

EVALUATION OF SPRINTS PERFORMED IN FUTSAL: PROPOSAL OF A TRAINING PROTOCOL

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ABSTRACT

Futsal is a sport with intermittent characteristics and varied intensities. Objectives: Evaluate the sprints performed by futsal athletes in each tactical position and propose a training protocol. Materials and Methods: This is a quantitative, descriptive and longitudinal study. Environment: Field study. Participants: Carried out with twenty adult futsal athletes, all Brazilians who played in the 2018 and 2019 seasons, being six fixed, eight flanks, and six pivots. The data collect took place through observation of the footage taken in 20 games. It was counting the passes in sprints by position. Data were analysed for a significance level of $p \leq 0.05$. The research was approved by the Research Ethics Committee, protocol number 4,078,830. Results: The frequency of sprints per minute was 1.4, with a mean distance of 8.0 ± 3.4 m and occurrence of 30.1 ± 5.6 sprints per game. The results did not show statistically significant differences between the evaluated positions. Conclusion: However, these indicators served as parameters for proposing a training protocol specifically for sprints in the futsal modality, with a distance of less than 34.5m, with 40-second intervals between stimuli, and with a summed distance of at most of 463m.

Key words: Futsal. Sprints. Training. Prescription. Intermittency.

RESUMO

Avaliação de sprints realizados no futsal: proposta de protocolo de treinamento

Objetivo: O futsal é uma modalidade esportiva com características intermitentes e intensidades variadas. Objetivos: Avaliar os sprints realizados pelos atletas de futsal em cada posição tática e propor um protocolo de treinamento. Materiais e Métodos: Trata-se de um estudo quantitativo, descritivo e longitudinal. Ambiente: Estudo de campo. Participantes: Realizado com vinte atletas de futsal adulto, todos brasileiros que atuaram nas temporadas de 2018 e 2019, sendo seis fixos, oito laterais e seis pivôs. A coleta de dados ocorreu por meio da observação das filmagens realizadas em 20 jogos. Contava-se os passes em sprints por posição. Os dados foram analisados para um nível de significância de $p \leq 0,05$. A pesquisa foi aprovada pelo Comitê de Ética em Pesquisa, protocolo número 4.078.830. Resultados: A frequência de sprints por minuto foi de 1,4, com distância média de $8,0 \pm 3,4$ m e ocorrência de $30,1 \pm 5,6$ sprints por jogo. Os resultados não mostraram diferenças estatisticamente significativas entre as posições avaliadas. Conclusão: No entanto, esses indicadores serviram como parâmetros para propor um protocolo de treinamento específico para sprints na modalidade futsal, com distância inferior a 34,5m, com intervalos de 40 segundos entre os estímulos e com distância somada de no máximo 463m.

Palavras-chave: Futsal. Sprints. Treinamento. Prescrição. Intermitência.

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INTRODUCTION

Over the years, Futsal has gone through a series of modifications and adaptations in its context, such changes have made this modality recognized worldwide (Bertolla et al., 2007).

Starting to be practiced on a large scale, in schools, kindergartens, base categories, with the objective of leisure, entertainment, income, or even as a profession.

These changes transformed futsal into a dynamic sport, characterized by game situations of short duration and varied intensity, with a high number of goals (Vieira et al., 2016; Cepeda, Gamboa, Sanabria, 2019).

Accelerated passes, fast movements with and without the ball, intense marking, fast attack and defense transitions, constant loss and recovery of ball possession, with moments of equality and numerical inequality and with a high occurrence of set pieces, making the sport unpredictable, leaving -the most dynamic and demanding greater versatility from the practitioner (Matzenbacher et al., 2014).

Characterized as a stressful, intermittent, high-intensity sport that intersperses high-intensity, short-duration efforts of approximately 2-3 seconds, with brief recovery periods of 20-30 seconds, in association with constant changes in speed and direction (Stolen et al., 2005; Haugen et al., 2014).

This proportion of effort and recovery periods results in high physical, technical and tactical demands for players (Santos et al., 2018).

These characteristics transfer to the technical committees adjustments in the volume and intensity of activities, seeking to increase the physical capacity of athletes, their performance, and prolonging the useful life of each player (Matos et al., 2014).

These variants require great energy demand during matches, which is supplied by the aerobic system (Naser, Macadam, 2017).

The constant frequency of sprints, sudden stops, accelerations, decelerations, changes in direction and submissions that occur during matches require a well-trained neuromuscular and anaerobic energy system (Nogueira et al., 2018).

Thus, the movement on the court requires sudden acceleration and deceleration

with a sudden change of direction (Moreira et al., 2004).

It is characterized as an oppositional game, unpredictable, in which the technical-tactical aspects have great relevance (Fukuda, Santana, 2012).

For Oliveira et al., (2018), the need for dynamism and speed in their practice is increasingly felt.

Speed is an essential physical ability for these athletes, and it is related to several physical actions performed during the game (Oliveira et al., 2014).

Beato et al., (2016) point out that several sprints and high-intensity actions occur intermittently during matches. In addition to running approximately 3,000 to 4,000 m with an intensity of 85-90% of the maximum heart rate (HR max.)(Freitas et al., 2016).

Unlike field football, where the size of the game space provides distances that range from 10 km to 12 km (Maciel, Caputo, Silva, 2011). Cetolin et al., (2013) point out that high intensity displacements present distances of up to 40 meters.

The speed of these, according to Castagna et al., (2009), are higher than 18.3 km/h. on the other hand, in futsal, the size of the court has a maximum limit of 40 m, which hardly allows sprints at the same speeds provided in the field, due to the distances and the need for braking at the end of the course.

The high physical demand required from athletes can be impaired due to fatigue, physical unpreparedness, or injuries caused by inconsistencies in training sessions, thus impairing their regularity and improvement (Barbero-Alvarez et al., 2009; Tapparo et al., 2019).

Therefore, detailing and knowing the sport makes the professionals involved in the prescriptions have greater security of parameters and training reliability, as well as the qualification of the futsal athlete, emphasizing their physical characteristics compatible with those that predominate in the game (Agudelo, Velásquez, 2011; Faude et al., 2012).

Due to the reduced space of the game and the high number of sprints during a match, this ability must be improved at various times during the training program.

The improvement of the technical and tactical components within the game are based on a high level of physical capacity, and this is

subdivided into the different displacements performed by the athletes, with special emphasis on the sprints, which allow the athlete to take advantage of the opponent, either by an approximation in marking, occupying a space, disputes of balls in offensive and defensive actions, or advantages at the moment of passing, or of submissions (Sasaki et al., 2015; Chaouachi et al., 2012).

In this way, players must not only run fast in a linear manner, but also decelerate and accelerate quickly when changing direction.

The ability to perform sprints has been described as a complex skill, supported by a series of different factors, such as speed, running technique, strength, power and muscle quality of the lower limb segmentation (Condello et al., 2016; Sheppard, Young, 2006).

Thus, quantifying and enabling parameters for the technical committees can help in the preparation of training sessions, raising respect for the specificity of training, thus, the present study sought to investigate the number of sprints performed during a futsal match in the adult category, and propose a specific training protocol for futsal tactical positions.

MATERIALS AND METHODS

This is a characteristic, observational, quantitative, descriptive, and longitudinal research, as the athletes were evaluated over a season in different games, which took place in a 36x19m court.

Twenty Brazilian futsal athletes, male adult category, belonging to the Marauense Futsal Association (AMF) team, Gaúcho futsal team, ten athletes in the 2019 season, and ten athletes in the 2018 edition participated in the study. 20 ± 6.47 years, weight 75.48 ± 6.59 kg, height 1.76 ± 0.06 m, fat percentage of $11.54 \pm 3.86\%$, and lean muscle mass of $49.46 \pm 4.05\%$ showing a significant difference in age ($p \leq 0.05$) and weight ($p=0.019$) of the sample between seasons.

Each athlete was analysed from their original tactical position, in two different games, selected at random, creating an analysis by tactical position, with three fixed, four flanks, and three pivots, per season, goalkeepers were not evaluated in the present research. In this sense, the following inclusion criteria were considered: being linked to the team,

participating in the games of their respective competitions during the proposed seasons, regardless of the competitive phase.

Data collection was done through observation and analysis of the video footage of the games carried out and filed in the team's collection, where, in each game, the steps taken by the athletes were counted, in the displacements characterized as sprints.

This quantification of strides was recorded, adding with the records of individual participation time of each selected athlete, collected together with the scalts performed in the games, to later determine, through the number of strides per athlete, the distance covered in this displacement characteristic, the quantification of actions performed in sprints, within the total time of the athletes per game, and thus to be able to estimate the indicators of the possible full-time participation of the athlete on the court.

To determine the size of the specific stride, data collected through the protocol by Withers et al., (1982), where each athlete covered a distance of nine meters, in the form of a sprint. The stride length was obtained by dividing the test distance by the number of steps covered in this space.

Statistical analyses were processed using the Statistical Package for Social Science (SPSS), version 20.0, with a significance level of $p \leq 0.05$, where descriptive statistics (mean and standard deviation) were used for data presentation, Kolmogorov-Smirnov test to verify normality, Student's t test for independent data to compare positions, and analysis of variance (ANOVA one way) followed by Tukey's test to compare between seasons and between tactical positions of athletes.

The study was approved under protocol number 4,078,830, by the Ethics Committee for Research on Human Beings of the University of Passo Fundo.

According to the ethical standards of regulatory norms and guidelines for research involving human beings, in accordance with Resolution 466/ 2012 of the National Health Council and with the Declaration of Helsinki.

RESULTS

Table 1 presents the statistics of the parameters evaluated by tactical position.

Table 1 - Description of the total distance covered, time spent on the court, average of sprints performed in the game and per minute, distances and frequency of occurrence.

Parameters evaluated	Tactical Position	Mean	Standard-Deviation	p
Average distance Covered (m)	FIXED	249,5	41,8	0,609
	FLANK	247,9	66,7	
	PIVOT	221,9	44,6	
Average time/game (min)	FIXED	21,0	2,5	0,914
	FLANK	21,0	3,7	
	PIVOT	20,2	4,3	
Average sprints/game (occurrences)	FIXED	11,9	1,7	0,551
	FLANK	11,6	1,5	
	PIVOT	11,0	1,0	
Average sprints/min (frequency)	FIXED	1,5	0,2	0,936
	FLANK	1,4	0,1	
	PIVOT	1,4	0,1	
Average distances covered in sprints (m)	FIXED	8,1	3,2	0,557
	FLANK	8,1	3,2	
	PIVOT	7,7	3,7	
Médias de frequência da realização de sprints (m)	FIXED	30,6	5,5	0,512
	FLANK	30,8	4,6	
	PIVOT	28,8	6,0	

Note: 6 fixed, 8 flanks and 6 pivots were analyzed; Analysis of variance; significant for $p < 0.05$.

No significant differences were found in relation to time played on the court ($p=0.609$), time played ($p=0.914$), sprints per game ($p=0.551$), or sprints per minute ($p=0.936$), in distance covered ($p=0.557$) and the frequency of sprints, this demonstrates a linearity profile between the displacement characteristic and the athlete's participation time in a match, regardless of their tactical position.

The dynamics of the high-performance futsal game requires from the athlete similar high-intensity actions between tactical positions, regardless of the time that has been working in a match and its tactical function. The average participation time of athletes by tactical position is a little more than half of the total timed game time, this fact can be explained by

the high rotation of athletes during the match, adapting the quartets of athletes to the conditions imposed by the dynamics and requirements of each game.

The average sprints performed per minute in their performance within the game, shows that to maintain the average of the game pattern dichotomization, sprints above 1.5 per minute, the athlete would be doing a very high load, so, if it is below 1.4 it will be below the average. Thus, the default of this displacement, to act within the total 40 minutes of a game, would be 56 sprints as the lower limit and 60 sprints as the upper limit in the game. And the estimated total distance to be covered during the game, would have a limit of 447 to 479 m if the athlete remained the 40 minutes on court.

It is also known that the athlete, as he stays on the court, gradually and in a singular way decreases his intensity of performing the different actions within the game due to the physical and mental wear accumulated by the nuances of the confrontation, so he usually participates in a lower time at 40 min per game.

The average distance covered in sprints between the tactical positions presented a minimum distance of 1.3 m and a maximum of 34.5 m, demonstrating that the specificity of the modality must be respected by the size of the court, in the specific works of this displacement.

Even though futsal courts show a variation in length and width sizes forming a rectangle of 25 to 42 m in length and 16 to 25 m in width, sprints were not found in the total distance of the court and, however, there is a frequency average of 8 m. Regarding the average frequency of sprints performed by tactical position, during the period that each athlete was on the court, in their tactical position, an average of 30 sprints per game was detected, maintaining homogeneity between the tactical positions.

Figure 1 shows the characteristics of the sprints.

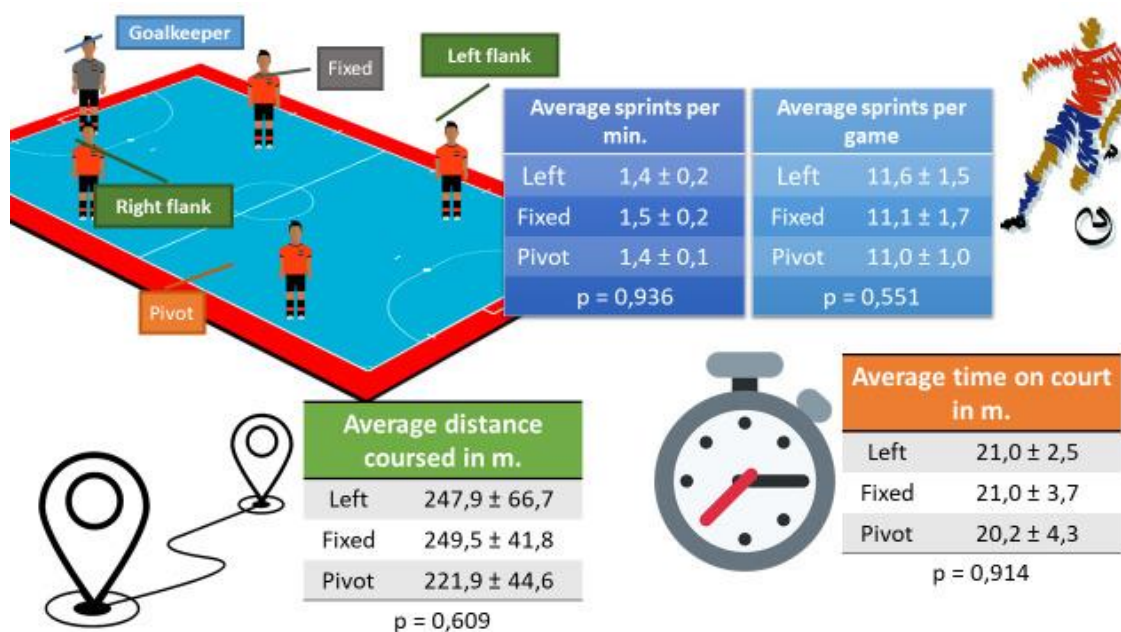


Figure 1 - Demonstration of the characteristics of sprints in the adult male futsal game.

Figure 1 demonstrates the positioning and tactical denomination of the athletes within the game court, followed by tables of the characteristics of the sprints, showing a frequency of 1.4 to 1.5 per minute, and that during the game the average of sprints performed is 11 per position, with an average time of stay on the court for these athletes is 21 min, totalling a total distance covered in this displacement characteristic of 221.9 to 249.5 m, it should be noted that in none of these evaluations there was a significant difference between the positions, dismantling uniformity between the tactical positions.

DISCUSSION

It is important to highlight that individual sports modalities can only provide a physical profile, while collective modalities demonstrate the average structure of a group of athletes. However, knowing the morphological pattern and motor performance of futsal athletes, especially those involved in high-level competitions, is essential.

Such information seems to be relevant, both for the choice of physical preparation strategies to be applied, and for the detection and selection of young talents for the sport (Queiroga, Ferreira, Romanzini, 2005).

It is noteworthy that the importance of physical preparation in high performance team

sports, being elaborated according to the tactical function, given that the specific requirements, morphological characteristics and motor performance are different.

Avelar et al., (2008) highlight the existence and need for low levels of body fat and outstanding motor performance in elite futsal athletes. In the present study, the sample showed body adiposity of $11.54 \pm 3.86\%$, with no significant difference between seasons evaluated, nor between game positions, highlighting the athletic profile of the individuals.

With regard to the characteristic movements in a soccer game, it is observed that a sprint occurs on average every 90 seconds with durations between 2 and 4 seconds. In the present research, a sprint every 40 seconds was found, demonstrating the high intensity in this modality, when compared to soccer (Reilly, Thomas, 1976; Spencer et al., 2005).

As for the sprints distance, investigated in this study, the findings were 8.0 ± 3.4 m, with small changes in distances between the positions as shown in Table 1, however, no significant differences were found for them.

Edwards et al., (2003) describes that the distance of 15 m in sprint presents itself in counterattack situations and therefore tends to occur less frequently. In an investigation carried out by Barbero-Alvarez et al., (2008), they demonstrated that running speeds in sprints totalled 45% of the total distance covered during matches, and that 13.7% of displacements are performed at high intensity (18.1 at 25.0 km/h) and 8.9% in the form of sprints (above 25 km/h). In the studies by Castagna, Barbero (2010), sprints mostly take place at distances between 10 and 30 m. Cruz et al., (2015), diverge, noting that they can be 5, 10 and 15 m.

In this study, it was possible to find varied distances between the Futsal tactical positions, similar to the studies mentioned above, ranging from 1.3 m to 34.5 meters, clearly showing that the specific distances of the sport comprise the maximum size of the court, ignoring ideas and prescriptions of sprints of 100, 200, 400 or even 1,000 m, which diverge from the principle of neuromuscular and metabolic specificity.

Analysis of the movements of futsal players, according to the studies by Dođramacý, Watsford (2006), Castagna et al., (2009), Gorostiaga et al., (2009), indicate an average sprint every 79 seconds, and with

locomotor alterations to every 3.28 seconds during a match.

Based on the findings of the present study and the reviews shown, futsal is considered a high-intensity intermittent sport, with multiple sprints, demanding from the adult athlete high demands on the metabolic systems of aerobic and anaerobic energy supply (lactic and alactic), causing a favourable situation of fatigue in players. Therefore, as a way to prevent such conditions, the use of unlimited substitutions has been widely suggested. The use of the athlete in part of the game, and never in its total context, is evidenced in the time of participation in the sample (Table 1).

Castagna et al., (2009) has shown that the effect of manipulating the training frequency under equalized volume conditions remained unknown and that it has not received attention in the literature and, despite the large body of scientific evidence of repeated running capacity training in team sports, not extensive.

Answering to this request, and which can help in the prescription of sprint training, increasing the performance of this displacement and respecting the guidelines of the principle of interdependence volume and intensity, creating a palpable parameter for the technical committees, the findings of the use of 56 sprints as the lower limit and 60 sprints as the upper limit in the game, or the estimated distance covered during the game, in the sprint displacement characteristic, with a limit of 447 to 479 m if the athlete remained on court for 40 minutes, regardless of tactical positions (Vieira et al., 2016; Bueno et al., 2014).

Di Mascio, Bradley (2012) state that soccer athletes cover up to 1,320 m per match, while in futsal, the average distance covered is 356 m in the tactical positions of fixed, flank and pivot, also pointing out that this characteristic means 8.40% of activities performed in the game, being determined of high intensity.

Under the principle of specificity, it is worth emphasizing the findings that the interval between one sprint and another is 40 timed seconds, and that this interval can be suggested as an indication of time between sprints performed in a training session.

According to Buchheit, et al., (2013), Castagna, et al., (2013) and Oliveira et al., (2013) the sequences of sprints and intermittent high-intensity exercises of movement, speed and muscle power of the lower limbs were

identified as qualities key to improving performance during the season.

Consequently, the ability to repeat several short-duration sprints with brief recovery periods is widely accepted as a crucial component of physical performance, especially for intermittent sports such as futsal.

For Avelar et al., (2008), the performance of futsal athletes in motor tests are similar between game positions, suggesting the existence of homogeneity in the physical performance of these athletes who work in different positions.

These results can be attributed to the constant evolution of the rule, and the dynamics of futsal which, in turn, has required the effective participation of athletes in different game positions.

This dynamic was also observed in the notes in Table 1, where the frequency and number of sprints performed by the athletes, during the games, in the different tactical positions analysed, there was no significant difference between them, thus proposing an equality of specific training for sprints.

CONCLUSION

The constant evolution of training has increasingly based on technological devices that help monitor loads, volume and intensity performed by athletes during training and games.

Searching for consolidated parameters, specific to the modality, makes the training prescription more trustworthy and precise, erroneously avoiding unnecessary volumes and excessive demands, which end up overloading the athletes' locomotor system, and thus, reducing their useful life in terms of performance and their career.

The improvement in performance is also associated not only with a systematic planning that takes into account the specific characteristics of a given sport, but that also considers the characteristics of its practitioners, from the perspective of the individuality principle arising from the theory of sports training.

The athlete's qualification in view of his potential and performance on the court is multifactorial, and is associated with the ability of neural recruitment, the typology of fibres involved in the movement and its motor coordination, as well as the precise designation of training planning in a systematic way, the valorisation of the potential characteristics of the biological individuality, nutritional, intellectual and psychological factors that, together, the sports training theories help in the athlete's general preparation.

Based on the findings of this study and considering the idiosyncrasies of the studied sample regarding the evaluated sport, we propose a training protocol specifically for futsal sprint (Figure 2).

In this way, we seek to create a numerical parameter determining the training protocol profile, as shown in Figure 2, emphasizing the minimum, maximum and average distances of the sprints found, respecting an average time interval of 40 seconds between them.

The way of using this information as a prescription is determined in the volume table, separated by possible percentages of use, according to the interest of the technical committee, being able to use the proposed volume of 8 m sprints, or even propose changes in this distance, respecting the minimum and the maximum found, but not exceeding the stipulated total distance.

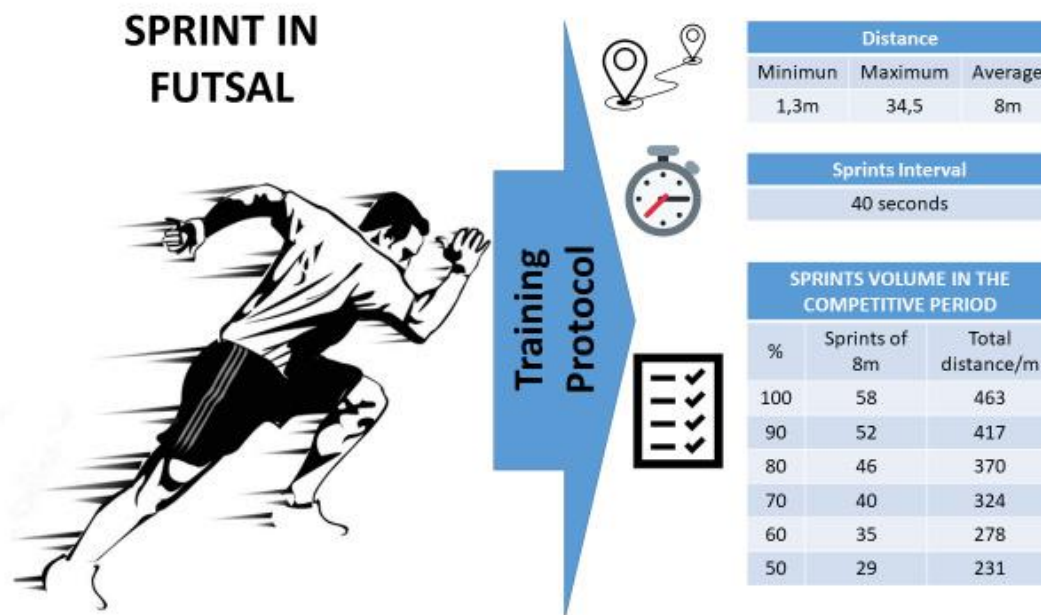


Figure 2 - Futsal sprint training protocol.

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