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The effect of skipping rope exercise versus ladder exercise in cardio pulmonary endurance and agility among female Kho-Kho players - A piolt study

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Abstract
The present study investigates the comparative effects of skipping rope and agility ladder exercises on cardiopulmonary endurance and agility among female Kho-Kho players. Given the growing concern over physical inactivity among adolescents, this study emphasizes accessible and time-efficient training methods to enhance overall fitness. Eighteen female college students aged 18–25 years participated in a pilot study lasting six to eight weeks. Subjects underwent pre- and post-intervention assessments using the 1.5-mile run test to evaluate cardiopulmonary endurance and the Illinois Agility Test to measure agility.

Participants were divided into two groups, one performing skipping rope exercises and the other agility ladder drills. Skipping rope exercises targeted aerobic capacity, involving whole-body muscle engagement, which led to significant improvements in VO_2max and cardiovascular efficiency. Conversely, ladder drills focused on footwork, coordination, and leg muscle power, substantially enhancing agility. Statistical analysis showed significant improvements in both groups post-intervention, with skipping exercises contributing more to endurance and ladder drills more to agility enhancement.

The findings suggest that integrating both skipping and ladder exercises into training regimens can holistically improve fitness among athletes, particularly those involved in agility-based sports like Kho-Kho. These methods are low-cost, easy to implement, and effective in improving critical components of athletic performance. Therefore, they can be considered valuable additions to conditioning programs, especially in educational and recreational sports settings.

Keywords: Skipping rope, Agility ladder, Cardiopulmonary endurance, Agility, VO_2max, Female athletes

Introduction

Maintaining health can be done by doing physical activity. WHO recommends doing physical activity or exercise in 1 week to accumulate at least 150 minutes (ACSM, 2018). If calculated per day, the minimum physical activity carried out is only about 20 minutes, but this relatively short time is not enough to encourage someone to do exercise regularly. This can be caused by a shift in habits due to the use of gadgets that offer many conveniences through technology so that it makes someone lazy to exercise. In fact, physical activity is correlated with fitness. The more often a person does physical activity, the better the fitness will be Decrease in physical activity occurs in all circles of society, including adolescents. Based on data from the Ministry of Health, the level of physical activity at the age of adolescents is in the less category, which is 49.6% at the age of 15-19 years and by 33.2% at the age of 20-24 years (Ministry of Health of the Republic of Indonesia, 2018). This shows that the level of physical activity in adolescents, including students, needs to be increased. Fitness to support health has several components, namely cardiorespiratory endurance, muscle strength, muscle endurance, flexibility and body composition (ACSM, 2018). Cardiorespiratory endurance can be used as a reference to measure a person's level of fitness; therefore, it is important to do exercises that can increase cardiorespiratory endurance. Some exercises that can be done to increase cardiorespiratory endurance include skipping rope, and agility ladder. These exercises are often encountered every day and are classified as exercises that are quite simple, easy to implement and do not require a long time especially for students to do. Skipping rope exercises and agility ladder will stimulate overall muscle work, so that it will stimulate an increase in the work of organs and organ systems, one of which is the heart to supply the oxygen and nutrients needed to muscles and other organs, so that cardiorespiratory endurance will increase (Power and Howley, 2015).

Skipping rope which refers to aerobic fitness programs. It is a combination of jumping rope, including long, in combination with acrobatic elements, dance exercises, with one or two skipping ropes performed individually, in pairs or groups. The availability of exercises, their relative simplicity and emotionality allows using rope skipping in various forms of physical education, with students of different ages and levels of physical condition. Skipping is very easy and chief to develop fitness. It requires a small area and less time. It may be just a rope but the fact is how one uses this basic tool which can help to keep fit. The benefits of an active lifestyle are well documented. Many of these benefits are also associated with higher levels of cardio respiratory fitness (VO2max) which may exert protective effects which are independent of traditional risk factors. Skipping exercises improve coordination, balance, agility, rhythm, speed, and especially static or dynamic muscular strength during repetitive or constant performance and these practices may contribute to the development of motor skills. Rope-jump improves muscles in the arms and legs cardiovascular functions and metabolism. It also has positive effects on cardio-circulation, muscle strength, endurance, speed, mobility and flexibility, balance, coordination, vertical jump, timing, rhythm and speed, lean body mass, bone density. It helps in improving your heart rate. VO2MAX the maximal O2 consumption rate is a measure of how much O2 is used during exercise. V for

volume, O2 for oxygen and max for maximum. Maximal oxygen consumption reflects cardio respiratory fitness and endurance capacity in exercise performance. VO2max in normal active male is 38ml/kg/min and in normal active female are 29ml/kg/min.

Ladder training are used to improve foot work in maximizing athletic performance. It is the multi directional training which helps to improve strength, power, balance, agility, coordination, proprioception, core and joint stability, foot speed, and mobility. Ladder drills is very much fun to perform the task on ladder. The training sessions in it will helps to achieve various above objective by performing drills in a rhythm and teaching the body and mind various foot combinations. To improve performance level in footwork and coordination. Ladder drills will help the player to catch, strike, and to block or tackle the component.

Materials and Methods

Study design

The study was a pilot study.

Participants: Screening for 18 college going students done for the study from physiotherapy college, Coimbatore.

Inclusion criteria

- In inclusion criteria female age group of 18-25 years was included.
- Students who are willing to participate was included.
- Students with no history of serious illness or any disease that could recur due to fatigue or stress.
- Veteran KHO-KHO Players were included.

Exclusion *criteria*

- Students suffered an injury recently were excluded.
- Students who are not willing to participate were excluded.

Study duration: 6 to 8 weeks

The study participants underwent demographic assessment, 1.5 mile run test procedures, Illinois agility test.

The Illinois Agility Test (IAT) is a widely used field test that assesses an individual's ability to change direction rapidly while running. The primary purpose of the IAT is to evaluate an athlete's agility, which is the ability to quickly change direction and speed. Agility is crucial in many sports, such as basketball, soccer, and hockey, where athletes need to react quickly to changing game situations. The IAT helps assess an athlete's potential in these sports. Athletes can use the IAT to track their progress in agility training programs. By regularly performing the test and comparing results, they can see if their training is improving their agility. The IAT can help identify specific areas where an athlete's agility needs improvement. For example, if an athlete struggles with a particular part of the course, they can focus their training on those specific movements. A test track consisting of three cones lined up on a straight line at intervals of 5m in width, 10m in length and 3.3m in the middle section is set up. The test consists of a 40m straight and 20m slalom run between cones with 180º turns every 10m. The time taken to complete the entire course is recorded using a stopwatch. The faster the time, the better the agility. Typically, the test is performed multiple times, and the best time is recorded. Proper technique is crucial for accurate results. Instruct athletes on the correct running form and turning technique. The Illinois Agility Test can be effectively used to assess and improve agility in athletes.

The 1.5-mile run test is a common assessment used to measure cardiovascular endurance. The primary purpose of the 1.5-mile run test is to evaluate an individual's aerobic capacity or cardiovascular endurance. This refers to the body's ability to efficiently use oxygen to produce energy during sustained exercise. Monitor Progress: It can be used to track progress over time as you improve your fitness level through training and exercise. The test results can help you set realistic fitness goals, such as improving your running pace or increasing your endurance. Perform a light warm-up, such as a brisk walk or light jog, for about 5-10 minutes to prepare your muscles. Choose a flat, safe, and measured course of 1.5 miles (2.4 kilometres). Start the timer: Begin running as quickly as you can maintain a consistent pace. Maintain pace: Strive to keep a steady pace throughout the run. Finish the run: Stop the timer when you complete the 1.5-mile distance. Cool-down: Walk for a few minutes to allow your heart rate to gradually return to normal. Note your finishing time for future reference. If you're training for a specific event or fitness goal, consider practicing the 1.5-mile run regularly to improve your time.

Result

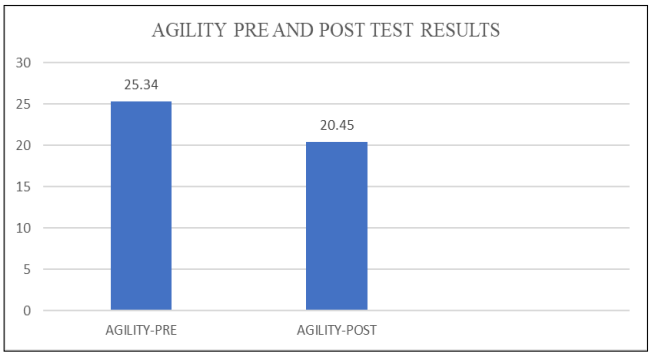

Fig 1

Table 1

Agility		CPE		Agility & CPE	
Pre	Post	Pre	Post	Post	Post
25.34	20.45	38.73	44.01	44.01	20.45

Pre-& Post Test Value of Agility & Cardiopulmonary

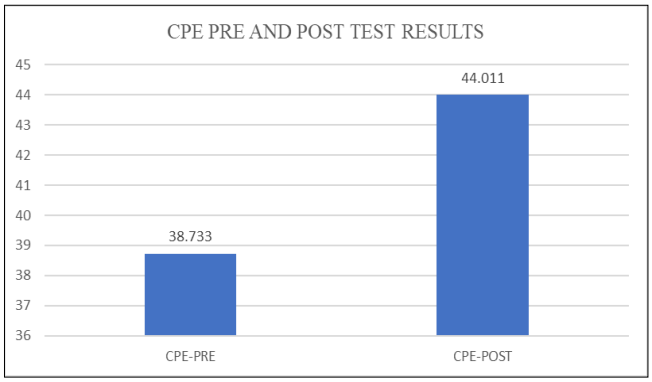

Fig 2

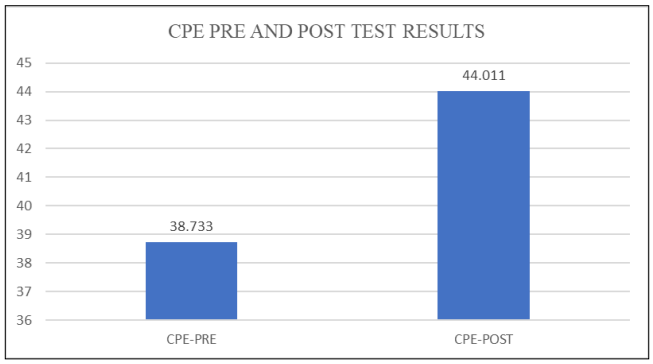

Fig 3

This study shows a result of significant differences between pre and post-test values. Null hypothesis is rejected and Alter hypothesis is accepted. Here we concluded that cardiopulmonary endurances and agility is improved followed by skipping rope exercise and agility ladder training.

Discussion

Based on the results of this study, it was found that skipping rope and agility ladder exercise increased cardiorespiratory endurance initially, then agility ladder exercise improve agility in female kho-kho players. Skipping rope exercise for 6 days with a dose of 2 minutes, 5 sets and 1-minute rest between sets. The skipping rope movement consists of skipping and landing phases on two feet, accompanied by the movement of the hands turning the rope when going to jump, causing contraction of almost all body muscles, increasing the supply of oxygen demand for the contracting muscles. The respiratory system will increase work to take in more oxygen, which is followed by an increase in the work of the cardiovascular system, the heart works hard to pump blood and circulate oxygen to the contracting muscles, so that oxygen needs are fulfilled. The increase in oxygen supply causes cardiorespiratory endurance to increase. In this study we have taken kho-kho players from paramedical department, when they first started skipping rope with a predetermined dose, adaptation had not occurred in the body. This causes the muscles, respiratory and cardiovascular systems to get pressure or stressors. The longer it takes, the muscles, respiratory and cardiovascular systems will adapt, so that at the end of the exercise there will be an increase in cardiorespiratory endurance.

Ladder drills is a form of jumping exercise by a foot or two by jumping on a ladder-shaped rope that is placed on the floor or on the ground. This exercise cannot be separated from leg muscle strength because it uses a lot of leg muscles in addition to using leg muscles only. The main muscle components involved in the Ladder Drills are Sartorius muscle, Gracilis muscle, Semitendinosus muscle, Gluteus Maximus muscle, Vastus Lateralis muscle, Vastus Medialis Muscles, Vastus Intermedius Muscles, Gastrocnemius Muscles, Longus Peroneus Muscles, Hallucis Longus Muscle Extensor, and Hallucis Longus Flexor Muscles. Ladder drills exercise helps us to improve movement aspects, increase balance, muscle power coordination and reaction time between all of body parts and to change direction quickly for players even at high speed. Besides physical benefits, using this tool can also improve the nerve system and related muscle groups. Ladder drills exercise has a significant effect on speed and agility because the leg muscles constantly perform contractions continuously during the exercise. Ladder drills in ladder practice The Hop-Scotch Drill begins with one leg on each side of the ladder. Then, the players jump with both feet into the first box then to the front of the box with legs spread apart so that everyone landed on the outside of the ladder. Ladder Hop-Scotch Drill training data provides a significant increase in speed and agility.

Conclusion

We concluded that we can add both agility training and skipping rope exercise in training program for Kho- Kho players. It helps to improve both agility and cardiopulmonary endurances because both are main components Kho- Kho players.

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