

## 49 - INFLUENCE OF INTERVAL TRAINING ON DIFFERENT SURFACES IN FUTSAL ATHLETES

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#### INTRODUCTION

Futsal (indoor soccer) is one of the most practiced modalities in Brazil and around the world, however there are few studies on the effects of the physical training over this sport. The knowledge of the characteristics and predominant metabolic ways, are essential factors in the construction and structuring of adequate training programs (BARBERO; BARBERO, 2003; OLKOSKI et al., 2013).

During its practice, the athlete is subjected to several situations of high intensity and short duration, such as jumps, turns, changes of direction and maximum speed sprints, making the anaerobic metabolism very much required for the performance of this modality. These demands and characteristics can be explained by the fact that futsal presents an indeterminate number of substitutions (Barbero et al., 2002; Almeida; Rogatto, 2007).

The interval training method is characterized by high intensity efforts and is heavily used in futsal for its efficiency, promoting adequate stimulus to the requirements of the games, which are of intermittent character (Gault et al., 2006; Gormely et al., 2008). This training method emerged to intensify race training between the 30s and 40s, and has since been heavily used by coaches and researchers (DANIELS; SCARDINA, 1984).

In futsal, there is a growing demand for scientific research on practical and efficient methods for training, however, the training has been little explored in terrains other than those traditionally exhibited by athletes. The sand can be used for the training of futsal athletes, with the intent of replacing the court, not only for physical conditioning, but also for recovery and rehabilitation sessions (BINNIE et al., 2013a).

There are physiological and biomechanical differences associated with the exercise performed in the sand compared to a firmer training surface such as from the court. Among the differences, there are changes in muscular activation patterns when running in sand with consequent increase in energy expenditure (BINNIE et al., 2013b).

Therefore, the aim of this study was to compare the performance in futsal athletes after interval training performed in court and sand.

#### MATERIALS AND METHODS

We evaluated 27 athletes from the futsal modality in the city of Coronel Macedo/SP, aged from between 13 and 16 years old. Initially, all of them underwent an anthropometric evaluation by vertical jump and anaerobic power tests. Subsequently, they were divided into two groups: Court group (CG, n=14), who performed all the training on the court; and Sand group (SG; n=13), who performed interval training on sand.

Regarding the ethical issues, after clarifying the purposes of the research and the procedures to which the athletes would be submitted to, all those responsible signed a free and informed consent form.

Both groups underwent eight weeks of training, consisting of two weekly sessions, in which they developed as main part, the interval training characterized by the Forward-Backward protocol, which consists of running distances of 9, 3, 6, 3, 9 and 5 m, totaling 35 meters, in the shortest possible time, with round trips, having 10 seconds of interval for the new repetition, which totaled six at the end, as well as technical and tactical works developed in an identical for both groups.

At the end of eight weeks, the participants underwent a new evaluation. Prior to the tests, all of the subjects performed warm up procedures with duration of 10 minutes.

#### Vertical Jump Test

In order to carry out the vertical impulse test, a 4m tape measure was placed on a smooth wall. The evaluator positioned himself laterally on the graduated surface, with the soles of the feet fully supported on the ground and with an arm extended above the head, where the highest point reached was marked with the middle finger. To facilitate marking, chalk powder was used at the fingertips. From the orthostatic position, the execution consisted in flexing the legs and performing the push (countermovement jump) with the aid of the arms, and touching the highest possible point on the wall. The marking was done with an accuracy of 0.5 cm. The value was calculated by the difference of the highest height reached (with jump) and the lowest height (stopped), with values expressed in centimeters (Coledam et al., 2009).

#### Running Anaerobic Sprint Test (RAST)

The RAST consisted in performance of six maximal runs of 35 m with 10 s passive recovery in between them. Each effort was timed. The power was determined in each race by measuring the time (t), distance (D) and body mass (MC) of the individuals ( $P(W) = (MC \times D^2) / t^3$ ).

As The RAST variables, there were determined the potencies peak (PP), mean (PM) and minimum (Pmin), as well as the fatigue index (IF) ( $IF (\%) = (PP - Pmin) \times 100 / PP$ ) were determined as The RAST variables. Moreover, maximum velocity (Vmax) and mean velocity (Vmed) were determined through the distance and effort time ratio (Kalva-Filho et al., 2013).

#### Statistical analysis

The results are presented in means  $\pm$  standard deviation. Comparisons between the groups were performed by Student's t test. Statistical significance was accepted at the level of  $p < 0.05$ .

RESULTS AND DISCUSSION

The physical conditioning is extremely important for the practice of the most sports and anaerobic power is indispensable for the practice of futsal, therefore, it is necessary to seek specific training programs that maximize this capacity in the athletes.

The anthropometric variables presented in Table 1, did not differ between the groups, except the SG that presented the highest value in the final body weight in relation to the initial moment. It is a consensus in the literature that the performance in sports is related to the maturational state of athletes, especially from the age of 13, becoming more significant between 14 and 16 years old, age that understands the age group of the investigated athletes (DAL PUPO et al., 2016).

Table 1. Anthropometric data

Variables	CG (n=14)	SG (n=13)
Age (years)	14.4 ± 10.8	15.0 ± 07.9
Height (m)	1.69 ± 8.3	1.70 ± 8.7
Initial BW (kg)	68.5 ± 12.1	61.8 ± 11.0
Final BW (kg)	68.5 ± 11.4	63.0 ± 9.9*

Data are expressed as mean ± standard deviation. CG: court group; SG: sand group. BW: body weight. \*p < 0.05 vs. Initial BW within the same group (paired Student's t) test.

The vertical jump evaluated at the initial and final moments were not statistically different between the groups; both groups presented increase in the height of the final vertical jump when compared to the initial moment (Table 2). Another study that did not do specific training in plyometrics and achieved better results in the vertical jump test was that of Marques; Badillo; Marques (2005) in athletes aged 10 to 13 years old, who found improvement of vertical jump capacity after strength training.

Table 2. Vertical jump test

Variables	CG (n=14)	SG (n=13)
Initial MJ (cm)	42.3 ± 34.5	40.3 ± 29.7
Final MJ (cm)	45.1 ± 43.2*	43.2 ± 73.6*

Data are expressed as mean ± standard deviation. CG: court group; SG: sand group. MJ: vertical jump. \*p < 0.05 vs. Initial MJ within the same group (paired Student's t) test.

The groups presented higher values of PP, PM and Pmin after eight weeks of interval training when compared to the initial values (Table 3). In the research done by Gonçalves (2007) with adult futsal athletes, it was observed that the values of maximum power were higher than those found in our study, possibly due to the age differences among athletes. Braz et al. (2007) also verified improvement in all parameters of the RAST test (PP, PM, Pmin and IF) after six weeks of training.

Table 3. Peak power, mean power, and minimum power obtained in RAST

Groups	PP (W)		PM (W)		PMin (W)	
	Initial	Final	Initial	Final	Initial	Final
CG	402 ± 88	492 ± 124*	296 ± 57	390 ± 83*	206 ± 51	303 ± 71*
SG	399 ± 109	432 ± 124*	302 ± 83	340 ± 94*	216 ± 74	269 ± 79*

Data are expressed as mean ± standard deviation. CG: court group; SG: sand group; PP: peak power; PM: mean power; PMin: minimum power. \*p < 0.05 vs. within the same group (paired Student's t) test.

The fatigue index was lower in both groups regarding the initial moment, and the maximum and average speeds were higher at the final moment, and the SG had the lowest Vmed when compared to the CG at the end of the study (Table 4). It has been shown that the energy cost for the race can be influenced by the surface, as the sand acts like a dumper, the accelerations during the contact phase are reduced, with the consequence that the kinetic energy variations and the vertical motion of the center of mass are also reduced (VEGA et al., 1998), and therefore the smaller Vmed presented in SG may have a relation with the stimulus in soil that required a longer contact time with the soil.

Table 4. Maximum and mean speed, fatigue index obtained in RAST

Groups	Vmax (m/s)		Vmed (m/s)		IF (%)	
	Initial	Final	Initial	Final	Initial	Final
CG	5.81	6.29*	5.30 ± 0.34	6.24 ± 0.03*	47.8 ± 10.4	37.1 ± 11.7*
SG	6.00	6.17*	5.51 ± 0.30	5.68 ± 0.31*	45.6 ± 12.4	37.2 ± 9.21*

Data are expressed as mean ± standard deviation. CG: court group; SG: sand group; Vmax: maximum speed; Vmed: average speed; IF: fatigue index. \*p < 0.05 vs. within the same group (paired Student's t) test; # p < 0.05 vs. CG (unpaired Student's t) test.

CONCLUSION

We concluded that interval training on different surfaces improves anaerobic power in futsal athletes, and the average velocity is lower in trained sand athletes.

Therefore, coaches should pay attention to the moment of periodization to use training on different surfaces.

REFERENCES

ALMEIDA, G. T.; ROGATTO, G. P. Efeitos do Método Pliométrico de Treinamento sobre a Força Explosiva, Agilidade e Velocidade de Deslocamento de jogadoras de Futsal. Revista Brasileira de Educação Física, Esporte, Lazer e Dança, v. 2, n. 1, p. 23-38, 2007.

BARBERO, A. et al. Necesidades cardiovasculares y metabólicas del fútbol-zala: análisis de la competición. Apunts: Educación física y deportes, Barcelona, n. 67, p. 45-53, 2002. Disponível em: <http://dialnet.unirioja.es/servlet/articulo?codigo=242815>. Acesso em: 27 out. 2017.

BARBERO, A. J. C.; BARBERO, A. V. Relación entre el consumo máximo de oxígeno y La capacidad para realizar

ejercicio intermitente de alta intensidad en jugadores de Fútbol Sala. *Rev Entren Deportivo*. 17 (2): 13–24, 2013.

BINNIE, M. J. et al. Sand training: a review of current research and practical applications. *Journal of Sports Sciences*, p. 37–41, 2013a.

BINNIE, M. J. et al. Effect of training surface on acute physiological responses after interval training. *Journal Of Strength And Conditioning Research*, v. 27, n. 4, p. 1047–56, 2013b.

BRAZ, T. V. et al. Análise do desenvolvimento das capacidades físicas potência anaeróbica, potência aeróbia, velocidade e força explosiva durante período preparatório de 6 semanas em futebolistas profissionais. *Coleção Pesquisa em Educação Física, Jundiaí*, v. 6, p. 61-66, 2007.

COLEDAM, C. et al. Efeito do aquecimento com corrida sobre a agilidade e a impulsão vertical em jogadores juvenis de futebol. *Motriz-revista de Educação Física*. Rio Claro: Univ Estadual Paulista-unesp, Inst Biociencias, v. 15, n. 2, p. 257-262, 2009.

DANIELS, J.; SCARDINA, N. Interval training and performance. *Journal of Sports Medicine*, v. 1, n. 4, p. 327-34, 1984.

GIBALA, M. J. et al. Short-term sprint interval versus traditional endurance training: similar initial adaptations in human skeletal muscle and exercise performance. *Journal of Physiology*, 901-911, 2006.

GONÇALVES, H. R. et al. Análise de informações associadas a testes de potência anaeróbica em atletas jovens de diferentes modalidades esportivas. *Arquivo de Ciência da Saúde da Unipar*. Vol. 11. Num. 2 p.115-121. 2007.

GORMELY, S. E. G. et al. Effect of intensity of aerobic training on VO<sub>2</sub>max. *Medicine and Science in Sports and Exercise*, 40, 7, 1336-1343, 2008.

KALVA-FILHO, C. A. et al. Comparação da potência anaeróbica mensurada pelo teste de RAST em diferentes condições de calçado e superfícies. *Rev. Bras. Med. Esporte* vol.19 n.2 São Paulo Mar./Apr. 2013

LEJEUNE, T. M. et al. MECHANICS AND ENERGETICS OF HUMAN LOCOMOTION ON SAND. *The Journal of Experimental Biology* 201, 2071–2080 (1998).

MARQUES, M. A. C.; GONZÁLEZ B. J. J. O efeito do treino de força sobre o salto vertical em jogadores de basquetebol de 10-13 anos de idade. *R. Bras. Ci e Mov*. 13(2): 93-100. 2005.

OLKOSKI, M. M. et al. Respostas bioquímicas e físicas ao treinamento realizado dentro e fora da água em atletas de futsal. *Motriz*, Rio Claro, v.19 n.2, p.432-440, abr./jun. 2013.

PUPO, J. D. et al. Capacidade de sprints repetidos e níveis de potência muscular em jogadores de futsal das categorias sub-15 e sub-17. *Rev. Bras. Ciênc. Esporte*. 39(1):73-78. 2016.

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#### INFLUENCE OF INTERVAL TRAINING ON DIFFERENT SURFACES IN FUTSAL ATHLETES

Futsal is one of the fastest growing modalities in sport's scenario in recent years, with that, it becomes necessary to know the characteristics of this sport, in order to structure effective training programs. The athlete is subjected to several situations of high intensity and short duration during the game, so the interval training is a very suitable method for coaches. The objective of this study was to compare the performance in futsal athletes after interval training performed in court and sand. Thirty-seven futsal athletes aged between 13 and 16 years old, who underwent an anthropometric evaluation, followed by the vertical jump and anaerobic power tests, participated in the study. Subsequently, they were divided into two groups: Court group (CG, n=14), who performed all training on the court, and sand group (SG, n=13), who performed interval training in the sand. For eight weeks, with two sessions a week, the athletes developed the Forward-Backward protocol, which consists of running distances of 9, 3, 6, 3, 9 and 5 m, totaling 35 meters in the smallest time, with round-trip movements, taking 10 seconds of interval for new repetition, which totaled six at the end; in addition, technical and tactical work developed in the same way for both groups. At the end of eight weeks, the participants underwent a new evaluation. The results showed that both groups had evolution in the analyzed parameters, but the SG presented a lower average velocity when compared to CG at the end of the study. Therefore, we concluded that interval training on different surfaces improves anaerobic power in futsal athletes, and the mean velocity is lower in trained sand athletes.

Keywords: Futsal, Interval Training, Anaerobic Power.

#### INFLUENCE DE LA FORMATION INTERVALLE EFFECTUÉE SUR DIFFÉRENTES SURFACES DE LA PERFORMANCE DESATHLÈTES FUTSAL MIRINS

Le futsal est l'une des modalités sportives à la croissance la plus rapide de ces dernières années, et il est donc nécessaire de connaître les caractéristiques de ce sport afin de structurer des programmes d'entraînement efficaces. L'athlète est soumis à plusieurs situations de haute intensité et de courte durée pendant le jeu, de sorte que l'entraînement par intervalles est une méthode très appropriée pour les entraîneurs. L'objectif de cette étude était de comparer la performance chez les athlètes de futsal après un entraînement par intervalles effectué sur le court et le sable. Trente-sept athlètes de futsal âgés de 13 à 16 ans, qui ont subi une évaluation anthropométrique, suivis des tests de saut vertical et de puissance anaérobie, ont participé à l'étude. Ils ont été divisés en deux groupes: le groupe Quadra (GQ, n = 14), qui a effectué tout l'entraînement sur le terrain, et le groupe Sable (GA, n = 13), qui ont effectué un entraînement par intervalles dans le sable. Pendant huit semaines, avec deux sessions par semaine, les athlètes ont développé le protocole Forward-Backward, qui consiste en des distances de franchissement de 9, 3, 6, 3, 9 et 5 m, totalisant 35 mètres dans les plus petites distances. temps, avec des mouvements aller-retour, en prenant 10 secondes d'intervalle pour la nouvelle répétition, qui ont totalisé six à la fin; de plus, le travail technique et tactique s'est développé de la même manière pour les deux groupes. Au bout de 8 (huit) semaines, les participants ont subi une nouvelle évaluation. Les résultats ont montré que les deux groupes avaient une évolution dans les paramètres analysés, mais l'AG présentait une vitesse moyenne inférieure par rapport à GQ à la fin de l'étude. Ainsi, il est conclu que l'entraînement par intervalles sur différentes surfaces améliore la puissance anaérobie chez les athlètes de futsal, et la vitesse moyenne est plus faible chez les athlètes de sable entraînés.

Mots clés: Futsal, entraînement par intervalles, pouvoir anaérobie.

#### INFLUENCIA DEL ENTRENAMIENTO INTERVALADO REALIZADO EN DIFERENTES SUPERFICIES EN EL RENDIMIENTO DE ATLETAS MIRINS DE FUTSAL

El fútbol sala, es una de las modalidades que más crece en el escenario deportivo en los últimos años, con ello, se

hace necesario conocer las características de este deporte, para la estructuración de programas eficaces de entrenamiento. El atleta es sometido a varias situaciones de alta intensidad y corta duración durante el juego, por lo que el entrenamiento intervalado es un método bastante indicado para entrenadores. El objetivo de este estudio fue comparar el desempeño en atletas de fútbol sala después de entrenamiento intervalado realizado en campo y arena. En la investigación participaron 27 atletas de fútbol sala con edad entre 13 y 16 años, que inicialmente fueron sometidos a una evaluación antropométrica, y luego por las pruebas de salto vertical y de potencia anaerobia. Posteriormente se dividieron en dos grupos: el grupo Quadra (GQ, n = 14), que ejecutó todos los entrenamientos en la cancha, y grupo Arena (GA, n = 13), que ejecutó entrenamiento intervalado en la arena. Durante ocho semanas, con dos sesiones semanales, los atletas desarrollaban como parte principal de entrenamiento el protocolo de Forward-Backward, que consiste en recorrer las distancias de 9, 3, 6, 3, 9 y 5 m, totalizando 35 metros, en el menor tiempo posible, con movimientos de ida y vuelta, teniendo 10 segundos de intervalo para nueva repetición, que totalizaban seis al final; además, se realizaron trabajos técnicos y tácticos desarrollados de forma idéntica para ambos grupos. Al final de las 8 (ocho) semanas, los participantes pasaron por una nueva evaluación. Los resultados mostraron que ambos grupos tuvieron evolución en los parámetros analizados, pero el GA presentó velocidad media menor cuando comparado a GQ al final del estudio. Con ello, se concluye que el entrenamiento intervalado en diferentes superficies mejora potencia anaerobia en atletas de fútbol sala, y la velocidad media es menor en atletas entrenados en la arena.

Palabras clave: Fútbol Sala, Entrenamiento Intervalado, Potencia Anaerobia.

#### INFLUÊNCIA DO TREINAMENTO INTERVALADO REALIZADO EM DIFERENTES SUPERFÍCIES NO DESEMPENHO DE ATLETAS MIRINS DE FUTSAL

O futsal, é uma das modalidades que mais cresce no cenário esportivo nos últimos anos, com isso, torna-se necessário conhecer as características deste esporte, para a estruturação de programas eficazes de treinamento. O atleta é submetido a várias situações de alta intensidade e curta duração durante o jogo, portanto o treinamento intervalado é um método bastante indicado para treinadores. O objetivo deste estudo foi comparar o desempenho em atletas de futsal após treinamento intervalado realizado em quadra e areia. Participaram da pesquisa 27 atletas de futsal com idade entre 13 e 16 anos, que inicialmente foram submetidos a uma avaliação antropométrica, e em seguida pelos testes de salto vertical e de potência anaeróbia. Posteriormente foram divididos em dois grupos: grupo Quadra (GQ, n= 14), que executou todos os treinos na quadra, e grupo areia (GA, n= 13), que executou treinamento intervalado na areia. Durante oito semanas, com duas sessões semanais, os atletas desenvolviam como parte principal de treinamento o protocolo de Forward-Backward, que consiste em percorrer as distâncias de 9, 3, 6, 3, 9 e 5 m, totalizando 35 metros, no menor tempo possível, com movimentos de ida e volta, tendo 10 segundos de intervalo para nova repetição, que totalizavam seis ao final; além disso, realizou-se trabalhos técnicos e tácticos desenvolvidos de forma idéntica para ambos grupos. Ao final das 8 (oito) semanas, os participantes passaram por uma nova avaliação. Os resultados mostraram que ambos os grupos tiveram evolução nos parâmetros analisados, porém o GA apresentou velocidade média menor quando comparado a GQ ao final do estudo. Com isso, conclui-se que o treinamento intervalado em diferentes superfícies melhora potência anaeróbia em atletas de futsal, e a velocidade média é menor em atletas treinados na areia.

Palavras chaves: Futsal, Treinamento Intervalado, Potência Anaeróbia.