108 - ANAEROBIC POWER OF SINCRONIZED SWIMERS WINGATE TEST

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INTRODUCTION

The Wingate test is applied to evaluate the anaerobic power and quantify the muscle efficiency through physiological and mechanicals (1) variables in most diverse subjects, including children, athletes and debilitated persons (2, 3).

Jacobs (1982) showed, through muscle biopsy, during the Wingate test that there's a decrease on energetic substrates (ATP, CP, glycogen) concentrations and increase on lactate concentration on muscle level getting with evidences more directs of anaerobic characteristics of test.

The Wingate test became the most indicate to be administered with simple structure, with low cost, validated, non evasive and which presents high reproducible (5). Its test application became essential in activities of recreational character and in competitive sports modality where the velocity and the strength are main qualities of training that are demands movements of fast transition from resting to high intensity exercise using anaerobic metabolic process.

The synchronized swimmers is an modality where the athlete efficacy is associated to capacity to regenerate ATP consumed during the muscle contractions, maintaining by a longer period the muscle fatigue, seen that's characteristic of modality a solicitation much intense from inferior's member muscle grouping. However not much are the available investigations in literature about this modality, where the same refrain from describe anthropometrics athletes characteristics (6) and evaluate ergospirometrics aspects (7,8,9,10,11) in laboratory's condition.

The aim of the present study was to evaluate the anaerobic power of the synchronized swimmers by the Wingate test.

MATERIALS AND METHODS

Sample selection and anthropometric evaluation

The sample was composed of 16 athletes from Brazilian synchronized swimmers selection/2004 (17 ± 1,4 years old) all involved in regular systematic training program and 8 non athletes youth (21± 2,6 years old). For characterization of sample, the groups were submitted to anthropometric evaluation, being realized the measures from: skinful thickness (CESCORF, 0,1 mm); body perimeters (flexible metallic tape- CARDIOMED, 1cm); bone diameters (paquimetro, 1mm); height (stadiometer, 1mm) and weight (electronic balance, 50g). To leave of these data the following parameter had been gotten: body fat (G%) e body mass index (BMI).

The measures were realized according to described proceed from International Society for Advancement in Kinanthropometry - ISAK (12).

Wingate test

All tests were administered by the same appraises to guarantee the ratability of the collect proceeding. All the moment immediately before the realization of them the participants were requested to keep sat, pedaling as fat as possible, keeping the maximal effort during the 30 seconds of test.

The Wingate test was done in the mechanical cycle ergometer (MONARK). The seat's height was determined with the appraiser's leg totality extend with the tarsus 90º. All participants had their feet fixed at the pedal by a strip to guarantee a higher application of strength at the pedal during each revolution.

An optical sensor was placed beside the wheel of cycle ergometer being this administrated by a program of acquisition (Lab view 6.0), that permitted compute the member of revolutions of the pedal during each five seconds. The predetermined load was estimated by 0,075 kp by kg of body weight, as anticipated at Wingate test (4,13).

The test was anteceded by a period of 3 minutes of warm-up without resistance maintaining a velocity of 20 $km.h^{-1}$ with the purpose to prepare the heart and pulmonary system to the test beginning.

Statistics Analysis

All basis expressed in medium and pattern deviation were analyzed by ANOVA one way, followed by the test multiples comparison Newman-Kenls test ($p<0,05$).

All participants were cleared about the proceeding of the test, being invited to sign a term of consent approved by Ethics Committee of University Hospital (HUCFF/UFRJ).

RESULTS

Table 1: ANTHROPOMETRIC CHARACTERISTICS

Variable	Júnior (n=7)	Sênior (n=9)	Non athletes	P value
Age (years)	15,6 ± 1,0[b]	17,6 ± 1,7[c]	21,1±2,6	0,0002 *
Height (cm)	163,0 ± 0,0[b]	166,0± 0,0[c]	161,1±4,8	0,01*
Total Body Mass (kg)	54,1 ± 4,4	56,2 ± 5,3	56,5±9,4	0,92
Body Fat (%)	22,1 ± 3,8	20,4 ± 2,9	24,8±6,1	0,13
Body Mass Index ($kg.m^2$)	20,5 ± 1,8	20,3 ± 1,0	21,7±3,4	0,33

*significant difference to p? 0,05; b=difference between Junior and non-athletes; c=difference between senior and non-athletes.

The groups differed significantly how the chronological age, being the group of non-athletes the older one. In spite of presenting different ages the groups didn't get significantly difference to body weight, height, body mass index and body fat (Table 1).

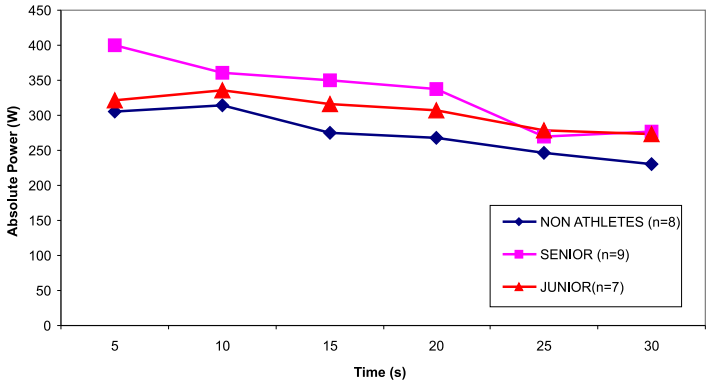
Whatever the index of performance listed in Table 2 was verified significant statistical difference between the groups to these parameters: Absolute Medium Power, Relative Medium Power and Fatigue Index.

The absolute and relative power produced each 5 seconds during the test between the groups is presented in graphics 1 and 2 respectively.

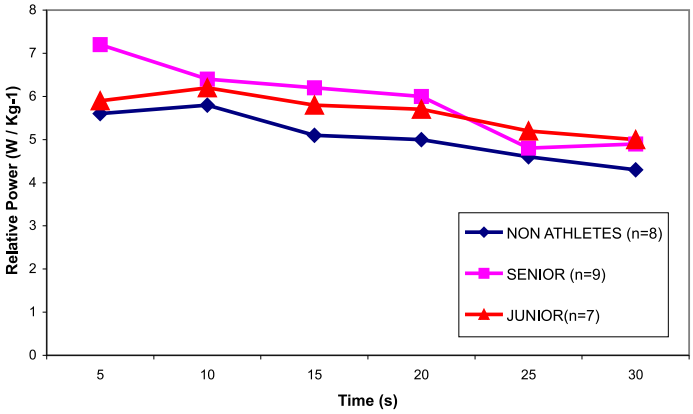
Table 2: INDEX OF PERFORMANCE OBTAINED IN WINGATE TEST

Variable	Júnior (n=7)	Sênior (n=9)	Non athletes	P value
Absolute Peak Power (W)	342,58 ± 35,40	406,7 ± 75,57	353,01 ±77,83	0,13
Relative Peak Power (W.Kg^{-1})	6,33 ± 0,53	7,26 ± 1,36	6,50 ±0,92	0,09
Absolute Medium Power (W)	305,14 ± 32,55	332,58 ± 59,27^{c}	273,40 ±40,24	0,05*
Relative Medium Power (W.Kg^{-1})	5,64 ± 0,53	5,93 ± 1,05^{c}	5,08 ±0,56	0,04*
Fatigue Index (%)	24,66 ± 7,49^{b}	35,13 ± 16,16	42,06 ±9,59	0,03*

*significant difference to p? 0,05; b=difference between junior and non-athletes; c=difference between senior and non-athletes.



Graphic 1- Absolute Power (w) produced each 5 seconds during the test between the team of senior, junior and the group of non athletes.



Graphic 2- Relative Power (w) produced each 5 seconds during the test between the team of senior, junior and the group of non athletes.

In analysis of absolute power it was verified that only in 5 first seconds of test the senior group presented significantly high values from other groups (p=0,04).

It was observed that the groups didn't present significantly difference to relative power produced each 5 seconds during the Wingate test.

The observation of graphics 1 and 2 permit verify that the higher peak power as much absolute as relative was reached by the group of senior athletes in 5 seconds of the test, while in junior group and non-athletes this power was reached after 5 seconds of the test, indicating the influence of body mass in power analysis.

DISCUSSIONS

The comparisons of anthropometrics measurements between athletes of different class frequently reveal characteristics that are connected to performance. The body composition is a primordial point of good performance. Kohrt (2004) adds that the female athletes of class more advanced tend to have relative levels of body fat shorter than the competitors of younger class and than the non-athletes. The senior athletes analyzed although be 10 years old in medium of training didn't present difference in body composition (Table 1). With regard to team of junior (8 years of training) how was hoped

The referent basis of performance index during the test between the valued groups showed that the senior group even so present an satisfactory anaerobic answer in the first moments of test, isn't able to maintain this comportment during all the test, knowing that it presented medium values higher than the other groups all that the fatigue index.

By the values all that the performance index during the test (Relative and Absolute Medium Power) verify that the senior group obtained a better answer, that can be justified by a better adaptation to specific stimulus of training that are submitted and still the individual physiological characteristics.

Some studies show (14) that a form to distinct individuals with alactics anaerobic characteristics more potent and by observation of peak power.

The athletes that reach until the 5 first seconds of test, period that the energy to the activity come mainly from ATP-CP system, show better performance of anaerobic system. This was the skyline presented by senior athletes.

Individuals that present a peak power after 5 seconds, how was verified in other groups, are characterized to present

difficult to recruit muscle fiber of fast contraction and orderly a higher number of unit motors necessary to an exercise effort, that retract individuals with few capacity to this kind of solicitation (14).

This mind was confirmed by a study realized by Esbjörnsson *et al., (*1993), that verified a relation between the performance index in the Wingate Test with a proportion of fast contraction fibers and to the metabolic proprieties of quadriceps muscle, as the activity of phosfofrutokinase enzyme.

CONCLUSIONS

Believe that the senior group present higher anaerobic capacity than the other ones. Based on realized study by Esbjörnsson propose that the senior group have a higher proportion of fast contraction fibers and/or better, capacity of recruiting a bigger number of motor units in a short period of time.

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ANAEROBIC POWER OF SINCRONIZED SWIMERS - WINGATE TEST

SUMMARY

The aims of the present study were to evaluate the anaerobic power of athletes of the elite of synchronized swimmers (17.0 ±1,4 year) and a group of non-athletes (21.0 ±2, 6.0 years) by the Wingate test (30 s). The adopted load was of 0.075 kg for kilogram of corporal weight. The analyzed parameters had been: the fatigue index, power prick and the average power. The group of senior athlete presents greater anaerobic capacity than the junior athlete.

Key words: Anaerobic power; Athletes; Wingate test.

PUISSANCE ANAÉROBIE DE NAGEURS SYNCHRONISES - ESSAI DE WINGATE

SOMMAIRE

Les objectifs de la présente étude devait évaluer la puissance anaérobie des athlètes de l'élite de nageurs synchronisés (année 17.0 ±1,4) et d'un groupe d'non-athlètes (21.0 ±2, 6.0 ans) par l'essai de Wingate (30 s). La charge adoptée était de 0.075 kg pour le kilogramme de poids corporel. Les paramètres analysés été: l'index de fatigue, piqûre de puissance et la puissance moyenne. Le groupe de l'athlète aîné présente une plus grande capacité anaérobie que l'athlète junior. Mots clés: Puissance anaérobie, Athlètes, Wingate test

POTENCIA ANAEROBIA DE ATLETAS DE NADO SINCRONIZADO - PRUEBA DE WINGATE

RESUMEN

El estudio propone a evaluar la potencia anaerobia <http://copacabana.dlsi.ua.es/insbil/index.php?lang=pt-es&palabra=ANAERÓBICA> de atletas de élite de nado sincronizado (año 17±1,4) y de un grupo de no-entrenados (años 21±2,6) por la prueba de Wingate <http://copacabana.dlsi.ua.es/insbil/index.php?lang=pt-es&palabra=WINGATE> (30s). La carga adoptada estaba de 0,075 kg para el kilogramo de peso corporal. Los parámetros analizados habían sido: el índice de la fatiga, pinchazo de la energía y la energía media. El grupo del atleta mayor presenta mayor capacidad anaerobia que el atleta menor.

Palabras claves: Potencia anaerobia <http://copacabana.dlsi.ua.es/insbil/index.php?lang=pt-es&palabra=ANAERÓBICA>; Atletas; Prueba de Wingate <http://copacabana.dlsi.ua.es/insbil/index.php?lang=pt-es&palabra=WINGATE>.

POTÊNCIA ANAERÓBIA DE ATLETAS DE NADO SINCRONIZADO - WINGATE TEST

RESUMO

O presente estudo teve como objetivo avaliar a potência anaeróbica de atletas de elite de nado sincronizado (17±1,4 ano) e de um grupo de não-atletas (21±2,6 anos) pelo teste de Wingate de 30s. A carga adotada foi de 0,075 kg por quilograma de peso corporal. Os parâmetros analisados foram: o índice de fadiga, a potência-pico e a potência média. O grupo de atletas seniores apresenta maior capacidade anaeróbica do que o grupo de juniores.

Palavras chaves: Potência anaeróbia; Atletas; Wingate test.