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Comparison of the Effects of Zig-Zag Run and Shuttle Run Exercises on Agility in Futsal Players

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ABSTRACT

Background: Futsal players really need agility so that they can improve their performance and get maximum results as well as improve the body's physiological systems and functions. Physiotherapy plays a role in efforts to improve player achievement by optimizing physical capacity and functional abilities so that maximum achievement is achieved. Agility exercises that can be used to improve agility are obstacle runs, zig-zag runs, and shuttle runs. The purpose of this study is to find out which has a greater effect between the addition of zig-zag run and shuttle run exercises on the agility of futsal players.

Subjects and method: This was an experimental study to compare the effect of zig-zag run and shuttle run on agility. 30 futsal players aged 18-23 years were divided into two groups, i.e. zig-zag run and shuttle run, randomly. The dependent variable was agility. The independent variables were zig-zag run and shuttle run. Difference of agility score before and after intervention between groups was tested using independent t-test.

Results: There was no difference of agility level between zig-zag run (Mean= 10.06; SD= 0.49) and shuttle run (Mean= 10.02; SD= 0.74) groups before intervention, p= 0.315. After intervention, there was a slight difference of agility level between zig-zag run (Mean= 9.77; SD= 0.43) and shuttle run (Mean= 9.73; SD= 0.74) groups, and it was marginally significant (p= 0.052).

Conclusion: After intervention, there is a slight difference of agility level between zig-zag run and shuttle run groups, and it is marginally significant.

Keywords: agility, zig-zag run and shuttle run exercises.

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BACKGROUND

Futsal is a widely recognized and beloved sport across all levels of Indonesian society, from urban to rural areas and spanning all age groups, from children to the elderly. However, it is particularly popular among teenagers and adults, as evidenced by the numerous futsal clubs in various regions and the frequent futsal matches held at local, regional, national, and international levels. As a complex sport, futsal demands not only advanced techniques and strategic gameplay but also excellent physical abilities. It differs significantly from other sports in several aspects (Syahputra et al., 2021; Gunawan, 2018; Nosa et al., 2019). Agility plays a crucial role in futsal, enabling players to swiftly change direction

to find space, receive the ball, attack by aiming for the opponent's goal, or quickly return to defensive positions. This agility is closely influenced by an individual's balance, highlighting its importance in the game.

Agility is the ability to quickly change movements or body positions while coordinating these changes with other movements. Other factors that impact movement include balance, coordination, speed, and power (Syahara, 2011). In futsal, agility plays a crucial role in achieving success during matches. Balance is an essential component of agility, allowing a player to make rapid directional changes without losing control of their body, ensuring they maintain stability while moving.

To improve physical conditioning, agility exercises are a highly effective solution. Various forms of agility training include shuttle runs, zig-zag runs, wind sprints, square sprints, dot drills, tree cone drills, down-the-line drills, grass drills, and starting and stopping runs. Among these, the zig-zag run and shuttle run exercises are particularly beneficial for enhancing agility (Tofikin and Sinurat, 2020).

The primary goal of exercise is to improve the body's physiological systems and functions, enabling individuals to perform optimally during sports activities. Achieving this requires collaboration from various disciplines, one of which is physiotherapy. Physiotherapy plays a crucial role in enhancing player performance by optimizing physical capacity and functional abilities, based on an analysis of the specific demands of the sport. This, in turn, leads to maximum performance outcomes. A key component of physiotherapy treatment involves providing supplementary exercises, such as zig-zag runs and shuttle runs, to improve agility skills.

In the zig-zag run exercise, the leg muscles play a crucial role in supporting the body weight and enabling the completion of the movements. The exercise involves running forward and making quick turns, which requires more than just leg movement. Every action performed by the body is a result of muscle contractions. During each exercise, the body responds to the physical demands, and over time, it begins to adapt to the training. This adaptation helps improve strength, agility, and overall performance as the muscles become more conditioned to the repetitive movements involved in the exercise.

In shuttle run training, the muscles contract in response to movement. These contractions can be classified into isometric and isotonic types. Isometric contractions occur without sliding filaments, while isotonic contractions involve muscle shortening while maintaining consistent tension. During shuttle runs, both contraction types are involved. Isometric contractions help stabilize the limbs, while isotonic contractions enable leg movement.

When a player decelerates before changing direction to run back to the starting point, alternating contractions in specific muscles occur. The hip muscles, such as the knee extensors and hip extensors, undergo eccentric contractions (muscle lengthening) as they slow down the body's forward momentum. These muscles then quickly contract to propel the body into a new direction.

With consistent application of training principles, including repetitive exercises over time, the activity and work of mitochondria in muscle cells are enhanced, improving muscle endurance and efficiency. Repetition in training allows the body to adapt and increase agility. In sports like football, agility is key; the more agile the player, the better their performance on the

field in terms of meeting the demands of the game (Guyton, 2014; Ruslan et al., 2021).

SUBJECTS AND METHOD

1. Study Design

This was an experimental study carried out at Health Polytechnics, Ministry of Health, in Surakarta from June to August 2024. The exercise program was conducted over a period of 8 weeks, with a frequency of 2 sessions per week, totaling 16 meetings.

2. Population and Sample

30 futsal players aged 18-23 years were divided into two groups, i.e. zig-zag run (15 persons) and shuttle run (15 futsal players persons). The study subjects were members of the futsal team in Health Polytechnics in Surakarta. Study subjects who had undergone agility training for 4 weeks, ending no later than 1 month before this study, or those currently participating in agility training during the same period as the study schedule, were excluded from the study. The drop-out criteria for the study included players who did not regularly participate in the training program, with a maximum of 3 consecutive absences. Additionally, players who became sick or injured, preventing them from continuing the training program, were also excluded from the study.

3. Study Variables

The dependent variable was agility. The independent variables were zig-zag run and shuttle run.

4. Operational Definition of Variables

Agility is the ability to quickly change direction while maintaining control and balance. It is measured by the time taken to complete a course involving quick starts, stops, and directional changes. The lower the time, the higher the agility.

The Zig-zag run is a drill that tests agility by requiring an individual to run forward and change direction rapidly in a zig-zag pattern. The participant must navigate between a series of markers or cones set at sharp angles. The time it takes to complete the course is measured, with quicker times indicating better agility. The drill emphasizes speed, direction control, and body balance while making swift turns.

The shuttle run is a test of agility and speed where an individual runs back and forth between two markers placed at a specific distance. The participant starts at one marker, sprints to the other, touches it, and then returns to the starting point. The time taken to complete a set number of trips back and forth is recorded, with faster completion times indicating better agility and speed. The drill emphasizes quick acceleration, deceleration, and direction change. It was performed by running back and forth over a 10-meter distance 2-3 times, moving quickly between two points, and recording the total time taken to complete the task in seconds.

5. Study Instruments

The Agility T-Test is a test used to assess an athlete's agility by measuring their ability to quickly move to four points that form the shape of the letter "T." The points are labeled A, B, C, and D, with the following distances: A-B= 10 yards (9.14 meters), B-C= 5 yards (4.57 meters), and B-D= 5 yards (4.57 meters). Point A serves as the reference for both the start and finish of the test. The athlete must navigate the course by running to each point in sequence, changing direction rapidly, and returning to the starting point as quickly as possible.

6. Data analysis

Difference of agility score before and after intervention between groups was tested using independent t-test.

7. Research Ethics

The approval letter for the study ethics permit was obtained from the Health Study Ethics Commission (KEPK) of the Faculty of Medicine, University of Muhammadiyah Surakarta, No. 5221/B.2/KEPK/FKUMS/-III/2024, on March 30, 2024.

RESULTS

Before the intervention, there was no significant difference between groups for the Zig-zag run (p = 0.135). Since the p-value is greater than 0.05, this suggests that both groups started at a comparable agility level. After the intervention, both agility test times decreased. Time difference between groups is marginally significant (p= 0.052) (Table 1).

Table 1. Time difference of agility test between zig-zag run and shuttle run, before and after intervention

Group	n	Mean	SD	p
Before intervention				
Zig-zag run	15	10.06	0.49	0.135
Shuttle run	15	10.02	0.74	
After intervention				
Zig-zag run	15	9.77	0.43	0.052
Shuttle run	15	9.73	0.74	

DISCUSSION

Based on the results of this study, it was found that the addition of zig-zag run training had more effect than shuttle runs on the agility of futsal players. This means that there is indeed an influence on each of these treatments, but there is no statistically significant difference. This is in line with the study entitled "The Effect-iveness of Shuttle-Run and Zig-zag Run Training on the Agility of Football Players" with 39 subjects and divided into two groups, namely the zig-zag group and the shuttle run group.The zig-zag run training method and the shuttle run training method have a significant influ-ence on the improvement of agility and the zig-zag run training method has a more significant influence than the shuttle run training method on the improvement of agility (Alimuddin et al., 2024) .

Zig-zag run is a form of exercise that is carried out with meandering movements through prepared signs, with the aim of practicing the ability to change direction quickly. The purpose of zig-zag run training is to master running skills, avoiding various obstacles both people and objects around (Jonathan., 2005) them. By being given zig-zag run exercises, physical fitness elements such as leg muscle strength, speed, knee and hip joint flexibility, muscle elasticity and dynamic balance will experience an increase in physiological function so that it will affect the increase in leg agility. Strength is the neuromuscular ability to cope with the resistance of external and internal loads. There will be an improvement in ability and physiological response in this training, namely hypertrophy (muscle enlargement), and neural adaptation. The occurrence of hypertrophy is caused by an increase in the number of myofibrils in each muscle fiber, an increase in capillary density in muscle fibers and an increase in the number of muscle fibers. The occurrence of neural adaptation is characterized by an increase in a person's technique and skill level (Sukadiyanto., 2011) .

The procedure for performing a zig-zag run to improve agility is as follows: (1)

the cones are arranged in the form of a zig-zag line with several points (e.g. 4-5 points) and the distance between the points is 2 meters, (2) the subject stands behind the start line , (3) after there is a "yes" signal, the subject runs as fast as possible following the direction or cones that have been arranged in a zig-zag manner; According to the diagram until the finish limit (4) the zig-zag run exercise is carried out quickly so that it reaches a frequency of 2-3 times (5) the subject is given the opportunity to repeat 3 times and the best time of the 3 repetitions recorded.

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Briefly, the journey from the presence of a stimulus to the occurrence of a physiological anatomical reaction is (1) starting from the appearance of the stimulus received by the receptor, (2) this stimulus receptor is channeled through the sensory efferent nerve to the central nervous system (brain), (3) the transfer of the stimulus from the efferent nerve to the central nervous system and produces a cue that will be sent to the effector, (4) the propagation of this cue from the central nervous system through the motor efferent nerve. Towards the skeletal muscles (effectors) (5) This signal stimulus in the skeletal muscles causes contractions, movements, physical activity or work. The faster or shorter the path taken by the stimulus and the stimulation of the receptors until the reaction and muscles occur, the better the reaction time will be.

Shuttle run test is an exercise by running fast back and forth for 10 meters 2-3 times, and the travel time is recorded to the original place in seconds (Nala., 2011) . When doing a shuttle run , there is movement of the joints of the arms and especially the legs so that it will increase flexibility. Then the existence of repeated muscle contractions will produce muscle strength that is useful for increasing the speed of movement. When the exercise takes place, there will be coordination of muscle functions that function to improve the accuracy of movement and maintain balance. Flexibility, strength, speed and coordination are things that are necessary to improve agility, so if all these components have been trained it will have an effect on improving agility.

The procedure for performing a shuttle run to improve agility is as follows: (1) the subject stands behind the starting line with one foot placed behind the starting line (2) at the "yes" cue the subject immediately and as quickly as possible runs forward to the finish line and touches the line with his hand (3) after that immediately returns to the starting line and touches the line, Then rotate again and run towards the line to the end, then rotate again and immediately run again (4) is done so that it reaches a running frequency of 2-3 x 10 meters (5) the subject is given 2

opportunities and the best time of the 2 opportunities recorded.

This exercise will cause muscle contractions and repetitive movements in the arms and legs which will involve the primary work system that realizes movement and affects gross motor development. The primary working system is a motion implementing device consisting of a skeleton system that functions as joint movement, a muscular system that functions to cause muscle contractions and a nervous system that functions as a stimulus conductor (Giriwijoyo, 2012)

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AUTHOR CONTRIBUTIONS

Ana Mustafiyah Fahri plays a role as the main researcher who chooses the topic, conducts searches and collects data in this study, and compiles research articles. Vernanda Oktaviani played a role in conducting, data analysis and reviewing research documents. Atge Oktoreza Asyhari wrote the research report.

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CONFLICT OF INTEREST

There was no conflict of interest in this study.

REFERENCE

Alimuddin A, Yudiramawan Y, Komaini A, Gemaini A, Haris F (2024). The effectiveness of shuttle-run and zigzag run training on the agility of football players. Sports Medicine Curiosity Journal. 2: 69–75. doi:10.-15294/smcj.v2i2.77158

Giriwijoyo S (2012). Ilmu faal olahraga (fisiologi olahraga): The function of the human body in sports for health and achievement (fungsi tubuh manusia pada olahraga untuk kesehatan dan prestasi). Bandung: Remaja Rosdakarya.

Gunawan G (2018). The relationship between leg power and agility with dribbling skills in futsal games (hubungan power tungkai dan kelincahan dengan keterampilan menggiring bola pada permainan futsal). Jurnal Speed (Sport, Physical Education, Empowerment). 1:30–39. https://garuda.kemdikbud.go.id/documents/detail/1098074.

Guyton AC, H.JE (2014). Textbook of medical physiology (buku ajar fisiologi kedokteran), 1st ed. Jakarta: Penerbit Buku Kedokteran EGC.

Jonathan (2005). 101 performance evaluation tests. in brian mackenzie: zig-zag

run (101 performance evaluation tests. dalam brian mackenzie: zig-zag run). Electric Word plc, London. Hal: 59.

Nala (2011). Principles of physical training of sports (prinsip pelatihan fisik olah-raga). Denpasar: Udayana University Press.

Nosa VTA, Sulaiman I, Nurdin F, Praniata AR (2019). Futsal shooting learning model for high school students (model pembelajaran shooting futsal untuk siswa sma). Jurnal Pendi-dikan Olahraga. 8: 27. doi:10.-31571/jpo.v-8i1.1218

Pauole K, Madole K, Garhammer J, Laco-urse M, Rozenek R (2000). Reliability and validity of the t-test as a measure of agility, leg power, and leg speed in college-aged men and women. J Strength Cond Res 14. 443–450. doi: 10.1519/00124-278-200011000-000-12.

Ruslan SM, Faturrahman S (2021). Latihan lari zig-zag untuk kemampuan meng-giring sepak bola zig-zag (Running Exercises for Ball Drill Skills). Jambura J Sports Coaching. 3: 33–38. doi:10.37311/jjsc.v3i1.9644.

Sukadiyanto (2011). Introduction to phy-sical training theory and methodology (pengantar teori dan metodologi melatih fisik). Yogyakarta: CV Lubuk Agung.

Suwo R, (2020). Erratum: korelasi antara kelincahan dengan topspin tenis meja atlet kota kendari (erratum: corre-lation between agility and top spin table tennis athletes in kendari city). JUARA: Jurnal Olahraga. doi:10.332-22/juara.v5i2.914.

Syahara S (2011). Physical-motor growth & development (pertumbuhan & per-kembangan fisik-motorik). Padang: Fakultas Ilmu Keolah-ragaan. Univer-sitas Negeri Padang.

Syahputra MA, Hasibuan S, Novita N (2021). The effect of shuttle run and zig zag run exercises and confidence on passing productivity on tanjung-balai FC Pumata futsal players. J Physic Educ Health Recreation. 5: 173. doi:10.24114/pjkr.v5i2.27572

Tofikin, Sinurat R (2020). Zig-zag run: a method of practicing the agility of the pencak silat sickle kick (zig-zag run: metode latihan kelincahan tendangan sabit pencak silat). Journal Sport Area 5. 177–185. doi:10.25299/sportarea.-2020.vol5(2).5333

Widiastuti (2011). Exercise Tests and Mea-surements (Tes dan Pengukuran Olahraga). Jakarta: PT Bumi Timur Jaya.