The Ability to Repeat Maximum Speeds and Their Impact on Some Functional and Skill Indicators for Futsal Players

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Abstract

The research problem addresses the lack of performance assessments tailored specifically for futsal players, which accurately represent the key physical attributes demanded during matches, alongside insufficient comprehension of their physiological impacts, particularly concerning the cardiovascular and respiratory systems. Consequently, this study aims to offer a detailed descriptive analysis of the physical and physiological performance of futsal players, with a particular emphasis on Repeated Sprint Ability (RSA) and its influence on selected physiological and skill-related variables. The researchers propose that a relationship exists between RSA and certain physiological and technical indicators in futsal players. The experimental procedures involved a sample drawn from players at Al-Saniya Sports Club during the 2024–2025 futsal season. All measurements were performed at the College of Physical Education and Sports Sciences, University of Al-Qadisiyah. Physiological function variables were assessed using the COSMED K5 device, manufactured in Italy. Among the principal outcomes, the capacity to perform repeated high-intensity sprints demonstrated a positive impact on the physiological variables studied (VE, RQ, VE/VO2, VE/VCO2, HR), as well as on multiple composite skill indicators in futsal players. Based on these results, it is recommended that routine physiological assessments be integrated into futsal training programmes to monitor fitness status, and that RSA be systematically incorporated within training regimens.

Keywords: Repeated Sprint Ability, Physiological Indicators, K5, Skills, Futsal.

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Introduction

Futsal is regarded as one of the most rapidly developing sports in recent years, with significant progress observed in both technical and physical performance. These improvements are primarily linked to the quality of training methodologies and the organisation of training loads according to the energy systems most engaged during matches (Miguel et al., 2021). It is widely recognised that futsal performance depends mainly on anaerobic energy systems (phosphagen and lactic acid systems), owing to the repeated high-speed movements over short distances and in multiple directions required to execute both defensive and offensive tactical roles (Wing et al., 2022). Furthermore, the technical skills performed by futsal players predominantly occur under anaerobic conditions, which explains the rule permitting unlimited player substitutions without referee approval, emphasising the considerable physical demands placed on athletes during matches (Nemčić & Calleja-González, 2021).

Speed constitutes one of the most vital physical attributes in futsal, whether in possession of the ball or otherwise. It interacts with other physical capabilities, substantially contributing to overall athletic performance. For example, speed combines with strength to generate explosive power and with endurance to develop speed endurance. Speed endurance is a fundamental element for futsal players, as it allows them to sustain high-velocity efforts throughout both halves of a match, in offensive and defensive contexts, while resisting fatigue and preserving performance efficiency until the final whistle (Jatra et al., 2023). Accordingly, it is considered crucial to investigate the physiological responses and adaptations that occur in futsal players during repeated high-speed sprints, with particular emphasis on cardiac responses. Although heart rate monitoring is a straightforward technique, it can provide valuable insights into the internal physiological status of the athlete during such exertion.

Research Questions

Systematic implementation of performance testing and physiological assessments throughout training phases is essential to monitor attributes that directly influence athletic performance. This staged evaluation facilitates the

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verification of both general and specific training goals, enabling coaches to assess players' physical conditions, consolidate strengths, and rectify weaknesses within the training programme, especially during periods of competition. To attain optimal physical preparedness, it is crucial to integrate targeted testing that corresponds to the physiological demands characteristic of futsal. Consequently, the researcher sought to measure selected physiological variables during repeated sprint testing, a principal method for evaluating athlete readiness. Such data supports coaches in designing appropriate training plans based on the players' performance outcomes and physiological conditions. Therefore, the principal problem addressed in this study concerns examining the impact of repeated high-intensity sprints on specific physiological parameters in futsal players.

Objective

The objective is to determine the impact of repeated sprint ability on selected physiological and skill-related variables among futsal players from Al-Saniya Sports Club.

Hypotheses

There is a significant effect of repeated sprint ability on selected physiological and skill-related variables among futsal players of Al-Saniya Sports Club.

Field

The research sample comprised 10 futsal players from Al-Saniya Sports Club, selected to participate in the team for the 2024–2025 competitive season. The study spanned six months, commencing on 1 September 2024 and concluding on 11 March 2025, encompassing both the pre-season preparation phase and the in-season competition period. During this timeframe, physical and skill-related counter movement variables were assessed throughout training sessions and competitive matches. All testing and measurements were conducted within the halls and laboratories of the College of Physical Education and Sports Sciences at the University of Al-Qadisiyah. These facilities provided a controlled and scientifically appropriate environment, ensuring that the assessments were accurate and valid. The specialised setting minimised the influence of extraneous factors, thereby enabling the collection of more reliable and valid data.

Literature Review

Introduction to Performance Demands in Futsal

Futsal is a team sport characterised by intermittent, predominantly high-intensity activity, requiring players to execute numerous high-speed actions in succession, such as repeated sprints, accelerations, rapid changes in direction, and technical skills including dribbling and shooting, all under substantial physiological stress. The reduced court size and allowance for unlimited substitutions facilitate prolonged periods of intense play, while necessitating that players recover adequately to sustain explosive efforts during subsequent phases. As such, the physiological needs impose great dependence on both the anaerobic and the aerobic energy systems, and thus RSA and the ability to sustain near-maximum speeds are necessary for successful offensive and defensive performances (Ribeiro et al., 2023). These physiological needs are closely correlated with prime functional performance indicators such as muscle contractive properties, explosiveness of movement, and agility, as well as technical performances like dribbling, passing, and shooting. A player's ability to perform maximal sprints and recover between repeated sprints has an effect on both physical output and the precision and effectiveness of technical action during competition. Ergogenic effects of speed endurance through an enhanced measure of stamina have direct links with players' functional capabilities and competent execution of skill and thus relate speed endurance and technical and functional performances in a way that interlinks them in competition contexts of futsal (Mudian & Prasetiyo, 2024; Sánchez-Sánchez et al., 2018).

Repeated Sprint Ability and Physiological Responses

RSA is a pivotal performance criterion of futsal since the game involves repeated short bursts of high-intensity effort with interspersed recovery periods of short intervals. Sánchez-Sánchez et al. (2018) demonstrated that an RSA test (7 × 30 m) significantly impacted muscle contractile qualities in elite players and produced decreases of muscle stiffness with strength gains. Significantly, these physiological changes significantly correlated with decreases in performance, revealing the great physiological cost of repeated peak efforts. In a related vein, Guilherme, dos Santos and Ferrer (2023) reported that the Tabata high-intensity interval protocol imposed significant demands on futsal players since subjects could not sustain the set intensity of 170% vVO_2max and generated significantly greater ratings of perceived exertion and decreases in sprint speed. In addition, recovery period between sprints also plays a significant role in determining RSA. de Oliveira Sant'Ana et al. (2023) found that a short inter-sprint recovery period (15 seconds) caused impairments in the performance of amateur futsal players compared to longer recovery times (30–60 seconds), during which times players sustained output of sprints. These findings support the hypothesis that the best sprint-to-recovery ratios need to be performed in order to sustain repeated high-speed efforts in a variety of match-like conditions.

Resistance Training and Strength-Oriented Interventions

Resistance training (RT) lies at the foundation of the enhancement of sport-specific speed, agility and general functional capacity in futsal. For instance, Paz-Franco, Rey and Barcala-Furelos (2017) investigated the effect of weekly and bi-weekly RT and of RT conducted once every two weeks during the season. In their study, they discovered that weekly and bi-weekly RT elicited significant improvements in jumping capacity, sprint capacity and RSA (RSA), while those conducting RT once every two weeks maintained fitness largely. These results support the conclusion that while RT has a preventative function for the loss of performance, it also leads to great achievements where it is conducted on a regular basis, noting the significant role that it has in the advancement of performance.

Further research examined the interaction of RT with other training elements. Torres-Torrelo, Rodríguez-Rosell and González-Badillo (2017) evaluated the effect of constrained full squat exercise (pure RT) conducted alongside a series of loaded change-of-direction (COD) tasks. These interventions optimized strength gains in muscles and RSA and produced supplemental gains while transferring between RT and loaded COD exercise. Moreover, Torres-Torrelo et al. (2017) found that lifting velocity at maximum loads during light load squat sessions enhanced sprint, jumping and strength performances. Importantly, however, only RT produced enhanced change-of-direction ability in players of futsal and other conditions failed to produce significant changes in performances of change-of-direction. Iodice et al. (2020) observed that employing a slow-speed resistance training (SRT) protocol produced greater increases in muscle power, namely peak torque at higher velocities. Comparatively, traditional RT produced gains almost entirely in maximal voluntary contraction at low velocities. This therefore implies that the training velocity of resistance exercise determines the specific strength adaptations best transferring to benefit performances of futsal.

Plyometric, Velocity, and Speed Training Programs

Plyometric training constitutes a well-established approach for enhancing explosive power and speed, attributes that are essential for sustaining repeated maximal sprint efforts in athletic contexts. Research by Villanueva-Guerrero et al. (2024) examined the differential effects of strength-oriented and velocity-oriented training protocols on youth athletes, revealing that strength-focused regimens elicited superior gains in horizontal jumping ability and change-of-direction performance, whereas velocity-centred interventions produced more pronounced improvements in 100-metre sprint times. Subsequent validation by the same authors reaffirmed these findings, underscoring the capacity of tailored programme design to induce specific adaptations within lower limb performance parameters among young players.

In an associated study, Ilham et al. (2024) contrasted the effectiveness of plyometric training through hurdle jumps with bodyweight resistive exercise using lunges. Their findings showed that the plyometric protocol proved more efficacious in enhancing leg explosive power. Interestingly, the inclusion of high-speed running drills within the plyometric programme was correlated with added improvement of concentric muscle action, reflective of the importance of velocity in achieving favourable muscular mechanical output. Correspondingly, Apriantono et al. (2023) conducted a seven-week speed-emphasising training programme with adolescent male futsal players and documented significant gains in aerobic ability and agility. Yet gains in sprint capacity and vertical jump altitude remained relatively moderate, and this interventional specificity regarding training stimuli was deemed responsible. Together, these studies portray plyometric and speed training as providing differential influences on the multifactorial physical requirements needed for playing futsal. Plyometric exercise largely engenders the establishment of explosive power development, especially while focusing on speed, while speed training largely leads to improvements of an endurational and agility nature—the former being equally necessary for fulfilling the sport's competition requirements.

Sprint-Specific Training Approaches

Specialized sprint training approaches have been utilised in exploring both repeated and maximal sprint capacities. Robid (2019) compared parachute-assisted sprints and sprints with resistance bands and showed that the parachute-based training resulted in broader gains in speed development. Other studies, such as Hamzah, Malih and Amara (2023), provide further support for interactive sprint drills. Their female futsal-based investigation implemented interactive speed drills focusing on dribbling ability, ball control, and goal-scoring. While technical skill development remained the focal point of the research, the implementation of these interactive drills also encouraged an enhanced competition spirit within trainees. Support for these holistic approaches to training further stems from investigations that provide a more specific sporting focus. For instance, Nurkadri and Kholil (2024) found significant links between leg strength of muscles, agility ability, and

eye-foot dexterity and dribbling speed. Mudian and Prasetiyo (2024) found related correlations between speed ability, agility ability, and proficiency in dribbling. These studies together draw attention to the inter-relatedness of physical abilities and technical proficiency as vital for superior sprint ability within the game of futsal.

Technical Skills and Functional Indicators in High-Speed Contexts

High-speed ability in futsal transcends physical fitness and has an extensive effect on technical execution and scoring ability. Sadeq (2020) showed that penalty shots from 10 metres demanded higher work output and produced higher ball speed than shots taken from 6 metres. This result implies that increasing muscular power at high velocities and more stressful conditions has a great deal of influence on increasing the player's ability to score. Jabr and Abbas (2024) also made notable revelations through path analysis on investigating the interrelationships between fundamental motor skill speed, agility, and muscular strength and futsal skill. Through their research, they showed that these functional capacities have direct and indirect influences on skill execution and hence highlight the intricate interplay between technical attributes and physical performance in futsal.

External and Contextual Factors Affecting High-Speed Performance

Aside from training protocols, there are a variety of environmental and match-related variables that determine a futsal player's ability to maintain repeated maximal speeds. Ribeiro et al. (2023) showed that substitution patterns also largely determine performance, where players with more favourable work-to-rest ratios or decreased playing time maintain higher-intensity efforts for longer periods of time within match play. This implies that utilizing tactics of rotation may help maximize physical output. Moreover, player performance depends on the standard of competition. Overall, these results indicate that repeated maximal speed performance within futsal is not only influenced by tests of individual fitness and physiological measures, but also by external factors such as playing surface attributes, substitution strategies, and standards of competition. All of these variables must be incorporated into methods designed to maximize physical output.

Summary of Literature and Research Gaps

The studies reviewed in this thesis consistently demonstrate that RSA, alongside maximal speed capacity, is fundamental to futsal performance. Both physical outputs such as jump height, sprint time, and agility and technical skills including dribbling proficiency and striking accuracy are influenced by these physical capacities. Training modalities including resistance training, plyometric training, velocity-specific training, and speed training all offer beneficial effects; however, the extent of these effects varies considerably based on programme design. Factors such as training frequency and individual player characteristics significantly modulate training outcomes.

In spite of developments in literature, significant gaps persist. Most of the investigated training programs deal extensively with the improvement of physical qualities while leaving aside their influence on skill execution in high-intensity settings. Much is still lacking in terms of the direct connection between RSA improvement and match-specific indicators of a functional nature like decision-making speed, passing ability, and defensive intervention in the face of hyper-fatigue conditions of competition settings. Strategies of recovery between repeated maximal effort also require more research focus, particularly taking into account the effects of substitution behaviors, variations in playing surfaces, as well as tactical variables on the physical capabilities of players. Filling these gaps involves studies that not only analyze the capacity of sustaining repeated maximal speeds but also simultaneously test functional and skill-based indicators of authentic futsal settings. This combined approach represents the main focus of the current study.

Methodology and Field Procedures

Methodology

In pursuit of achieving objective and scientifically valid findings, it is very important to select a research method that is well-matched with the nature of the problem under examination. For this reason, the descriptive method has been applied since it is suitable for exploring the type of problem under examination in this research. This method entails the gathering of information and data on a certain phenomenon or setting and analyzing it in a way that enables the generalization of findings from a representative sample back to the whole population (Doyle et al., 2020; Siedlecki, 2020).

Population and Sample

The study sample included 16 youth players of Al-Saniya Futsal Club. Purposive sampling of 10 players was conducted in consultation with the team's coach. Players' selection was based on regular participation in matches and regular team participation except goalkeepers and irregular players. Table 1 displays the homogeneity of the sample on some of the most important characteristics like chronological age, training age, height, and weight.

Table 1

Sample Homogeneity in Variables Relevant to the Study

Variable	Unit	Mean	Standard Deviation	Coefficient of Variation (%)
Chronological Age	Years	21.14	1.71	9.70
Training Age	Years	5.82	0.14	3.14
Height	cm	178.71	3.91	1.67
Weight	kg	74.62	1.98	2.58

Tests and Measurements Used in the Study

The Repeated Sprint Ability Test, as described by de Oliveira Sant'Ana et al. (2023), was employed to evaluate the capacity to perform repeated maximal sprints.

- Purpose: This test aims to assess the athlete's ability to perform repeated maximal sprints.
- Equipment: Cones, measuring tape, stopwatch, and a flat running surface.
- Procedure: The athlete completed seven maximal-effort sprints over 30 metres, with 25 seconds of active recovery between each sprint.
- Data Recording: Each sprint time was recorded, and the following metrics were calculated:
  - Fastest Time: The shortest time achieved among all sprints.
  - Average Time: The mean sprint time across all repetitions.
  - Percentage Fatigue Index: Calculated using the formula:

(Best Time × Number of Sprints / Total Time − 1) × 100 (Formula adapted from Villanueva-Guerrero et al., 2024).

Physiological Measurements

Physiological indicators were assessed in real time during the physical performance test using the K5 device, which enabled the continuous collection of functional data (see Figure 1).

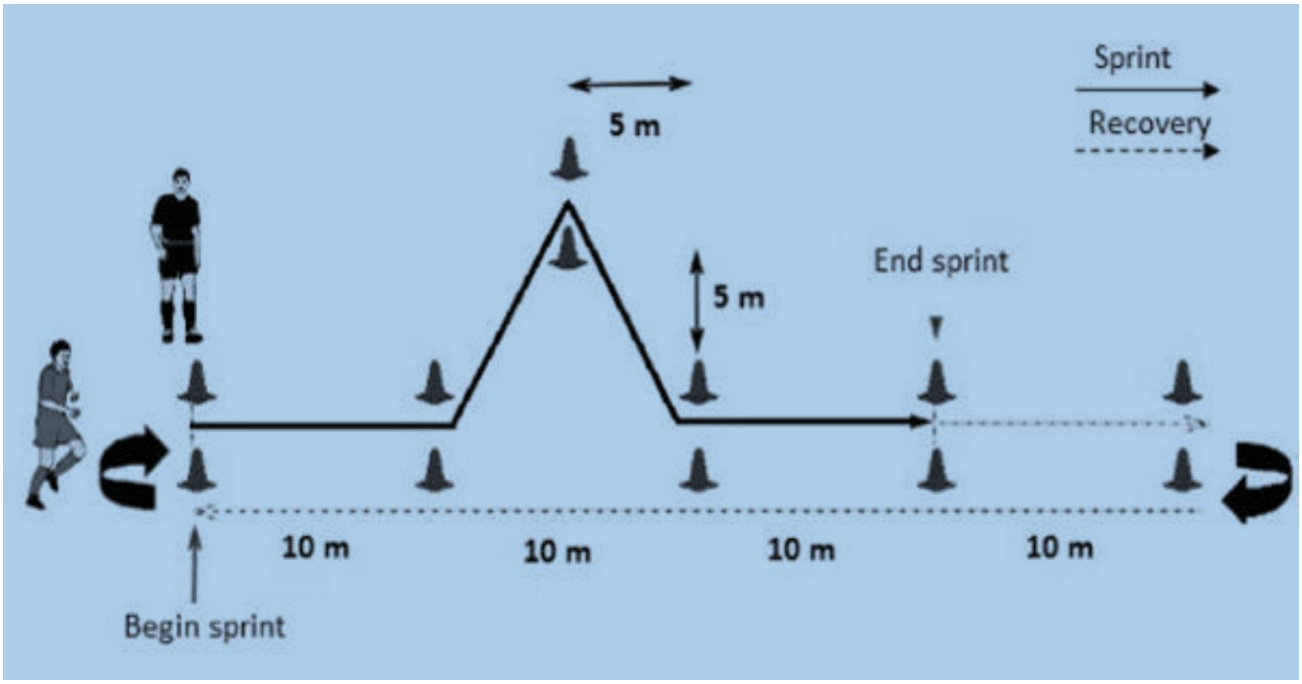

Figure 1: *Test of RSA, in Which the Player Performs 7 Repetitions of 30-Meter Maximal Sprints, Interspersed with 25 Seconds of Active Recovery.*

Skill-Based Tests: Three compound skill assessments were conducted to evaluate the players' technical performance:

1. Receiving the ball while in motion, followed by dribbling and passing
   - Purpose: To assess the capability to control the ball while moving, then dribble and deliver an accurate pass.
2. Receiving the ball within a designated circle, followed by dribbling and passing
   - Purpose: To measure proficiency in receiving, dribbling, and passing under spatial constraints.
3. Receiving the ball, dribbling, and shooting at a goal divided into marked target squares

Purpose: To evaluate the accuracy and execution of

receiving, dribbling, and targeted shooting.

Main Experiment

The main experiment was carried out in two distinct phases:

- Phase One (22/01/2025): Participants completed the Repeated Sprint Ability test, during which selected physiological variables were measured in real time using the K5 device. This phase was conducted in the indoor hall of the College of Physical Education and Sports Sciences, University of Al-Qadisiyah.
- Phase Two (23/01/2025): The same participants undertook the skill-based tests at the same venue, ensuring consistency in testing conditions.

Statistical Tools

The data were analysed using SPSS software (version 11) to examine the relationships between variables and to determine the levels of statistical significance.

Results and Discussion

Table 2 presents the means and standard deviations for the primary physiological and skill-related variables assessed: RSA, VE, RQ, HR, VE/VO_2, VE/VCO_2, and the technical skill sequences M1, M2 and M3. Moreover, Table 3 presents the Pearson correlation coefficients between RSA and the measured physiological variables (VE, RQ, HR, VE/VO_2, VE/VCO_2) as well as the skill sequences M1, M2 and M3. The results indicate significant associations, reflecting how these factors are interrelated and may affect players' capacity to sustain repeated maximal sprints in futsal. The analysis revealed significant positive correlations between RSA and all measured physiological variables. In contrast, negative correlations were identified with the skill-based tests, with M3 (Receiving → Dribbling → Shooting) showing a statistically significant relationship ($p = 0.000$).

Table 2

Means and Standard Deviations for the Studied Variables

Variable	Sample Size (n)	Mean	Standard Deviation	Unit of Measurement
Sprint Repetitions (RSA)	10	6.5	0.97	%
VE (Ventilation)	10	133.5	3.24	L/min
RQ (Respiratory Quotient)	10	0.98	0.15	—
HR (Heart Rate)	10	182	2.05	bpm
VE/VO_2	10	31.3	1.49	—
VE/VCO_2	10	32.8	2.48	—
M1: Receiving → Dribbling → Passing	10	1.88	0.64	—
M2: Receiving (Inside Circle) → Dribbling → Passing	10	1.60	0.69	—
M3: Receiving → Dribbling → Shooting (Toward Goal with Squares)	10	1.56	0.54	—

Table 3

Pearson Correlation Coefficients Between Repeated Sprint Ability and Physiological & Skill Variables

Variables	Sprint Ability	VE	RQ	HR	VE/VO_2	VE/VCO_2	M1	M2	M3
Pearson Correlation	1.000	0.970	0.886	0.946	0.956	0.966	-0.821	-0.164	-0.939
Significance (1-Tailed)	—	0.000	0.000	0.000	0.000	0.000	0.002	0.326	0.000

Table 4 presents the percentage contribution of the dependent variables in accounting for the variance of the independent variable, as derived from the regression model summary. The model indicates an almost perfect fit, with an R^2 value of 1.000, highlighting the exceptionally strong explanatory capacity of the included variables. Moreover, Table 5 presents the outcomes of the statistical significance testing for the correlational relationships among the examined variables. The findings indicate that the regression model achieves statistical significance ($p = 0.041$), thereby substantiating the robustness and practical relevance of the associations identified. This result confirms that the interplay between the measured physiological and skill-related indicators meaningfully contributes to explaining variations in RSA within the sampled futsal players. Furthermore, Table 6 reports the statistical significance levels and standardised coefficients for the variables incorporated into the regression model. The results elucidate the relative contributions of each physiological and skill-related indicator to RSA, identifying the factors exerting the greatest influence on performance outcomes within the sample.

Table 4

Percentage Contribution of Dependent Variables in Explaining the Independent Variable

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	1.000	1.000	0.997	0.05518

- a. Predictors: (Constant), M3, M2, M1, RQ, VE/VO_2, RF, VE/VCO_2, HR.
- b. Dependent Variable: Sprint Repetitions (RSA).

Table 5

Test of Significance for Correlational Relationships

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	8.497	8	1.062	348.854	0.041b
Residual	0.003	1	0.003	—	—
Total	8.500	9	—	—	—

- a. Dependent Variable: Sprint Ability.
- b. Predictors: (Constant), M3, M2, M1, RQ, VE/VO_2, RF, VE/VCO_2, HR.

Table 6

Significance of the Variables Under Study

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Correlations
	B	Std. Error	Beta		
1	(Constant) 140.793	35.465		3.970	0.157
	VE 0.111	0.034	0.369	3.242	0.190
	RQ 6.932	1.730	1.105	4.008	0.156
	HR -0.926	0.231	-1.957	-4.011	0.156
	VE/VO_2 0.326	0.073	0.502	4.482	0.140
	VE/VCO_2 0.140	0.036	0.358	3.864	0.161
	Ball Reception from Movement, Dribbling, and Passing -0.545	0.117	-0.359	-4.668	0.134
	Ball Reception from Inside the Circle, Dribbling, and Passing -0.027	0.048	-0.019	-0.559	0.675
	Ball Reception, Dribbling, and Shooting at a Segmented Goal -0.737	0.107	-0.416	-6.860	0.092

Dependent Variable: Sprint Repetition Ability.

Discussion

The results indicate a statistically significant correlation between heart rate (HR) and repeated high-intensity sprint capabilities. HR becomes an essential cardiovascular marker through its pivotal role in dictating exertion and recovery. HR indicates the amount of blood pumped per beat or per minute and is paramount for distributing oxygen and clearing metabolic end-products during and following exertion. Rapid recovery of HR post-exercise is established as a robust cardiovascular efficiency and adaptability marker. In futsal, where extensive physical and physiological demands exist on players, rapid recovery on substitution or short breaks becomes paramount. Unlimited substitution permits rest return of players on the field of play following rest breaks, further supporting rapid HR recovery as necessary for maintaining performance. During exercise, HR increases in direct proportion with exercise intensity as it tries to satisfy rising oxygen requirements of contracting muscles. As indicated by D'Andrea, Gambardella and Picano (2023) and Wedin, Nyberg and Henriksson (2020), rapid recovery of HR post-activity indicates greater physical fitness and cardiovascular adaptation.

The results also indicate a significant relationship between repeated sprint ability and pulmonary ventilation (VE). VE measures the exchange of air per minute and is central to delivery of O_2 and removal of CO_2. During exercise, the exercise requirements increase with higher demands for O_2 intake and efficient CO_2 clearance through higher respiratory frequencies and greater respiratory cycle amplitudes. Measured O_2 and CO_2 values through the K5 respiratory system during tests indicated higher O_2 than CO_2 levels, validating efficient gas exchange. Therefore, the respiratory system allows the creation of energy, removal of

waste and homeostatic regulation of pH and fluid and temperature balance. The study also confirms a relationship between repeated sprint ability and respiratory quotient (RQ). RQ as the quotient of CO_2 produced:O_2 consumed measures substrates used during metabolism. Carbohydrate oxidation prevails during high-intensity exercise and RQ measures may exceed 1.0 indicating an increase towards anerobic metabolism. This pattern corresponds with the demands of intermittent high-intensity exercise of futsal and predominance of phosphagenic and lactic energy systems. Schaffarczyk et al. (2023) observe that RQ tends significantly to increase near the anaerobic threshold.

Moreover, relationships were found with ventilatory equivalents for oxygen (VE/VO_2) and carbon dioxide (VE/VCO_2). A VE/VO_2 ratio of more than 25 L points towards high effort and higher requirements for oxygen delivery, and VE/VCO_2 higher than 32 L indicate enhanced clearing efficiency of CO_2. These ratios give information regarding metabolic changes occurring during high-intensity exercise and the respiratory system's compensation of lactate-related acidosis. As noted by Páez et al. (2023), with energetic effort, pulmonary ventilation often rises more than oxygen uptake as a response to the body's requirements for buffering high acidity levels. In conclusion, the evidence highlights the central relevance of repeated sprint exercise performance being dependent on the efficiency of the cardiorespiratory system of futsal players. Selective physiological markers such as HR, VE, RQ, VE/VO_2, and VE/VCO_2, taken together, give an overall picture of an athlete's capabilities of meeting energy requirements, recovering best, and reproducing repeated high-force efforts that all hold parsimonious importance in regard to competition excellence.

Technical Performance Results

The results in Table 7 indicate significant negative correlations between RSA and certain complex skill tests, namely receiving on the move followed by dribbling and passing, and receiving followed by dribbling and shooting. This suggests that higher technical proficiency is linked to shorter times in high-speed repeated performance, which in turn enhances skill execution under intense physical demands. According to Spyrou et al. (2020), a futsal player cannot perform effectively in a match unless they possess a high level of technical ability that enables them to meet the demands of match situations.

Table 7

Means, Standard Deviations, and Correlation Values Between Repeated Sprint Ability and Selected Complex Skills

Skill Tests	Mean	Standard Deviation	Correlation Coefficient	Significance
Receiving on the Move → Dribbling → Passing	1.88	2.418	-0.821	0.00
Receiving Inside the Circle → Dribbling → Passing	1.60	3.402	0.164	0.65
Receiving → Dribbling → Shooting on a Segmented Goal	1.56	0.267	-0.939	0.00

The researcher attributes these correlations to the nature of the training programmes undertaken by the players, which emphasised high-speed execution and strength-focused performance closely replicating match demands in terms of intensity, volume, and rest intervals between repetitions. Such training significantly improved both technical and physical efficiency. This outcome aligns with Terblanche et al. (2022), who noted that one of the main goals of effective coaching is to increase training efficiency within a specific time frame, adding that training time alone is insufficient and that regulating the training load is essential for achieving high efficiency. Furthermore, the correlation between RSA and complex skill tests is also linked to the inclusion of fast-paced, targeted exercises during training, requiring physical strength in execution. These drills enhanced complex skill performance through the use of varied and intense tactical skill-based activities. This, in turn, improved player efficiency and overall performance quality. Sanchez et al. (2023) emphasised that the golden rule of any preparation programme is specificity, meaning that the movements practised in training should closely resemble those used in actual competition.

This perspective is consistent with Sullivan et al. (2021), who stated that the primary goal of any exercise is to develop the player's ability and enhance their capacity to meet the challenges posed by skilled opponents. The observed improvements were also the result of sustained training during the specific preparation phase and the effectiveness of the training methods implemented by the researcher, which enhanced both maximal anaerobic capacity and complex skill execution, with positive effects extending to tactical performance. The training process was grounded in scientific principles and applied progressively, leading to improved physical fitness and better performance in the research tests. As Wenjie, Lou and Wang (2025) explained, daily training sessions are aimed at enabling players to master technical-tactical skills

despite their complexity and variety. Tactical execution in football is an essential component of the daily training unit. Based on the principle that rapid tactical preparation and precise execution of fundamental skills are critical to the game, a football player cannot successfully perform tactical tasks without first mastering and refining basic skills. Consequently, one of the primary objectives of training is to elevate the players' overall preparation to the highest achievable level.

Conclusions and Recommendations

Conclusions

The findings indicate that RSA has a positive influence on the physiological indicators assessed in futsal players, specifically VE, RQ, VE/VO_2, VE/VCO_2, and HR, suggesting that enhanced sprint repetition capacity contributes to improved physiological efficiency during high-intensity efforts. Furthermore, a significant association was observed between RSA and specific complex skill performances, highlighting the potential role of repeated sprint capacity in supporting superior technical execution and overall performance effectiveness in competitive futsal contexts.

Recommendations

1. Regular physiological evaluations should be implemented for futsal players to effectively monitor and track their fitness status.
2. Training programmes for futsal players ought to include targeted exercises aimed at improving RSA.
3. Future investigations are advised to examine similar research incorporating a broader range of physiological and physical variables in futsal players.

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