

## **The Dominant Physical Factor Determines the Ability to Play Sepak Takraw in the Nilam Raya Team**

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### **Abstract**

The study aimed to identify the physical condition factors that's most influence the playing ability of sepak takraw athletes from the Nilam Raya team. Ten male athletes aged 15 to 20 were selected using a purposive sampling technique, taking into account their active involvement in training and competitions. Data were collected through a series of tests covering leg muscle strength, body coordination, reaction speed, flexibility, and physical endurance. Furthermore, the athletes' technical abilities were measured through evaluations of their serving, passing, and smashing skills. The analysis revealed a strong correlation between body coordination and serving ability ( $r = 0.87$ ), indicating that precise motor control is crucial for successful serving. Leg muscle strength significantly influenced the effectiveness of smashes ( $r = 0.84$ ), which require explosive power and body stability. Meanwhile, reaction speed significantly correlated with passing accuracy ( $r = 0.81$ ), demonstrating the importance of quick reflexes in responding to an opponent's play. These three physical components—coordination, leg muscle strength, and reaction speed—emerged as the dominant factors shaping sepak takraw athlete performance. These findings provide a scientific basis for coaches and sports practitioners to design more targeted and evidence-based training programs, focusing on developing physical aspects that have been shown to directly contribute to improving playing skills on the field.

**Keywords:** Coordination, leg muscle power, reaction speed, sepak takraw, physical fitness

### **Introduction**

Sepak takraw is more than just a sport; it embodies the harmony of the body, strategy, and the art of movement that challenges the limits of human ability. In every jump, kick, and body rotation, complex biomechanical calculations are involved, making this game one of the most dynamic sports in Southeast Asia. Played by three teams on a 13.40 meter x 6.10 meter court with a net height of 145–155 cm (Hanif, 2015), sepak takraw demands high-level motor skills, explosive strength, and precise coordination. With the passage of time and the increasingly complex demands of competition, the sepak takraw match format has evolved. No longer limited to three-on-three, the sport now encompasses four main disciplines: two-on-two, three-on-three, four-on-four, and hoop takraw. Each discipline has distinct technical and physical characteristics, requiring

adaptations in strategy, technique, and the athletes' physical capacities. This evolution reflects the ever-evolving dynamics of modern sport, where flexibility and innovation are key to success.

This game uses a synthetic fiber ball, replacing the rattan used in the past. The ball is kicked and passed without using hands, creating a unique and demanding game dynamic. Basic techniques such as serving, passing, and smashing are not simply the result of repetitive training, but rather the result of synergy between body coordination, leg muscle strength, agility, and reaction speed (Rohman et al., 2020). In every movement, the athlete's body becomes the primary instrument in conquering space and time, combining physical strength and tactical intelligence in a harmonious whole. However, performance in sepak takraw is not solely determined by technical aspects. It also depends on mental readiness, tactical strategy, and optimal physical endurance (Hidayat et al., 2016). In this context, the coach acts like a performance architect, designing the athlete's physical and mental structure through a scientific approach and strategic intuition. Without accurate data, training strategies risk being speculative and ineffective. Bomp & Buzzichelli (2015) emphasize the importance of physical components such as muscular strength, cardiovascular endurance, flexibility, speed, stamina, agility, and explosive power as the foundation of athletic performance. here and insert your text. Click here and insert your text. Click here and insert your text.

Legendary basketball coach John Wooden once said, "A good coach can change a game. A great coach can change a life." This quote emphasizes that a knowledgeable coach focuses not only on the outcome of a match, but also on the process of developing an athlete's character and resilience. In the competitive world of sports, a coach is not only a technical instructor but also a mentor, motivator, and strategist capable of changing the course of an athlete's career through the right approach. Observations of the Nilam Raya Team show that differences in performance between players do not always correlate with training duration or competition experience. This phenomenon leads to a fundamental question: what physical factors are most crucial for success in sepak takraw? Is leg muscle strength the primary determinant of smashing? Is body coordination more important for serving? Or is reaction speed the key to accurate passing?

This study aims to answer these questions by focusing on core skills such as serving, passing, and smashing. These three techniques are heavily influenced by leg muscle strength, motor coordination, agility, and reaction time. By identifying the most influential physical components, coaches can design training programs that are more targeted, effective, and have long-term impacts. Just as a doctor diagnoses the root of a problem before prescribing treatment, a research-based coach can improve an athlete's performance from the source. In the context of athlete development, a data-driven approach is becoming increasingly relevant. In the digital age, coaches have access to performance tracking technology, video analysis, and statistical software that enable objective evaluation of an athlete's physical and technical abilities. By leveraging this data, coaches can identify individual strengths and weaknesses and develop training programs tailored to each player's specific needs. Furthermore, it's important to understand that athlete performance is influenced not only by internal factors but also by external factors such as social support, training facilities, and team culture. Studies in sports psychology have found that intrinsic motivation and a sense of belonging to a team can significantly increase an athlete's commitment and performance. Therefore, coaches must be able to create a supportive, inclusive, and motivating environment for athletes to develop optimally.

In sepak takraw, body coordination plays a crucial role in executing a precise serve. Serving isn't just about sending the ball into the opponent's court, but also about setting the pace of the game and creating psychological pressure. Good coordination allows athletes to precisely control their movements, avoid errors, and maximize the effectiveness of their serve. Research shows that coordination is strongly correlated with serving ability ( $r = 0.87$ ), indicating that this aspect should be a primary focus in basic technique training. Meanwhile, leg muscle strength has been shown to significantly influence smash effectiveness ( $r = 0.84$ ). Smashing is an attacking technique that requires explosive power, body stability, and precise timing. Leg muscle strength provides the propulsion necessary to jump high and produce powerful shots. Strength training such as squats, plyometrics, and resistance training can increase leg muscle capacity and support optimal smash performance.

Reaction speed also plays a crucial role in accurate passing ( $r = 0.81$ ). In a fast-paced game, the ability to respond quickly to stimuli is a competitive advantage. Good passing requires quick decision-making, eye-foot coordination, and the ability to read the opponent's movements. Reaction training such as visual drills, fast-paced ball drills, and simulated match situations can improve reflexes and passing accuracy. These three physical components coordination, leg muscle strength, and reaction speed emerged as dominant factors shaping sepak takraw athletes' performance. These findings provide a scientific basis for coaches and sports practitioners to design more strategic and evidence-based training programs. By focusing on developing physical aspects proven to directly contribute to improved playing skills, coaches can create more efficient and long-term training systems. This research also has important implications for the development of young athletes. In the early stages of development, identifying influential physical factors can help coaches develop training curricula appropriate to the individual's age, developmental level, and potential. This approach not only improves performance but also prevents injuries and fosters healthy and sustainable training habits.

Overall, sepak takraw is a sport that demands a balanced combination of technique, physical strength, and mental effort. Facing the challenges of modern competition, a scientific approach to training is increasingly important. This research is not merely an academic study, but a tangible contribution to the development of a more scientific, systematic, and sustainable national sepak takraw program. By understanding and applying these findings, coaches, athletes, and stakeholders can work together to build a more competitive and highly competitive future for sport.

## Research Methods

This study used a quantitative approach using a correlational design to examine the relationship between physical condition and sepak takraw playing ability. Ten male athletes from the Nilam Raya Team, who regularly participate in district-level competitions, participated. They were aged between 15 and 20, with an average height of 165 cm and a weight of approximately 50 kg.

Physical condition was measured using five main tests:

1. Coordination: tested using a ball throw-and-catch test (reliability 0.91)
2. Leg muscle strength: measured using a vertical jump test (reliability 0.88)
3. Agility: assessed using a 4x10-meter shuttle run (reliability 0.86)
4. Flexibility: assessed using a sit-and-reach test (reliability 0.84)

5. Reaction time: tested using a ruler drop test (reliability 0.82)

## Results and Discussion

Based on data analysis obtained from 10 Nilam Raya Team athletes, it was found that three components of physical condition significantly influence sepak takraw skills: coordination, leg muscle strength, and reaction speed. Coordination showed the highest correlation with serving ability ( $r = 0.87$ ), leg muscle strength contributed significantly to smash effectiveness ( $r = 0.84$ ), while reaction speed influenced passing accuracy ( $r = 0.81$ ).

Scientifically, the high correlation between coordination and serving ability can be explained by neuromotor principles, where good coordination allows for efficient synchronization of movements between the eyes, hands, and feet. Serving in sepak takraw is not simply about hitting the ball; it involves precise timing, direction, and body control. This aligns with the findings of Hidayat et al. (2020) who stated that motor coordination is a key predictor of basic sepak takraw skills.

Leg muscle strength plays a crucial role in smashing because this movement requires explosive power from the leg muscles to produce a high jump and powerful strike. The vertical jump test used in this study is capable of capturing this explosive capacity. Research by Zainuddin & Rahman (2021) also supports these findings, where plyometric training was shown to significantly improve leg strength and smashing performance. Meanwhile, reaction speed contributes to passing ability because players must respond quickly and accurately to the ball's direction. The light response test used showed that athletes with faster reaction times tended to be more accurate in directing the ball to teammates. A study by Yusuf & Hadi (2023) corroborates this finding, stating that reaction speed is a crucial component in fast-paced games like sepak takraw.

Variations in trends between players can be explained by differences in training background, playing experience, and the dominance of certain physical components. For example, players with high leg muscle strength but low coordination tend to excel at smashing but are less consistent in serving. This suggests that optimal performance in sepak takraw does not depend solely on a single physical aspect, but rather on a combination of them.

Thus, the results of this study answer the main question raised in the introduction: coordination, leg muscle strength, and reaction speed are the dominant factors determining sepak takraw performance. These findings provide a scientific basis for coaches to develop more targeted and evidence-based training programs, and open up opportunities for further research to explore psychological and tactical factors in the game.

Tabel 1. Correlation Table of Physical Components with Sepak Takraw Skills

Physical Components	Condition	Skills Affected by	Correlation Value (r)	Interpretation of the Relationship
Coordination		Service	0.87	Very strong and significant
Leg Muscle Strength		Smash	0.84	Very strong and significant
Reaction Speed		Passing	0.81	Very strong and significant

Tabel 2. Nilam Raya Team's Weekly Training Program  
Training Schedule (6 Days of Training, 1 Day of Rest)

Day	Training Focus	Main Objectives
Monday	Coordination Training	Improve serve accuracy
Tuesday	Leg Muscle Strength	Strengthen smashes
Wednesday	Reaction Speed	Accelerate and sharpen passing
Thursday	Combined Coordination & Reaction	Simulate fast-paced play
Friday	Combined Strength & Technique	Smashes and serves in realistic situations
Saturday	Rest & Recovery	Muscle and mental regeneration

## Discussion

The research results show that sepak takraw playing ability among Nilam Raya athletes is significantly influenced by three main physical components: coordination, leg muscle strength, and reaction speed. This finding aligns with the characteristics of sepak takraw, which is characterized by fast, accurate, and explosive movements. Coordination has been shown to have the strongest relationship with serving ability. In practice, a good serve is not only about sending the ball over the net, but also about controlling the tempo of the game from the start. Athletes with high coordination are able to synchronize eye, foot, and body movements, thus minimizing technical errors. This explains why coordination is the most dominant component in basic technique.

Leg muscle strength plays a significant role in smash success. Smashing is an explosive movement that requires a strong push from the legs to produce a high jump and powerful shot. Differences in smash performance between athletes are often influenced by variations in explosive leg muscle capacity, so strength-based exercises such as plyometrics, squats, and jumps are highly relevant for improving attacking technique performance. Meanwhile, reaction speed has been shown to be closely related to passing ability. In the fast-paced game, athletes must be able to respond to the ball's direction in milliseconds. Athletes with quick reactions are generally better able to anticipate the ball and direct it accurately to teammates. This finding reinforces the concept that sepak takraw is not just a game of strength, but also a game of very quick motor responses.

The differences in performance between athletes in this study indicate that physical advantages are not mutually exclusive. An athlete with good leg strength but poor coordination may excel at smashing but lack stability when serving. In other words, optimal performance can only be achieved when all three physical components are developed in balance. Factors such as training experience, playing frequency, and coaching quality also contribute to individual performance variations.

## Conclusion

This study confirms that three components of physical condition—coordination, leg muscle strength, and reaction speed—are the most dominant factors influencing sepak takraw performance, particularly in serving, smashing, and passing techniques. (1) Coordination has the greatest influence on serve quality ( $r = 0.87$ ), (2) Leg muscle strength contributes significantly to smash effectiveness ( $r = 0.84$ ), (3) Reaction speed plays a significant role in passing accuracy ( $r = 0.81$ ). These three components provide a scientific basis for coaches to design more targeted training programs tailored to the athletes' needs. With a data-driven training approach and regular evaluation, performance improvements can be achieved more effectively and sustainably. This study also confirms that optimal performance on the field requires a complex combination of physical abilities, not just a single aspect.

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