players.

Conflicts of Interest: The authors declare no conflict of interest in this study.

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