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Effectiveness of special exercises on anaerobic lactic capacity transitional speed and agility for advanced futsal players

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Abstract

The research aims to identify the effectiveness of special exercises on the anaerobic lactic power index, transitional speed, and agility of advanced futsal players. The experimental method was used, and a group was designed for pre- and post-testing. The research population consists of 14 advanced players from Al-Masafi Club. The main section (first part), from Jan 16, to Mar 18, 2026 the training sessions were held. The sessions lasted for 8 weeks, comprising 20 training sessions, each lasting no more than 35 minutes. The interval training method was used. The calculated t-values were 2.331 (p=0.045) for anaerobic capacity; 6.658 (p=0.000) for transitional speed; and 3.257 (p=0.008) for agility. This research indicated that the specialized interval training workouts greatly increased the ability of expert futsal players to produce anaerobic lactic acid These exercises also improved speed and agility in transitions which shows that they are beneficial for the quick multidirectional performance that is needed in tactical phases in the game The research suggests that experienced futsal players should include these specialized interval training activities in their training routines since they help improve physical skills It also stresses the need for making training activities that fit with energy production systems and an emphasis on the anaerobic lactic acid system, because that's what the game needs particularly during high-intensity bursts of play that are common in futsal matches

Keywords: Specific exercises, anaerobic lactic acid production capacity, transition speed, agility.

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Introduction

The training process is deeply linked to various specialized sports sciences, and this process achieves an ideal level in the functioning of internal systems that serve athletic performance, from physical fitness to technical skill. Development in all these aspects occurs when training curricula are built on scientific foundations that rely on the physiology of the athlete's internal systems and employ appropriate training methods to mimic the prevailing energy system.

Futsal has witnessed a remarkable evolution in its physical and physiological performance requirements. Reliance on anaerobic energy systems has become a crucial element in determining high performance levels, especially in the fast-paced and intense nature of the game. Despite numerous studies addressing the development of physical abilities in team sports, there is a limited number of studies focusing on employing specific exercises based on anaerobic energy systems to enhance physical performance in futsal.

This necessitates further research in this area. Futsal is a sport that relies heavily on the second energy production system due to the small playing area, unlimited substitutions, fast-paced technical performance, continuous attacking and defensive movements, and the small number of players. This anaerobic system is essential for players and cannot be developed without high-intensity training sessions that reach their maximum for limited periods, with adequate rest periods between sessions.

It requires a good working relationship with trained players and necessitates training periods spanning several seasons, especially if the training combines physical and technical aspects. This is because the anaerobic (lactic) development of the skill level must serve the technical performance in matches. The anaerobic lactic system works to delay fatigue in the working muscles. For this reason, the Laws of Futsal allow for unlimited substitutions between players. Yasser, in his study, confirmed that interval training in futsal contributes to delaying the onset of fatigue for a longer period and allows for better control over training variables such as performance time, repetitions, and a slower heart rate. (Al-Baqal, 2002).

Zuhair states, "Using interval training is the best method in football because the player's movement involves running with or without the ball as quickly as possible." (Al-Khashab, 1999)

A coach with extensive experience and a scientific approach is always looking for new methods across specialized training and exercises that combine the physiology of the body's systems with physical abilities. Each physical ability is categorized within its respective energy system, emphasizing that energy systems work together but in specific proportions.

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A football player must possess several physical abilities. to complement their technical and tactical skills and fulfill their duties during matches. Among the most important of these abilities are speed, as the game demands it significantly, and agility, which integrates several physical capabilities. The more a player possesses these abilities, the more distinguished they will be during matches.

This is what the coach achieves by designing exercises with an intensity and difficulty similar to those of matches, repeating them during short and medium training sessions, and varying the training loads to achieve physical and technical development and, subsequently, physiological adaptation of the body's systems and muscles.

Youssef asserts in his study that properly regulating training load will lead to improved functioning of the body's systems and organs and to the development of physical attributes to achieve peak athletic performance. (Kammash, 1999). Amer states in his study that "the coach must understand the relationship between the intensity and volume of the load to increase the athlete's ability to adapt." (Amrallah, 1998).

Mohammed emphasizes the importance of increasing training load step by step and over time periods that allow for physiological adaptation. These periods range from weeks to months. (Allawi, 2000).

Rissan affirms that "one of the most important requirements for developing physical attributes is to put pressure on the energy system that controls the attribute, because all energy systems contribute to achieving performance when developed." (Kharebet, 2016). In Amin's study it was noted that a player becomes more active when controlling the ball or preparing to receive it unlike a player who is further away from the ball who is less active and slower.

The importance of this study lies in the development of specific exercises based on energy systems as well as their integration with players' physical abilities and technical performance This connection between research variables delays muscle fatigue during matches, helping players maintain optimal performance for longer periods.

The research problem lies in the fact that some futsal coaches rely on tactical aspects in their training plans during the competition period and this excessive reliance negatively affects the use of specific exercises that rely on physiological principles related to energy systems especially the anaerobic lactic system and this affects the development of physical abilities that are effective in this game.

Therefore, this study aims to answer the following question: How effective are specific exercises in developing anaerobic lactic endurance, speed, and agility in futsal players? Special

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training exercises were developed for first-division futsal players at AlMasafi Club to assess their anaerobic endurance speed agility and to determine the effectiveness of these exercises on the studied variables. The study included first-division players from AlMasafi Club participating in the 2025-2026 professional league season during the period from Jan 16 to Mar 18 - 2026 The training sessions were held in the indoor sports hall at AlShabab Sports Club in the Palestine Street area of Baghdad.

Methods

The research employed an experimental approach; the research group (one group) underwent pre- and post-tests to obtain results that confirmed the research objectives and hypotheses. The original study population was defined as players from professional futsal league clubs participating in the 2025-2026 season. The research sample was selected purposively representing Al Masafi Club and its 14 players amounting 9.77% of the study population.

Table 1. *Descriptive Statistics of the Research Variables*

Variables	Measurement Unit	Mean	Median	Standard Deviation	Skewness
Anaerobic Power	Watt	22.88	23.29	3.97	0.28
Speed (Linear Speed)	Second	4.38	4.39	0.16	0.37
Agility	Second	21.58	21.69	0.63	0.467

The field research procedures included several tests: the anaerobic (lactic) capacity test (Morrow et al., 2015) the 60-second stride test (Al-Hadithi, 2014) the 20-meter standing run test (Al-Dulaimi, 2019) and the Barrow agility test.

A set of tools was used to implement the exercises and the supporting team conducted the specified tests for the research sample in the indoor hall of the Youth Sports Club on Tuesday January 13 2026 at 4:00 PM. The support team implemented the specific exercises designed by the researchers and trainer on the research sample (the experimental group). These exercises were applied in the first part of the main training modules beginning on Friday January 16 2026 and continuing until Wednesday March 18 2026.

The modules were structured over eight weeks comprising 20 training sessions each lasting no more than 35 minutes. The training method employed interval training and a 2:1 training load variability approach. Following completion of the specific exercises post-tests were conducted on the research sample in the indoor hall of the Youth Club on March 18 2026 at 4:00 PM for 40 minutes. The researchers used the SPSS statistical package for data analysis.

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Result

Displaying the results of the pre- and post-tests for anaerobic lactic power, transitional speed, and agility:

Table 2. *Mean Differences, Standard Deviation of Differences, Standard Error, and t-Test Values for the Studied Variables*

Variables	Mean Difference	SD of Differences	Standard Error	Calculated t-value	Sig. (p-value)	Significance
Anaerobic Power	1.949	2.644	0.836	2.331	0.045	Significant
Linear Speed	0.119	0.062	0.017	6.658	0.000	Significant
Agility	0.297	0.316	0.091	3.257	0.008	Significant

Note: Results are considered statistically significant when $p < 0.05$ at a degree of freedom (df) = 13.

Discussion

The results from the tables above show that the research sample developed anaerobic capacity transitional speed and agility. The presence of statistically significant differences suggests that the specific exercises implemented during training sessions were systematically designed to enhance anaerobic capacity speed and agility. This improvement is attributed to the development of muscle resistance to fatigue and enhanced neuromuscular coordination. The specific exercises were varied and repeated multiple times over two months with varying intensity volume and rest periods between repetitions. Furthermore interval training was highly suitable for the training environment with simulated match conditions during training sessions.

The presence of motor programs in the brain contributed to better performance during official matches. Training aids were used to prevent boredom during implementation (Khadem & Ahmed, 2022). Some studies confirm that anaerobic capacity depends on the player's ability to resist fatigue due to increased oxygen debt which leads to lactic acid buildup. The faster and more continuous the movements the less oxygen is available for energy production thus necessitating the use of the second energy production system (Al-Mawla, 2017; Curby, 2024).

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Al-Sabati explained that during conditioned training in terms of the number of touches specific areas and linking speed drills to skill performance in various situations while emphasizing the speed of skill execution players acquire a high level of play. (Amrallah, 2016).

Tariq in his study emphasizes that interval training in football when applied at appropriate intensity levels significantly influences skill-related variables anaerobic capacity and the fatigue index of players particularly when training programs are standardized and based on functional indicators to determine training loads and rest periods. (Mohammed, 2016).

Al-Rabdhi in his study affirms that varying exercises within a single sport avoids mental confusion and increases the desire to train. Furthermore gaining experience in varying performance leads to acquiring diverse physical qualities and abilities." (Al-Rabdi, 2010).

Bahaa Al-Din states that "training regularly for weeks will lead to physiological adaptation and the player's physical and functional abilities will develop contributing to the player's ability to endure the specific (anaerobic-lactic system)." (Salama, 2000; Mushtaq, 2023).

Muhammad's study also mentions that a successful coach plans their training program to cultivate this specific style, which requires physical activity that focuses more on developing the energy system and muscle groups to achieve the desired goals (Allawi, 2000).

Fares' study indicated that the implemented exercises increased the motivation and enthusiasm of the female players while performing their specific exercises. (Asleawa, 2020)

Rashid emphasizes that "the coach's encouragement is one of the factors that influence the player's physiological, technical, and skill-based response, and this influence is very important because external motivation leads to team gains and cohesion" (Hamad, 2009).

Interval training allows the athlete to achieve the highest training load with the least amount of fatigue. This enables the athlete to perform technical movements repeatedly over extended periods, provided the development of physical abilities is balanced. Since agility is a set of physical capabilities, Hamdoun stated that "during training, the player should not move away from the ball while performing various exercises, as this causes neuromuscular stress on the player, which contributes to the development of their physical abilities and skills" (Al-Hayali, 2016).

Fares' study indicated that improvement in players' performance, particularly in speed and high accuracy in developing basic skills, resulted from the use of these new and effective special exercises, which were scientifically and systematically designed. These exercises emphasized correct performance and helped players develop quick decision-making during skill execution. (Yousif, 2016)

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Al-Bashtawi asserts that "running in different directions, performing movements similar to the technique, and repeating them at an appropriate speed contribute to achieving the motor pathway in the neuromuscular system, which leads to the development of speed and agility." (Al-Bashtawi, 2006).

Mohammed's study indicates that the performance and repetition of the technical skill over long training periods led to improvements in coordination, as observed in the sample, which consisted of advanced high-level players. (Al-Madaghema, 2008).

Schmidt's study confirms that the systematic and purposeful repetition of specific exercises contributes to the development of skill performance and enhances the ability to apply the skill efficiently in competitive situations (Schmidt, 2011).

The physiological adaptations resulting from anaerobic training include improved function of enzymes responsible for rapid energy production, leading to increased muscle power (Amanh, 2018).

Finally, some recent studies have confirmed that amino acid supplements are effective in developing the physical abilities of female futsal players when incorporated into daily training for a limited period and in controlled amounts (Qasim, 2026).

Conclusion

1. The specialized exercises used in interval training significantly improved the anaerobic lactic capacity of advanced futsal players.

2. The specialized exercises significantly improved transitional speed and agility reflecting their suitability to the demands of rapid multidirectional performance that mimics tactical plays in futsal.

3. The application of specialized exercises within a structured interval training framework contributes to the comprehensive development of certain physical abilities relevant to futsal performance.

4. The study results indicate that designing exercises in accordance with the requirements of anaerobic energy systems enhances the physical response efficiency of players.

Recommendations

1. Adding particular interval training activities to futsal training regimens is very important since they help improve physical abilities.

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2. Because of the nature of the game training activities must be developed to work with energy production systems with a concentration on the anaerobic lactic system.

3. To improve your transitional speed and agility you need to do particular training activities that are like real game scenarios.

4. The training load (intensity volume and rest) should be set up in a scientific way to make sure that the body can respond in the right way.

5. Use extra training tools and aids to boost players' enthusiasm and the quality of their performance during practice sessions.

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