# 41 - EFFECT OF PROPHYLACTIC ADMINISTRATION OF IBUPROFEN IN LONG-DISTANCE SWIMMERS ENDURANCE PERFORMANCE ON TESTS OF 1500 METERS

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## INTRODUCTION

In Middle and Long Distance swimming events, Maglisho (1999) points out that the pain tolerance is one of the contributing causes for the fatigue, suggesting that athletes who are capable of withstanding the discomfort are able to compete in a level close to their true physiological limit. Silverthorn (2003) defines the pain as a sensation perceived from a harmful stimulus (noniceptive), protecting the body tissue against endogenous and exogenous stresses. A frequent used strategy by athletes going through acute physical pain generated by the exercise is the use of Nonsteroidal anti-inflammatory drugs (NSAIDs). The pharmacodynamics is basically based on the non selective of the constitutive and inductive cyclooxygenase enzymes ( COX-1 and COX -2 respectively) and inhibition consequent from the prostaglandin (particularly in its isoform E2) in the case of analgesic effect, working along with bradicine and histamine, exciting nociceptors in the spot of the active body tissue ( VAN, 2003). Corrigan e Kazlauskas (2003) analyzed the Forms of Declaration of Doping Control from the Sidney Olympic Games and was identified the use of AINE´s by 860 athletes (31,1%), configuring this medication classes as the second most frequently used sort of substances by those analyzed athletes staying behind only from Vitamins. In another observational study, Wharam et al. (2006) analyzed 330 finalists triathletes of New Zealand´s Iron Man in 2004, in this study was found a prevalence of declared usage of AINE´s of 30%. Regarding the use of non-opioids analgesics in Ultra Endurance Events and post induction of muscle damage, has been studied the pharmacologicals effects under the inflammatory process (Peterson et al., 2003), pain perception and plasma levels of creatine kinase and cytokine ( NIEMAN et al., 2005), oxidative stress and muscles levels of prostaglandine ( MCANULTY et al., 2007; TRAPPE et al 2001) and effort perception ( GARCIN et al., 2005). However, there is no records in the literature of any investigation sufficiently controlled that has analyzed the effects of the use of AINE on the performance of swimmers. The purpose of this present study itself was to estimate the interference of the prophylactic use of AINE ibuprofen under the performance and biomechanical parameters of 1500 meters in free swimming style events.

## METHODOLOGY

The present clinic essay randomized and double-blind has been approved by a local Ethic Committee, 9 Long Distances Competitive Swimmers ( at the local level), from the same team of the Southern region of Brazil ( 17,7 ± 2,6 anos, 74,3 ± 5,3 kilograms, 180,2 ± 7,5cm, 6,4 ± 2,4 % of body fat and 6,3 ± 2,1 years of training), they were all at the same training period, all of them with no history of recent muscle or articular injuries, no cardiorespiratory or gastrointestinal problems or any other disturbance which may prejudice their performance. The individuals held two 1500 meters freestyle swimming tests in a 25 meter pool ( water temperature at 29 degrees Celsius), with a break of 7 days, being one of them one hour after the oral administration of 1,2 gr of Ibuprofen ( 1500Ibu) or placebo ( 1500pla) in randomized order and double blind. Immediately before the test, the individuals involved performed a standardized warm up, afterwards beginning the test right away individually. Visual signals were placed at the lateral edge of the swimming pool, between the seventh and the twenty second meter, starting and ending, respectively an area of 15 meters (Z15). In the 25 last meters over a 50 meters course, it was chronometered the amount of time taken to accomplish the Z15 ( T_Z15) for the achievement of 5 cycles of stroke within the Z15 (T_15s). Then it was calculated the swimmers speed during the passage of the Z15, termed as Instant Speed ( IS, expressed in m´s-1), through the formula of " IS=15T_Z15-1" the stroke frequency ( SF, expressed in m stroke), it was calculated through the formula " SF = 15 ( SFT_Z15)-1" and the stroke length ( SL expressed in strokes-1) it was calculated through the formula ( SL = 15( SF =15 ( SF T _Z15)-1. The individuals received verbal and visual encouragement throughout the entire way and they were also visually followed up as soon as they completed 500 meter 1000 meters and 1400 meters. Assessing the blood lactate concentration of the individuals 10 minutes before warming up ( LAC pre) Using a Bohering lactimeter, Accusport model, reagent ribbons Roche and disposable lancets Bohering ( Finger Sticks of the right index finger). The statistical analyze was carried out using a SPSS 14.0 software. The T Student Test was used as samples to compare the total time between the situations ( 1500 Pla and 1500 Lbu) and the lactacidemia behavior. ANOVA two way of repeated measures and post-hoc Bonferroni was used to compare IV SF and SL along the test. The significancy level adopted was 5 % ( p<-05).

## RESULTS

The total time of 1500 Ibu was 18min48sec ±40sec presenting lower than the 1500Pla (19min10sec ±50sec), which presents an improvement in performance using prophylactic of ibuprofen. The IV SF and SL behavior it´s shown in the figure 1, 2 and 3 respectively, There was no significative difference observed in any measurement over the the tests among the treatments.

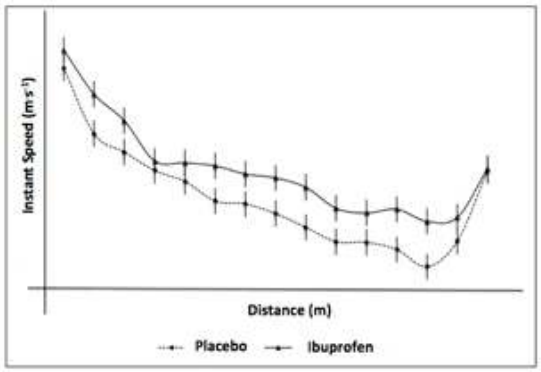



Figure 1: Instant Speed Behaviour along both tests of 1500 meters (ibuprofen and placebo). No significative difference in the partial and middle values among the treatments.

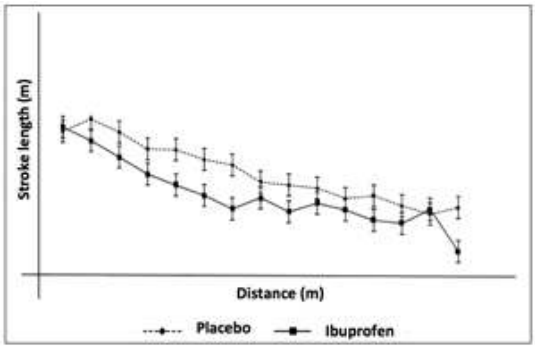



Figure 2: Behaviour of the stroke length (SL) along the tests of 1500 meters in both situations (ibuprofen and placebo) No significative difference in the partial and middle values among the treatments.

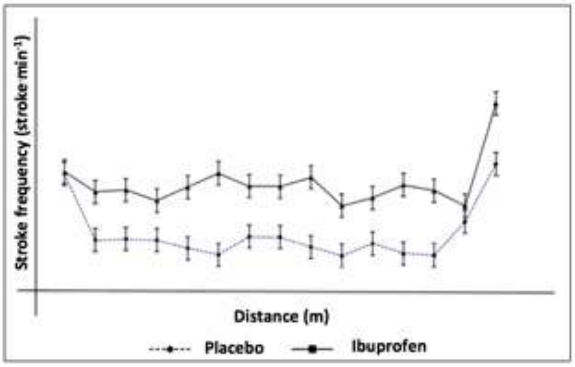



Figure 3: Frequency of stroke cycles and Behaviour of the stroke length (SL) along the test of 1500 meters in both situations (ibuprofen and placebo) No significative difference in the partial and middle values among the treatments.

In either test 1500 Pla as 1500 Lbu the values of Lac post were bigger than Lac pre, ( p=0,043), however the pre and post variations among the treatments was bigger in the Ibuprofen when compared with 1500 Pla (p= 0,04) as it can be noticed in the Figure 1.

| | $Lac_{pré}$ | $Lac_{Pós}$ |
|---|---|---|
| $1500_{Pla}$ | $1,5±0,44^{a}$ | $6,61±2,27^{b}$ |
| $1500_{Ibu}$ | $1,91±0,33^{a}$ | $8,22±2,17^{b}$ |

Chart 1: Values of LACpre and LAC post of both tests ( p<0,05). Equal letters represent an absence of significative difference.

**DISCUSSION**

The main result of this study was the shortest amount of time that the athletes took prior to accomplish the 1500 Ibu in comparison to 1500 Pla tests. This goes against the results of Nieman et al. (2005) and Mcanulty et al. (2007) that they did not note the ergogenic effect of Prophylactic of AINE´s use in in Ultra resistance running competition. Semark et al. (1999) also did not find difference in sprints of 30 meters of run between users and non-users of Flurbiprofen. These differences can be related to the sort of exercise that was analyzed, the employed doses and the way of administration of Aine´s used in addition, different experimental designs.The studies of Nieman et al. (2005) and Mcanulty (2007)analyzed larger period events while Semark et al. (1999) analyzed a smaller period exercise even shorter than this present study, extending the pain may impact the performance differently depending on the time of exercises. Furthermore, while other studies compare non analyzed samples and in different situations, the present study used a crossed model style with a same group in 2 distinct situation (treatments).The proportion among the doses of used medication and the time of exercise were not all the same in all these studies, this could explain the differences encountered.

Comparing users and non-users of acetaminophen, Garcin et al. (2005) encountered the same percentage of maximum aerobic running speed during a threshold of lactate for both groups, however, a smaller sensation of subjective perception of efforts in the user group.In the current study, the sample was instructed to swim both tests in maximum subjunctive sensation in which facing the analgesic effect expected, enabled the development of a higher swimming rate, being like that, improving the performance of the 1500 meters test.

The concentration of lactate after tests ( 6,61± 2,27 mmoll-1 and 8,22 ± 2,17 mmoll-1 para 1500Pla and 1500lbu, respectively) did not present any significative difference and resembled the concentration of lactate found out by Strzala, Tyka and Krezalek (2007) after a 2000 meters swimming test (7,03±2,09 mmol-1). With the findings of this present study corroborates also the findings of Przybylowski et al. (2003), referred to the final lactate concentration after an incremental test to the exhaustion in cicloergometer among individuals who had taken aspirins before the tests and control individuals. Astrand et al, (2006) recommend that lactate concentration above 8-9 mmoll-1 would clearly indicate the reach of maximum aerobic power by the individuals leads to believe that the use of prophylactic of ibuprofen allowed the achievement of a superior physiologic intensity comparing to placebo.

The values of SL (Stroke length) found in this study did not present any significant difference when compared to treatments and SF(Stroke Frequency) and IS (Instant Speed) were smaller than the one encountered by Castro et al. (2005) of long Distance Swimmers that did a repetition of 25 meters in a 1500 meters test wich affects the importance degree of factor such as pain, hidroeletrolitic balance, temperature and hormonal secretions among others, presented to this performance. Regarding the study of Strzala, Tyka and Krezalek (2007), the values of SF and IS found in our study also were smaller and the SL also were similar, however the differences were smaller we suggest that this happened due to difference of level in athletes involved in each study, once the authors mentioned above analyzed their athletes at a national and international level whilst in our particular study we analyzed athletes at a regional level.

Taking into consideration that the analgesic strategy can boost the performance of Long distance Swimmers, suggests a possible ergogenic effect on this pharmacological class within this specific condition even though the administration of this farmaco for this intended outcome it´s not clinically emphasized.

**CONCLUSION**

Even though no significant difference among the situations (Treatments) was encountered on this study on the lactate concentration post exercise, stroke length, Stroke frequency and partial speed along the test, the performance of the swimmers (total time achieved) was enhanced when the individuals carried out the exercise under the effect of Ibuprofen anti-inflammatories, suggesting a possible ergogenic effect in this pharmacological class.

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**EFFECT OF PROPHYLACTIC ADMINISTRATION OF IBUPROFEN IN LONG-DISTANCE SWIMMERS ENDURANCE PERFORMANCE ON TESTS OF 1500 METERS**

**ABSTRACT**

The Nonsteroidal anti-inflammatory drugs (NSAIDs) has been used and abused without medical prescription by non-athletes and athletes of many different modalities. The main reason of this research was to verify the usage of prophylactic ibuprofen under the performance of Long-Distance Swimmers. In 25 meter pool, 9 male swimmers ( 17,7 ± 2,6 years of age, 74,3 ± 5,3 Kilograms, 180,2 ± 7,5 cm, 6,4 ± 2,6 % of body fat and 6,3 ± 2,1 years of training), did two tests, whereas the maximum distance allowed was 1500 meters containing a seven days break between them, one hour after the oral administration of 1,2 gr of Ibuprofen or placebo ( clinical trial, randomized, double-blind) Then standarized as a training and nutrition prior to the tests. The total amount of time in each situation was recorded, the blood lactate concentration was measured 1 minute before and after exercise post-exercise, as well as the partial speed in every 50 meters reached, length and frequency of stroke. Student T Test was used to make a statistical comparison based on the SPSS 15.0. The significancy level adopted was the p<-0.05. The significant difference ( p=0,02) was verified both in the total time of the 2 situations ( 1500pla = 19 min10 seg ±50 sec and 1500 Ibu = 18 min48sec ± 40 sec) as in the lactate concentration ( pla= 5,1 ± 2,2 e Ibu = 6,3 ± 2,2. p= 0,04). No significant difference was observed between the variables of biomechanical swim. Starting from the total proof time and the lactate concentration superior in the Ibuprofen situation, we consider the possibility of Ergogenic Effects from the analgesic effects of the concerned pharmaco.

**KEY WORDS:** Swimming, Endurance, Ibuprofen, Fatigue, Performance

**L'EFFET DE L'ADMINISTRATION PROPHYLACTIQUE D'IBUPROFÈNE SUR LES PERFORMANCES DES NAGEURS EN TEST DE 1500M**

**RÉSUMÉ**

Les anti-inflamatoir nom stéroïdes (AINE's) son utilizeé sans prescription du médecin et de form abusif par les athlètes et les non-athlètes de différents sports. Le objectif de cette étude était d'évaluer l'effet de l'ibuprofène prophylactique sur les performances des nageurs. Dans piscine de 25 mètres, 9 nageurs (17,7 ± 2,6 ans, 74,3 ± 5,3 kg, 180,2 ± 7,5 cm, 6,4 ± 2,6% de matières grasses et 6 3 ± 2,1 années de formation), effectué deux essais maximum de 1500 mètres avec un intervalle de sept jours, une heure après l'administration orale de 1,2 g d'ibuprofène ou un placebo (essais clinique, randomisée, en double aveugle). A été du patron les entraîner et alimenter avant du test. Il a été enregistré le temps total dans chaque situation, la concentration de lactate sanguin avant et 1 minute après l'exercice, chaque vitesse de 50m partielle, longueur et la fréquence du brassée. Test t de Student a été utilisé pour comparer les traitements dans SPSS 15.0. Le niveau de signification a été deó p≤ 0.05. Différence significative (p = 0,02) a été observée à la fois dans le temps total des 2 situations (1500pla = ± 19min10seg 50seg et 1500Ibu 18min48seg = ± 40sec), et dans la concentration de lactate (PLA = 5,1 ± 2,2 et Ibu = 6, 3 ± 2,2. p = 0,04). Aucune différence significative n'a été observée entre les variables biomécaniques de natation. De la durée totale de l'essai et la concentration de lactate supérieure dans la situation ibuprofène, envisager la possibilité d'un effet ergogène de l'effet analgésique du médicament en question.

**MOTS-CLÉS:** Natation, Endurance, l'ibuprofène, La Fatigue, La Performance.

**EFECTO DE LA ADMINISTRACIÓN PROFILPACTICA DEL IBUPROFENO EN EL RENDIMIENTO DE LOS NADADORES EN PRUEBAS DE 1500M**

**RESUMEN**

Los antiinflamatorios no esteroides (AINEs) se utilizan sin receta y en exceso por los atletas y los no atletas de varios deportes. El objetivo de este estudio fue investigar el efecto del uso profiláctico de ibuprofeno sobre el desenpenho de los nadadores de pruebas largas. En piscina de 25 metros, 9 nadadores masculinos (17,7 ± 2,6 años, 74,3 ± 5,3 kg, 180,2 ± 7,5 cm, 6,4 ± 2,6% de grasa y 6,3 ± 2,1 años de entrenamiento), realizaron dos pruebas máximas de 1500 metros con un intervalo de siete días, una hora después de la administración oral de 1,2gr de ibuprofeno o placebo (ensayo clínico, aleatorizado, dobleciego). Fue estandarizado entrenamiento y alimentacion antes de la prueba. Se grabó el tiempo total en cada situación, La concentración de lactato en sangre antes y 1 minuto después del ejercicio, velocidad parcial cada 50 metros, La longitud y la frecuencia de brazada. Prueba T de Student se utilizó para comparar los tratamientos en paquete estadístico SPSS 15.0. El nivel de significación adoptado fue de p≤ 0.05. diferencia significativa (p=0.02) se observó tanto en el tiempo total de las dos situaciones (1500pla=19min10seg±50seg e 1500Ibu=18min48seg±40seg), como em la concentracion de lactato (pla=5,1±2,2 e Ibu=6,3±2,2. p=0.04). No se observaron diferencias significativas entre las variables biomecánicas de natación. Desde el tiempo total de prueba y concentracon de lactato superior en la situacion Ibuprofeno, consideramos la posibilidad de un efecto ergogénico desde el efecto analgésico de la droga en cuestión.

**PALABRAS LLAVE:** Natación, Resistencia, Ibuprofeno, Fatiga, Rendimiento.

**EFEITO DA ADMINISTRAÇÃO PROFILÁTICA DE IBUPROFENO NA PERFORMANCE DE NADADORES FUNDISTAS EM TESTES DE 1500M**

**RESUMO**

Os antiinflamatórios não-esteróides (AINEs) são utilizados sem prescrição médica e de forma abusiva por não-atletas e atletas de diversas modalidades. O objetivo deste trabalho foi verificar o efeito do uso profilático de Ibuprofeno sobre o desempenho de nadadores fundistas. Em piscina de 25 metros, 9 nadadores masculinos (17,7±2,6 anos, 74,3±5,3 quilos, 180,2 ±7,5 cm, 6,4±2,6 % de gordura e 6,3±2,1 anos de treinamento), realizaram dois testes máximos de 1500 metros com intervalo de sete dias, uma hora após administração oral de 1,2gr de Ibuprofeno ou placebo (ensaio clínico, randomizado e duplo-cego). Padronizou-se treinamento e alimentação prévia ao teste. Foi registrado o tempo total em cada situação, a concentração de lactato sanguíneo antes e 1 minuto após o exercício pós exercício, velocidade parcial a cada 50m, comprimento e frequência de braçada. Teste T de Student foi utilizado para comparar os tratamentos no pacote estatístico SPSS 15.0. O nível de significância adotado foi de p≤ 0.05. Diferença significativa (p=0.02) foi verificada tanto no tempo total das 2 situações (1500pla=19min10seg±50seg e 1500Ibu=18min48seg±40seg), quanto na concentração de lactato (pla=5,1±2,2 e Ibu=6,3±2,2. p=0.04). Não foi observada diferença significativa entre os as variáveis biomecânicas de nado. A partir do tempo total de prova e concentração de lactato superiores na situação Ibuprofeno, consideramos a possibilidade de efeito ergogênico a partir do efeito analgésico do fármaco em questão.

**PALAVRAS CHAVES:** Natação, Endurance, Ibruprofeno, Fadiga, Performance