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Effectiveness of plyometric training and strengthening program on speed and agility among recreational footballers.

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ABSRACT

Background: This study is structured to delve into the impact of two specific training protocols, namely plyometric training and a core strengthening program, on the speed and agility levels of recreational football players. Through a systematic analysis, the research aims to explore how these training interventions influence the speed and agility among the individuals engaged in recreational football activities.

Purpose: To compare the effectiveness of plyometric training and core strengthening program on speed and agility among recreational footballers.

Materials and methods: In this study, 56 participants were conveniently sampled and randomly divided into two groups: plyometric (n=28) and core strengthening (n=28). Both groups underwent speed and agility measurements. The plyometric group received plyometric training four days a week for six weeks, while the core strengthening group followed a similar duration with core exercises.

Result: The post-test mean values of speed in plyometric group is 3.754 and mean value of speed in core strengthening group is 4.018. The post-test mean values of agility in plyometric group is 8.411and in the core strengthening group is 9.604. The post-test T vale of plyometric and core strengthening group is 6.7741 and 6.7923, respectively. With a p-value of less than 0.0001, both of the outcome measures in this group exhibit statistical significance. It was noted plyometrics was more beneficial in improving speed and agility.

Conclusion: In conclusion, both the plyometric and core strengthening intervention groups demonstrated positive effects on speed and agility. While both interventions contributed to improvements, the plyometric group exhibited a slight advantage in terms of enhancing speed and agility.

Keywords: Plyometric training, speed, core strengthening, agility, recreational footballers.

INTRODUCTION:

Football is a sport characterized by rapid sprints at full or varying speeds, powerful kicks, and swift changes in ball direction. Coaches often design training programs based on sports coaching and performance research to cater to diverse physiological and mechanical needs.[1] Football agents and coaches globally have traditionally used the assessment of players' physical traits as a key component in the selection and talent identification procedures.[2] Brief accelerations and straight-line sprints have been recognized in the past as crucial elements during a football match, as they often precede

goals and other pivotal actions.[3] Football is a lightning-fast, highly unpredictable team game that belongs throughout the multi-structural sports game category due to its rich freedom of movement.

Football is a complicated by anything, dynamic activity that involves an extensive number of complex kinesiological behaviour, certain of which are A-cyclical, while others are a cyclical in nature. In football, obtaining the highest score requires a meticulously constructed training regimen. Recognizing the structure of certain anthropological qualities and player characteristics, as well as their development, serves as crucial for high-quality the administration of the training process. In particular for sophisticated sports like football, information about physiological characteristics and body composition are significant. The skeleton's longitudinal dimension, transversal dimensionality, mass, and volume all play a role in determining the boundaries of the morphological space.[4]

Speed and agility combined with football methods and talents. Quality mobility is essential, and not just the speed of movement, but the speed of play, ball control, and movement both before and after they pass the ball. This mix of efficiency and efficacy differentiates the good from the great players.[5] According to sports literature, the capacity for rapid force generation in players is widely acknowledged as a crucial factor for achieving high-quality performance.[6,7] Agility and straight sprint speed have significance characteristics in an assortment of sports. Straight line sprinting is an exceptionally constrained skill that is used in gymnastics and track and field as well as other athletic endeavour wherein movements are planned and predictable. Even though it could appear exceedingly difficult to define, agility is frequently described as having the ability to start and stop fast alongside the ability to change direction. Changes in direction can be made all throughout the course of a match to follow or eliminate an opponent or to response to a moving ball. As a consequence, it has been understood that a part of agility the act of performing is an immediate response to a suggestion.[8]

These sports share two areas that in common: they both have specific ability requirements and a sequence of unpredictable, responsive, and sporadic motions. Due to the constantly changing movement patterns, it becomes essential to have the ability to run at high peak speeds and change directions quickly. Performance in team sports played on the court or on the field may be determined by these parameters.[9] The ability to move or travel a distance quickly is referred to as speed. [1] Sprinting performance is crucial in many sports. Consequently, successful athletes' interest sprinting was really high in learning fundamentals. As a footballer must excel in all physical facets of their activity, extensive training is necessary in order to establish successful and effective sprinting tactics. Agility is characterized as the capacity to swiftly alter the body's direction while maintaining a stable body position.[1]

Plyometric training, characterized by activities like bouncing and hopping that leverage the stretch-shortening cycle of muscle units, has consistently demonstrated the ability to enhance muscle force and power production. This is particularly evident in the trained muscles exhibiting quicker force production and incremental improvements in maximum isometric force.[10] The stretch shortening cycle is used in plyometric exercises, which involve rapid, strong movements using a pre-stretch or countermovement. When integrated into a consistent strength training routine, plyometric training can enhance athletes' performance in vertical leaps, facilitate quicker acceleration, strengthen leg and muscle power, improve joint awareness, and enhance overall proprioception.[11] Plyometric training is one of the methods frequently used for athletes in every discipline, particularly those with the short-shortening cycle (SSC), according to the majority of researchers and practitioners. These exercises are intended to increase dynamic efficiency

and explosiveness.[12] Exercises known as plyometric or stretch-shortening cycles are characterized by a rapid bodily slowdown followed almost immediately by a rapid acceleration in the opposite direction. [13]

Plyometric training has been made established through researchers that it can improve jump vertically performance, acceleration, which is strength of the legs, power from the muscles, joint perception, and a broader sense of position when in combination with a regularly occurring strength-training program. Plyometric training activities generally involve unanticipated ceases to exist, starts, and direction transformations. The motions in question are characteristics that can help in agility enhancement. [14] It is thought that a weak core alters how energy is transferred, which lowers athletic performance and increases the chance of damage to a muscle area that is already underdeveloped or weak. Consequently, it is assumed that improving core strength will improve athletic performance. Since then, strengthening the core has gained popularity among strength coaches and personal trainers as a way to enhance performance and lower the risk of injury. [15] Developing strength and condition benefits from core training.[16, 17] A robust core facilitates the efficient transfer of force from the lower body to the upper body, minimizing energy loss in the torso.[18]

The lack of understanding on an established technique for determining core strength has made it difficult to research on exercises for core stability. The measurements of core weakness and instability allow for continual monitoring of ultimately results and placing sufficient emphasis on core strengthening in specific populations.[19] The most recent studies have shown an enormous spike in interest in core exercises and an increase in the number of studies on the connections between core training and athletic performance, trunk stabilization, body composition, and disability. Recent research has demonstrated a significant increase in interest in core exercises and the relationship between core training and other factors such as athletic performance, trunk stabilization, body composition, and disability. nevertheless, there is an extensive amount of inconsistency regarding the relationship between performance and core stabilization. even though multiple research investigations indicate a weak correlation between core training and athletic performance, it can be argued that the structure of core training introduced multiple constraints that impact the findings of numerous studies.[20]

METHODS:

This study involved the recruitment of 56 participants through a convenient sampling method, ensuring a diverse representation of recreational footballers. To eliminate bias, participants were then randomly assigned to either the plyometric group or the core strengthening group, each consisting of 28 individuals. Following the initial selection process, all participants underwent comprehensive assessments to establish baseline measurements of their speed and agility levels.

Over the course of six weeks, the plyometric group dedicated themselves to rigorous plyometric training sessions, meticulously crafted to enhance explosive power and dynamic movement. These sessions were scheduled four days a week, ensuring consistent and intensive training stimuli. Conversely, the core strengthening group embarked on a similar journey, committing to a six-week regimen specifically designed to fortify and stabilize their core musculature. Like their counterparts in the plyometric group, they engaged in focused exercises four days a week, targeting the foundational muscles essential for overall stability and athleticism.

Participants in both the plyometric and core strengthening groups engaged in exercises comprising 10 repetitions and completed a total of 3 sets for each exercise. This structured approach ensured consistent training intensity and duration across all sessions. Each repetition was performed with precision and control, emphasizing proper form and technique to maximize the effectiveness of the exercises.

Plyometric training group(n =26) : Plyometric training

1. Side jump - Begin by positioning your feet shoulder-width apart, ensuring a stable foundation for the exercise. Slightly flex your knees and maintain a straight back as you lower your body, engaging your core muscles for stability. Propel yourself explosively off the ground by pushing through both feet, executing a lateral jump to one side. Focus on bringing your knees upward toward your chest to maintain control and height during the jump. As you land, aim to touch down softly on both feet simultaneously, with your knees bent to absorb the impact efficiently. Repeat the movement pattern, alternating sides with each jump, until the designated set is complete. This exercise, which combines lateral movement and explosive power, enhances agility, coordination, and lower body strength.

2. Double leg bound jump - Begin by standing with your feet together and extend your arms straight out in front of you. Initiate the movement by jumping upward and forward with maximal effort, aiming to cover as much distance as possible. As soon as you land, immediately transition into the next jump, maintaining a continuous and fluid motion. Repeat this sequence until the designated set is completed. This exercise, focusing on explosive forward jumps, targets lower body strength, power, and coordination, contributing to improved athletic performance and agility.

3. Squat jump - Stand with your feet shoulder-width apart and toes angled slightly outward for balance. Bend your knees and push your hips back, lowering into a squat position resembling sitting down. Propel yourself upward by pushing through your heels, engaging your lower body muscles. Upon landing, ensure your knees are slightly bent, and return to the squat position. Repeat this sequence until completing the set. This exercise targets lower body strength and power while enhancing stability and coordination.

4. Single leg hoop - Start by standing with your feet positioned hip-width apart for stability. Lift your left foot behind you, balancing on your right leg exclusively. Use your hands on your hips to ensure your hips remain level throughout the movement. Then, rise onto the toes of your supporting leg, gently bending the knee and ankle to prepare for a powerful hop. Transition to standing on your left leg and repeat the process. Continue alternating between legs until completing the set. This exercise targets lower body strength, balance, and coordination. It also helps improve proprioception and reduce the risk of injury by enhancing overall stability.

5. Countermovement jump - In a countermovement jump, the individual starts standing upright, then quickly bends their knees and hips before springing upward explosively. This sequence is repeated until the set is finished. It's a powerful exercise targeting lower body strength and explosiveness, commonly used to improve jumping ability and overall athleticism.

Core strengthening group (n =26) : core strengthening program

1. Mountain climbers - Begin in a push-up position, with your hands positioned directly beneath your shoulders and spaced shoulder-width apart for stability. Engage your core muscles to maintain a straight line from your head to your heels.
Swiftly bring your right knee toward your chest, ensuring it remains off the ground, then return it to the starting position. Alternate sides quickly and continuously, bringing each knee toward the chest in a rapid manner. Continue this alternating movement pattern until completing the designated set.

2. Glute bridging – Lie on your back with your knees bent and your hands placed beside you for support. Lift your hips off the floor, ensuring your back remains straight throughout the movement, and hold this position for one second. Lower your hips back down to the starting position and repeat the movement until completing the designated set.

3. Abdominal crunches - Lie on your back with your knees bent and your hands resting by your sides. From this position, engage your core muscles and press your feet into the ground, lifting your hips upward towards the ceiling. Aim to create a straight line from your shoulders to your knees, emphasizing the activation of your glutes and hamstrings. Hold this elevated position for a brief moment, ensuring that your back remains straight and your hips are fully engaged. Then, lower your hips back down to the starting position with control. Repeat this movement pattern for the prescribed number of repetitions, focusing on maintaining proper form and control throughout each repetition.

4. Scissor kicks – Lie on your back on a mat, with your hands placed under your hips for support. Lift your legs a few inches off the ground, keeping them straight. Engage your core muscles by pulling your belly button toward your spine. Lift one leg higher while lowering the other, creating a scissor-like motion. Continue alternating the movement in a controlled manner, crossing your legs over each other. Keep your lower back pressed into the mat to avoid arching.

5. Leg rise - Lie on a mat with arms at your sides and palms down. Keep your legs straight and close together. Activate your core by drawing your belly button toward your spine. Employ your abdominal muscles to lift your legs toward the ceiling, raising them until your hips are slightly elevated or you feel tension in your lower abs. Lower your legs gradually, ensuring they don't touch the ground. Repeat this motion for the desired number of repetitions.

STATISTICS:

The collected data underwent analysis and scrutiny. Mean and standard deviation were applied to each parameter. Statistical comparisons between pre-test and post-test measures were conducted using both paired t-tests and unpaired t-tests. The disparities in post-test values were calculated. The paired t-test will be employed to ascertain the significant differences within the group between pre-test and post-test results. Meanwhile, the independent t-test or unpaired t-test will be utilized to determine significant differences between groups.

RESULTS :

The plyometric group's pre- and post-test results indicate a notable improvement in speed and agility. The plyometric group's statistical mean speed before intervention was 4.232, while its statistical mean speed after intervention was 3.754. In the plyometric group, the pre-intervention statistical mean agility value was 10.457, and the post-intervention mean agility value was 8.411. In the plyometric group, the statistical T-values for speed and agility are 22.333 and 27.555, respectively. With a p-value of less than 0.0001, both of the outcome measures in this group exhibit statistical significance.

In the core strengthening group shoes a drastic improvement in speed and agility. This group's statistical mean speed before the intervention was 4.286, while its statistical mean speed after intervention was 4.018. In the core strengthening group, the pre-intervention statistical mean agility value was 10.439, and the post-intervention mean agility value was 9.604. In the plyometric group, the statistical T-values for speed and agility are 25.8661and 11.3979, respectively. With a p-value of less than 0.0001, both of the outcome measures in this group exhibit statistical significance.

The post-test mean values of speed in plyometric group is 3.754 and mean value of speed in core strengthening group is 4.018. The post-test mean values of agility in plyometric group is 8.411and in the core strengthening group is 9.604. The post-test T vale of plyometric and core strengthening group is 6.7741 and 6.7923, respectively. With a p-value of less than 0.0001, both of the outcome measures in this group exhibit statistical significance.