24 - RELATIONSHIP BETWEEN ALACTIC ANAEROBIC POWER TESTS: SEARCHING ALTERNATIVE FOR THE PHYSICAL EVALUATION

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INTRODUCTION

The evaluation of the physical performance can not be summarized only by the measure of the aerobic capacity. The anaerobic metabolism, the sprint, the force and the maximum power also are determinative factors in many physical activities (VANDEWALLE et al., 1987). In accordance with Manning et al. (1988), a primary factor for the success in athletic performance is the capacity of the muscle to generate high levels of explosive force. However, even anaerobic works being essential in many activities, little attention has been given to the anaerobic tests (BOSCO et al., 1983).

Fontana and Reis (1982) cite the anaerobic power as the work accomplishment supra-maximum of short duration. This power, that is, the metabolic power for events as shots and jumps in the track and field, survey of weight, springboard and diving in platform, is exclusively gotten of composites phosphates of high energy (KNUTTGEN and KOMI, 1992). The anaerobic power can be defined as the maximum of set free energy for unit of time for suppling system. The maximum muscular power is gotten in excellent values of force and sprint. No meanwhile, theoretically, is necessary to evaluate the relationship between force, sprint and power to necessarily measure the maximum power with protocols such as isocinetic ergometer tests, tests in cycle ergometer, tests of jumps or tests of stairs (VANDEWALLE et al., 1987).

Given the importance of the muscular power in the athletic performance of diverse sports, some methods as above cited had been considered to measure the anaerobic power. However, many times the application of the test desired or the most cited in literature is not possible, for the fact to demand more complex material resources. The Wingate Anaerobic Test (TAW), for example, needs of a bicycle, software and an interface specific, beyond being a tiring test for the executants. Therefore, the objective of this study was analyze if the field tests as squat jump (SJ), countermovement jump (CMJ) and sprint of race in 10m (V10) and in 40m (V40) evaluates the referring parameters to the alactic anaerobic power, in order to make possible the substitution of the TAW for these tests.

METHODS

Ten individuals, 6 male and 4 female had participated as voluntary in this study. In TABLE 1 the characterization of the sample is presented.

TABLE 1
Average and standard deviation of age, height and mass of the volunteers

	Age (years)	Mass (kg)	Height (cm)
Average ± Standard Deviation	23 ± 8	64 ± 21	161 ± 47

The carried through tests had been the following ones:

1. TAW (Inbar et al., 1996): The test was carried through with the inferior members in one cycle ergometer monark (Maxx®) connected to software MCE®. The used load was of 0,075 Kp/Kg (Bar-Or, 1987). The test had duration of 30 seconds. The TAW session started with a standardized warm-up of 5 minutes of cycling at 50 rpm against no load.Before the test the volunteers they had carried through a heating of five minutes and had been instructed so that they carried through the biggest possible power during all the duration of the test.

2. V10 and V40 (LOPES and SZMUCHROWSKI, 1997): In these tests the individuals would have to cover in the distance fastest possible of 40 meters. Three pairs of photocells had been used to measure the reached sprint. A pair was located at the beginning of the way; another pair was placed the 10 meters of the beginning of the passage and a last pair of photocells the 40 meters of the beginning of the passage. The photocells had been connected to MultSprint® software and the beam was adjusted for the height of the hip of the individuals with a filter of as.

3. SJ (BOSCO et al, 1983): The squat jump was carried through with the angle of the knees auto-selected, fixed hands in the waist and maintenance of the knees, hips and ankles extended during all the flight phase. The individual before the accomplishment of the ascending phase of the jump would have to remain per three seconds in the squat position. To evaluate the height reached in the jump, a carpet of contact (JumpTest®) hardwired to MultSprint® software was used.

4. CMJ: In the jump with countermovement the individuals would have to follow the same standardization of squat jump, with exception of the permanence in the position squat per three seconds. In this in case that, the descending transition phase for the ascendant would have to be made in fast way. The used material was the same of squat jump.

The anaerobic test of Wingate (TAW) was executed only one time for each volunteer. Of all the parameters supplied for software, only those supposedly related to the alactic anaerobic power had been used in this study. They are they: relative maximum power (PMáxRel) and time to reach the maximum power (TPMáx).

For the test of sprint of 40 meters, also a repetition for individual was carried through. It was subdivides in test of sprint of 10 meters (V10), where the values used for calculation of the average sprint are referring to the ten first meters of the race, and test of sprint of 40 meters (V40) referring to the calculation of the average sprint of all the passage.

For the jump tests squat jump (SJ) and countermovement jump (CMJ) had been carried through three executions of each type, being that, the biggest value gotten for each volunteer was used for the analysis of the data. The jump tests had been carried through in the same day. All test and training sessions were separated by at least 1 week.

Statistic Analyze

The values of the variable relative maximum power (W/kg), time to reach the maximum power (s), average sprint in the 10 m (V10, m/s), average sprint in the 40 m (V40, m/s), height of the SQ (cm) and height of the CMJ (cm) had been calculated and express on mean and pattern standard. The SigmaStat® program version 3.5 was used for the calculation of the Pearson

product-moment correlation coefficient between parameters. The test of Kolmogorov-Smirnov was applied for ascertainment of the normality of the sample of data.

RESULTS

The normality test indicated that the data are normal. The referring results of the descriptive analysis to the parameters relative maximum power, time to reach the maximum power, mean sprint - V10, mean sprint - V40, height of the SJ and the CMJ are presented in TABLE 2.

TABLE 2

Descriptive analysis of relative maximum power, time to reach the maximum power, mean sprint of v10, mean sprint of v40, SJ and CMJ

	PMáxRel (W/kg)	TPMáx (s)	Mean Sprint - V10 (m/s)	Mean Sprint - V40 (m/s)	SJ (cm)	CMJ (cm)
Mean	11,40	3,18	5,00	6,52	28,8	32,8
± SD	± 1,54	± 0,74	± 0,39	± 0,70	± 7,0	± 10,0

Pearson product-moment correlation coefficient values had shown that the PmáxRel had greater correlation with the sprint of the V40 (r=0.962) that with the one of the V10 (r=0.832) (3 TABLE and FIGURE 1), and greater correlation with the performance in the CMJ (r=0.944) that in the SJ (r=0.920) (3 TABLE and FIGURE 2).

TABLE 3

Correlation coefficient (r) between variables

	TPMáx	V10	V40	SJ	CMJ
PMáxRel	-0.445	0.832	0.962	0.920	0.944
TPMáx		-0.129	-0.448	-0.280	0.359
V10			0.912	0.826	0.870
V40				0.905	0.945
SJ					0.964

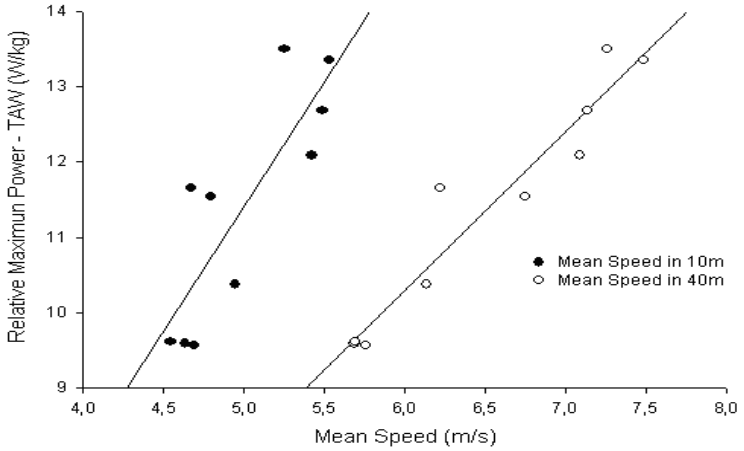

Figure 1 - Correlation between relative maximum power and sprint

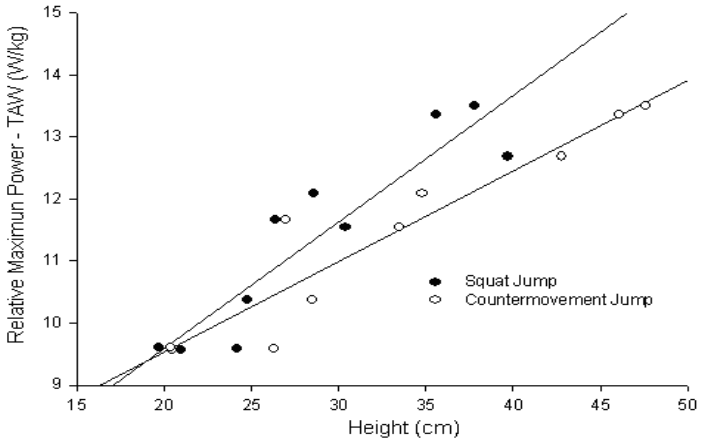

Figure 2 - Correlation between relative maximum power and height of jump

The jumps and sprint correlations value showed that both the jumps had greater correlation with the V40 (SJ=0,905 and CMJ=0,945) that with the V10 (SJ=0,826 and CMJ=0,870). Moreover, both the values of race (TV10 and TV40) had presented greater correlation with the CMJ (V10=0,870 and V40=0,945) that with the SJ (V10=0,826 and V40=0,905).

DISCUSSION

The results had shown that the sprints of race in 10 and 40 m and jumps SJ and CMJ had presented high correlation with the PMáxRel reached in the test of Wingate. The test of Wingate is known by evaluating, beyond other parameters, the alactic anaerobic power, and as it had one high correlation (r=0,832 the 0,962) above enters the cited tests, it can be said that the tests of 40 race of 10 and m and jumps SJ and CMJ also can be used to evaluate this power.

The TPMáx measured by the TAW did not present significant correlation with the sprint and jumps tests. So, the sprint and jumps tests are not appropriate to measure this variable. When the objective will be to evaluate the TPMáx parameter must be used the TAW.

Some studies had been carried through previously with the objective to verify a possible correlation between power tests. Fontana and Reis (1982) had verified the correlation between tests of anaerobic power in different groups of athlete. The carried through tests had not been the same ones of the present study and the gotten values of correlation had not been high, even so some were significant.

In a similar study, Manning et al. (1988) they found significant values of correlation between tests of anaerobic power with moderate values. In that study the authors had verified the correlation of the values of power with anthropometrics variables and also they had found correlation significant.

The supply of energy through way ATP-CP (alactic anaerobic) is basic for the accomplishment of sports activities, as much in collective games how much in individual sports. From the results gotten in this study, the evaluation of this saw energy can be carried through in simpler and still efficient way. The sprint test easily is executed as well as the jump tests, therefore they are fast, of easy application, execution and are less exhausting, when compared with the TAW.

CONCLUSION

All applied tests, V10, V40, SJ and CMJ, are efficient for the evaluation of the alactic anaerobic power, since they had one high correlation with the test of Wingate that is the gold standard for this evaluation.

Key word: anaerobic power, sprint test, squat jump, countermovement jump, wingate anaerobic test

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RELATIONSHIP BETWEEN ALACTIC ANAEROBIC POWER TESTS: SEARCHING ALTERNATIVE FOR THE PHYSICAL EVALUATION

ABSTRACT

The anaerobic power is an important parameter for the evaluation of the physical capacity of the athlete. The Wingate Anaerobic Test is the gold-standard for the evaluation of this capacity, but many times its application is complex and expensive. Being thus, the objective of this study was to analyze if squat jump (SJ), countermovement jump (CMJ) and sprint of race in 10 m (V10) and 40 m (V40) evaluate the referring parameters to the developed alatic anaerobic power. Ten volunteers (23±8 years, 64±21 kg, 161±47 cm), had carried through the tests of Wingate, 40 race of 10 and m, squat jump (SJ) and countermovement jump (CMJ). The correlations between the data of reached relative maximum power (PMáxRel), time to reach the maximum power (TPMáx), sprint of race (V10 and V40) and height of the jumps had been analyzed. This study showed that the TPMáx did not present significant correlation with no 0 variable. The PmáxRel had greater correlation with the sprint of the V40 (r=0.962) that with the one of the V10 (r=0.832), and greater correlation with the performance in the CMJ (r=0.944) that in the SJ (r=0.920). The correlation enters the values of the jumps and of the race it showed that both the jumps had had greater correlation with the V40 (SJ=0,905 and CMJ=0,945) that with the V10 (SJ=0,826 and CMJ=0,870). Moreover, both sprint values (TV10 and TV40) had presented greater correlation with the CMJ (V10=0,870 and V40=0,945) that with the SJ (V10=0,826 and V40=0,905). One concludes that all the applied tests, V10, V40, SJ and CMJ, are efficient for the evaluation of the alatic anaerobic power.

KEY WORD: anaerobic power, sprint test, jump

RELATION ENTRE LES ESSAIS DE LA PUISSANCE ANAÉROBIE: RECHERCHE L'ALTERNATIVE DE L'ÉVALUATION PHYSIQUE

RÉSUMÉ

La puissance anaérobie est un paramètre important pour l'évaluation de la capacité physique de l'athlète. L'essai de Wingate est le standard-or pour l'évaluation de cette capacité, mais beaucoup de fois son application est complexe et chère. Étant de ce fait, l'objectif de cette étude était d'analyser si accroupi sautent (SJ), le saut de countermovement (CMJ) et Sprint de course dans 10m (V10) et 40 m (V40) évaluent les paramètres de référence à la puissance anaérobie alatic développée. Dix volontaires (23±8 années, 64±21 kilogramme, 161±47 centimètre), avaient réalisé les essais de Wingate, la course 40 de 10 et de m, le saut de posture accroupie (SJ) et le saut de countermovement (CMJ). Les corrélations entre les données de la puissance maximum relative atteinte (PMáxRel), le moment d'atteindre la puissance maximum (TPMáx), le Sprint de la course (V10 et V40) et la taille des sauts avaient été analysées. Cette étude a prouvé que le TPMáx n'a pas présenté la corrélation significative sans 0 variables. Le PmáxRel a eu une plus grande corrélation avec le Sprint du V40 (r=0.962) qui avec celui du V10 (r=0.832), et une plus grande corrélation avec l'exécution dans le CMJ (r=0.944) cela dans le SJ (r=0.920). La corrélation écrit les valeurs des sauts et de la course elle a prouvé que toutes les deux les sauts avaient eu une plus grande corrélation avec le V40 (SJ=0,905 et CMJ=0,945) cela avec le V10 (SJ=0,826 et CMJ=0,870). D'ailleurs, les deux valeurs de course (TV10 et TV40) avaient présenté

à une plus grande corrélation avec le CMJ (V10=0,870 et V40=0,945) cela avec le SJ (V10=0,826 et V40=0,905). On conclut que tous essais appliqués, V10, V40, SJ et CMJ, sont efficaces pour l'évaluation de la puissance anaérobie alatic.

MOT CLÉ: puissance anaérobie, essai de Sprint, saut

RELACIÓN ENTRE LAS PRUEBAS DE LA ENERGÍA ANAEROBIA: BUSCAR EL ALTERNATIVA PARA LA EVALUACIÓN FÍSICA

RESUMEN

La energía anaerobia es un parámetro importante para la evaluación de la capacidad física del atleta. La prueba de Wingate es el estándar-oro para la evaluación de esta capacidad, pero muchas veces su uso es complejo y costoso. Siendo así, el objetivo de este estudio era analizar si es agazapado salta (SJ), el salto del countermovement (CMJ) y Sprint de la raza en 10 m (V10) y 40 m (V40) evalúan los parámetros que se refieren a la energía anaerobia alatic desarrollada. Diez voluntarios (23±8 años, 64±21 kilogramo, 161±47 centímetro), habían llevado con las pruebas de Wingate, la raza 40 de 10 y de m, el salto de la posición en cuclillas (SJ) y el salto del countermovement (CMJ). Las correlaciones entre los datos de la energía máxima relativa alcanzada (PMáxRel), la hora de alcanzar la energía máxima (TPMáx), el Sprint de la raza (V10 y V40) y la altura de los saltos habían sido analizadas. Este estudio demostró que el TPMáx no presentó la correlación significativa sin variables. El PmáxRel tenía la mayor correlación con el Sprint del V40 (r=0.962) que con el que está del V10 (r=0.832), y mayor correlación con el funcionamiento en el CMJ (r=0.944) eso en el SJ (r=0.920). La correlación incorpora los valores de los saltos y de la raza demostró que ambas los saltos habían tenido mayor correlación con el V40 (SJ=0,905 y CMJ=0,945) eso con el V10 (SJ=0,826 y CMJ=0,870). Por otra parte, ambos valores de la raza (TV10 y TV40) habían presentado a mayor correlación con el CMJ (V10=0,870 y V40=0,945) eso con el SJ (V10=0,826 y V40=0,905). Uno concluye que todas las pruebas aplicadas, V10, V40, SJ y CMJ, son eficientes para la evaluación de la energía anaerobia alatic.

PALABRA CLAVE: energía anaerobia, prueba del Sprint, salto

RELAçãO ENTRE TESTES DE POTêNCIA ANAERóBIA ALáTICA: BUSCANDO ALTERNATIVAS PARA A AVALIAçãO FÍSICA

RESUMO

A potência anaeróbica é um importante parâmetro para a avaliação da capacidade física do atleta. O teste de Wingate é o padrão-ouro para a avaliação desta capacidade, mas muitas vezes a sua aplicação é complexa e cara. Sendo assim, o objetivo deste estudo foi analisar se o squat jump (SJ), countermovement jump (CMJ) e velocidade de corrida em 10 m (V10) e em 40 m (V40) avaliam os parâmetros referentes à potência anaeróbia alática desenvolvida. Dez voluntários (23±8 anos, 64±21 kg, 161±47 cm), realizaram os testes de Wingate, corrida de 10 e 40 m, squat jump (SJ) e countermovement jump (CMJ). As correlações entre os dados de potência máxima relativa atingida (PMáxRel), tempo para atingir a potência máxima (TPMáx), velocidade de corrida (V10 e V40) e altura dos saltos foram analisadas. O estudo mostrou que o TPMáx não apresentou correlação significante com nenhuma variável. A PmáxRel teve maior correlação com a velocidade do V40 (r=0.962) que com a do V10 (r=0.832), e maior correlação com o desempenho no CMJ (r=0.944) que no SJ (r=0.920). A correlação entre os valores dos saltos e os da corrida mostrou que ambos os saltos tiveram maior correlação com a V40 (SJ=0,905 e CMJ=0,945) que com a V10 (SJ=0,826 e CMJ=0,870). Além disso, ambos valores de corrida (TV10 e TV40) apresentaram maior correlação com o CMJ (V10=0,870 e V40=0,945) que com o SJ (V10=0,826 e V40=0,905). Conclui-se que todos os testes aplicados, V10, V40, SJ e CMJ, são eficientes para a avaliação da potência anaeróbia alática.

PALAVRA-CHAVE: potência anaeróbia, salto, velocidade.