# 145 - PHYSIOLOGICAL RESPONSES IN ACUTE JIU-JITSU AND CORRELATION WITH THE AEROBIC CAPACITY

CEZIMAR CORREIA BORGES[1]
RODRIGO ANSALONI DE OLIVEIRA[1]
RICARDO ANSALONI DE OLIVEIRA[1]
RAFAEL FREITAS SANTOS SILVA[1]
PAULO JOSÉ CARNEIRO PERFEITO[2]
[1.]FESG-FAFICH - Faculdade de Goiatuba, Goiatuba, Goiás, Brasil
[2.]Centro Universitário Unieuro, Brasília, Distrito Federal, Brasil
cezimarborges@yahoo.com.br

## INTRODUCTION

The Jiu - Jitsu or smooth art as cite, is a sport where the practitioner must maintain direct physical control over the opponent and overwhelms him with his own strength (RATAMESS, 1998; ASSIS et al., 2005).

The ground fighting, as is the predominance of Jiu Jitsu, are sports that require high demand of physical, have characteristics acyclic, mesomorphic predominant components are subjected to high workloads and have marked the participation of lactic anaerobic metabolism (FRANCHINI et al. 1997, Del Vecchio et al. 2007; GARRET & Donald, 2003).

Athletes are exposed to strenuous effort during intermittent periods of activity and rest, resulting in the mobilization of large amounts of energy substrate in the absence or deficiency of oxygen, which favors the increase of blood lactate concentrations during fights (Lima et al. 2004; DRIGO et al., 1996, Powers & Howley, 2000).

The accumulation of lactate is associated with fatigue and consequent interruption / reduction in the intensity of the activity. Thus, it can be inferred that the athlete who has a position to remove lactate more quickly will be able to start the fight with greater subsequent ATP (adenosine triphosphate) available and thus have more chance of achieving better performance (FRANCHINI et al. 2001).

Many parameters have been used to indirectly determine the cardiovascular burden imposed on the body during physical activity, such as heart rate (HR) and blood pressure (BP). The variable CF is widely used for the prescription and evaluation of training intensity within the sphere of sport, mainly because it is a noninvasive, easy to apply and low operating costs (MacDonald 2002).

The VO2 max is a reproducible measure of the ability of the cardiovascular system to release blood to a large muscle mass involved in a dynamic work (Powers & Howley, 2000). It is believed that high levels of power and aerobic capacity provide the athlete to maintain a high intensity throughout the fight, slowing the accumulation of lactate, and provide greater recovery between fights (Castarlenas & SOLE, 1997).

Some studies have proposed to evaluate some characteristics of Jiu Jitsu, such as profile lactacidemia (Cavalcanti et al., 2010), kinetics of lactate removal (Pereira et al., 2011), Heart Rate and Blood Pressure during the fight and also the manual pressure of the athletes (FRANCHINI et al. 2003; PRADO & LOPES, 2009) or to correlate the quantification methods of training load with the level of effort seen in a fighting session (Silva et al., 2011).

This study aims to determine the acute physiological responses on the practice of Jiu Jitsu, evaluating cardiovascular parameters (heart rate and blood pressure), biochemical (lactate) and correlate them with aerobic fitness (VO2 max.) Individuals young fans of the art.

## MATERIALS AND METHODS

Sample: 08 athletes Jiu Jitsu men agreed to participate in this study after reading and signing an informed consent form. This work meets the standards and guidelines of Resolution 196/96 of the National Health arranged for research involving humans. The healthy subjects the second Par-Q questionnaire had the following characteristics: (medium) - age = 19 years, BMI = 24.89, = 14.21% body fat, and practiced jiu-jitsu at competitive level to at least 01 years.

Heart Rate and Blood Pressure: the frequency trophy was collected during the struggle between athletes with the same degree and similar categories. The fight time was 5 minutes, even though there was the withdrawal of one player, which in competition would determine the end of the bout, the fight to resume until the expiration time. Every minute the heart rate was collected using a frequency-athlete's ® Polar FT4. Blood pressure was measured at rest pre fight and post fight using the ORION ® sphygmomanometer.

Lactate: approximately 25µl of capillary blood was collected from the ear lobe and measured by lactate lactimeter ACCUNTRED PLUS ® ROCHE in stages: pre fight and post fight (1, 5 and 15 minutes recovery).

Aerobic capacity: The stress test (running) on a treadmill was applied by means of a protocol "incremental ramp test" of the ACSM (American College of Sports Medicine) - with increased speed every 30 seconds and two increments of inclination, and the test ended up with fatigue indicated by the individual. The test results presented as the VO2 max and VO2 at anaerobic threshold. Having been used to detect ventilatory thresholds, the spirometer FLOW MET - MicroMed ®.

## RESULTS

Graph 1 shows the mean heart rate of athletes during the different moments of struggle and recovery post-fight

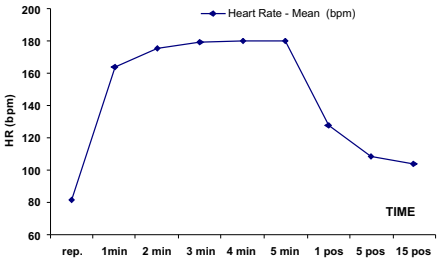



Figure 1 - Behavior of heart rate (HR) - bpm, resting during the fight (1, 2, 3, 4, 5 minutes) and recovery (1, 5, 15 min post-fight)

Since the behavior of blood pressure (average of the athletes) and blood lactate levels are described in the following charts (Figure 2 and 3 respectively).

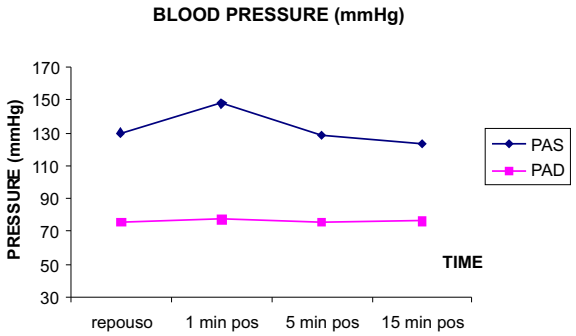



Chart 2 - Systolic and diastolic (average of the athletes), rest and recovery (1,5,15 min post-fight)

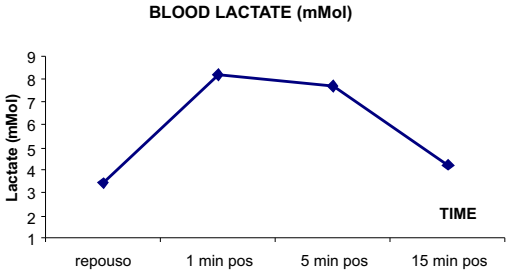



Chart 3 - Blood lactate (average among athletes), rest and recovery (1, 5, 15 min post-fight)
Power figures verified by the aerobic exercise test with respirometry are shown in Table 1.

| | $VO_2$ Máx. (ml/kg/min) | $VO_2$ (ml/kg/min) in anaerobic threshold | Heart rate (bpm) in anaerobic threshold | Time test (min) |
|---|---|---|---|---|
| Mean | 49,80 | 41,73 | 182,66 | 12,10 |
| Standard deviation | 2,86 | 2,04 | 6,43 | 0,32 |

Table 1 - Mean and standard deviation of data obtained by running test on a treadmill

**DISCUSSION**

Heart rate responses observed in Graph 1 indicates that there was a gradual increase in cardiac stress every minute of the fight, having been found near the maximum heart rate provided for some athletes (220 - age). Another complimentary registration that can be done and not been glimpsed in the overall graphics that some types of actions as an attack (in the up position to the opponent) or disadvantaged (as suffering "choke") there were peak maximum heart rate. According to Prado & Lopes (2009), Jiu Jitsu is a form of intermittent exercise, as there is an alternation in rhythm by applying strokes and their defense, apart from times when the fighters are studied, almost getting static.

Systolic blood pressure measured in our athletes (Figure 2) was high only in the period near the end of combat (1 min recovery), and interestingly has decreased to levels below pre-exercise during the recovery time (5, 15 min), indicating a post-exercise hypotension, similar to what has been reported in the literature when efforts to mobilize enough muscle strength (resistance exercise) (FARINAT, 2003, MACDONALD 2002).

This type of exercise seems to cause the body to various physiological and metabolic adaptations, easily sustained for a long time-intensive effort as indicated FRANCHINI et al. (2003) and can be retrieved in a timely manner. As observed in the study of Pereira et al. (2001), blood lactate in athletes here evaluated in this study (Table 3) increased significantly compared to resting levels, but there was a relatively rapid decrease of this metabolite to the time of 15 minutes.

As for the aerobic capacity test analyzed here by incremental treadmill running (Table 1), we observed that the athletes had an average VO2 Max = 49.80 ml / kg / min, a rate that can be considered good to excellent suitability as references General (ACSM, 2003) classification of this parameter. Furthermore, the anaerobic threshold obtained indirectly through the acquisition of the second ventilatory threshold (to 41.73 ml / kg / min) over 80% of VO2 Max in theory reinforces this conclusion. However, these values can not be considered as optimal for the purposes of sport performance, mainly because there are still few studies related to this type of fight.

The data presented in both graphs as in the above table only aware of the general average results of eight athletes investigated. However from individual comparative analysis of our records, we see clearly that the three athletes VO2 Max and anaerobic threshold higher were also able to withstand a longer effort in the running test, maximal heart rate under stress and even lower kinetics with a more effective removal of lactate, compared to other athletes.

**CONCLUSION**

It could be concluded from this study that during the battle in the fight Jiu Jitsu is a high request of the cardiovascular system and is required cardiac output at peak levels, and that during the post-fight, there is a hypotensive effect mainly in systolic blood pressure. Nevertheless, the relatively short period of effort (up to 5 minutes) and high intensity, the energy pathways are predominantly anaerobic requested, confirmed by the sudden increase in blood lactate. However, aerobic endurance should be seen as essential for the functional capacity of athletes in this sport, especially by the fact that competition may occur in short

intervals of rest before following a fight against another opponent. In this sense, coaches and athletes should pay special attention to the aerobic fitness training with the planning and execution of periodization training this sport.

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**PHYSIOLOGICAL RESPONSES IN ACUTE JIU-JITSU AND CORRELATION WITH THE AEROBIC CAPACITY**

**ABSTRACT**

The ground fighting, as most of the Jiu-Jitsu, are sports that require high demand of physical, have characteristics acyclic, mesomorphic predominant components are subjected to high workloads and have marked the participation of lactic anaerobic metabolism . Athletes are exposed to strenuous effort during intermittent periods of activity and rest, resulting in the mobilization of large amounts of energy substrate in the absence or deficiency of oxygen, which favors the increase of blood lactate concentrations during fights. This study aimed to determine the acute physiological responses on the practice of Jiu-Jitsu, the assessment of cardiovascular parameters (heart rate and blood pressure), biochemical (lactate) and correlate them with aerobic fitness (VO2 max. and Threshold anaerobic) of young fans of the art. There was a gradual increase in cardiac stress every minute of the fight, having been found near the maximum heart rate due to some athletes. Systolic blood pressure also showed the high end of the match (1 min recovery), but with significant decline in the following periods of rest, thus indicating post-exercise hypotensive effect. The athletes had higher values of VO2 max and VO2 at anaerobic threshold were those who showed better tolerance to treadmill running test, and developed faster recovery of blood lactate. Thus, this study reinforces the notion that better known aerobic fitness results in physiological responses favorable to good athletic performance, even in predominantly anaerobic modalities, such as Jiu-Jitsu.

**KEYWORDS:** Cardiovascular responses, aerobic power, fight.

**REACTIONS PHYSIOLOGIQUES CHEZ AIGUË JIU-JITSU ET LA CORRELATION AVEC LA CAPACITE AEROBIE**

**RESUME**

Le combat au sol, comme la plupart des Jiu-Jitsu, sont des sports qui nécessitent une forte demande de la physique, ont des caractéristiques acyclique, mésomorphe composantes prédominantes sont soumis à des charges de travail élevées et qui ont marqué la participation du métabolisme anaérobie lactique . Les athlètes sont exposés à des efforts acharnés pendant des périodes intermittentes d'activité et de repos, ce qui entraîne la mobilisation de grandes quantités de substrat énergétique en l'absence ou l'insuffisance de l'oxygène, ce qui favorise l'augmentation des concentrations de lactate dans le sang pendant les combats. Cette étude visait à déterminer les réponses physiologiques aigus sur la pratique du Jiu-Jitsu, l'évaluation des paramètres cardiovasculaires (fréquence cardiaque et pression artérielle), biochimiques (lactate) et les corréler avec capacité aérobique maximale (VO2. MAX. ) anaérobie des jeunes fans de l'art. Il y avait une augmentation graduelle de stress cardiaque chaque minute de la lutte, ayant été trouvé près de la fréquence cardiaque maximale en raison de certains athlètes. La pression artérielle systolique a également montré le haut de gamme du match (1 min de récupération), mais avec baisse significative dans

les périodes suivantes de repos, ce qui indique post-exercice effet hypotenseur. Les athlètes avaient des valeurs plus élevées de la VO2 MAX. et VO2 au seuil anaérobie ont été ceux qui ont montré une meilleure tolérance au test de course sur tapis roulant, et a développé une récupération plus rapide du lactate dans le sang. Ainsi, cette étude renforce l'idée que mieux connu des résultats aérobique dans les réponses physiologiques favorables à une bonne performance athlétique, même dans les modalités essentiellement anaérobie, tels que le jiu-jitsu.

**RESPUESTAS FISIOLÓGICAS EN AGUDA JIU-JITSU Y SU CORRELACIÓN CON LA CAPACIDAD AERÓBICA**

**RESUMEN**

La lucha en el suelo, como la mayoría de los Jiu-Jitsu, son los deportes que requieren alta demanda de bienestar físico, tienen características acíclicos, mesomorfo componentes predominantes son sometidos a altas cargas de trabajo y han marcado la participación del metabolismo anaeróbico láctico . Los atletas están expuestos a esfuerzos extenuantes durante períodos intermitentes de actividad y descanso, dando como resultado la movilización de grandes cantidades de sustrato energético en la ausencia o deficiencia de oxígeno, lo que favorece el aumento de las concentraciones de lactato en sangre durante los combates. Este estudio tuvo como objetivo determinar las respuestas fisiológicas agudas en la práctica del Jiu-Jitsu, la evaluación de los parámetros cardiovasculares (frecuencia cardíaca y presión arterial), bioquímicos (lactato) y correlacionarlos con la aptitud aeróbica máxima (VO2. MAX.) anaeróbica de los jóvenes aficionados del arte. Hubo un aumento gradual de esfuerzo cardíaco cada minuto de la pelea, después de haber sido encontrado cerca de la frecuencia cardíaca máxima, debido a algunos atletas. La presión arterial sistólica también mostró la parte alta del partido (1 min de recuperación), pero con disminución significativa en los siguientes períodos de descanso, lo que indica que después del ejercicio el efecto hipotensor. Los atletas presentaron mayores valores de VO2 max y VO2 en el umbral anaeróbico fueron los que mostraron una mejor tolerancia a la prueba de carrera en cinta, y desarrolló una recuperación más rápida de lactato en sangre. Así, este estudio refuerza la idea de que mejor conoce los resultados de la aptitud aeróbica en las respuestas fisiológicas favorables para el rendimiento deportivo bueno, incluso en las modalidades predominantemente anaeróbico, como el Jiu-Jitsu.

**RESPOSTAS FISIOLÓGICAS AGUDAS NA PRÁTICA DO JIU-JITSU E CORRELAÇÃO COM A CAPACIDADE AERÓBIA**

**RESUMO**

As lutas de solo, como é a maior parte do Jiu-Jítsu, são esportes que exigem alta demanda das capacidades físicas, possuem características acíclicas, componentes mesomórficos predominantes, estão sujeitos a elevadas cargas de trabalho e contam com a participação acentuada do metabolismo anaeróbio lático. Os atletas estão expostos a esforço extenuantes durante períodos intermitentes de atividade e repouso, acarretando a mobilização de grande quantidade de substrato energético na ausência ou déficit de oxigênio, o que favorece o aumento das concentrações de lactato sanguíneo durante as lutas. Este estudo teve como objetivo verificar as respostas fisiológicas agudas diante da prática do Jiu-Jítsu, avaliando-se parâmetros cardiovasculares (Freqüência Cardíaca e Pressão Arterial), bioquímico (lactato sanguíneo) e correlacioná-los com a aptidão aeróbia (VO2 máx. e Limiar anaeróbio) de indivíduos jovens adeptos desta arte marcial. Verificou-se aumento gradativo de esforço cardíaco a cada minuto de luta, tendo sido encontrado frequência cardíaca próximo da máxima prevista para alguns atletas. A pressão arterial sistólica mostrou-se também elevada ao final do combate (1 min recuperação), porém com queda expressiva nos períodos de descanso a seguir, indicando assim, efeito hipotensor pós-exercício. Os atletas que apresentaram valores superiores de VO2 MÁX e VO2 no limiar anaeróbio foram os que se mostraram com melhor tolerância ao teste de corrida em esteira, bem como desenvolveram restauração mais rápida de lactato sanguíneo. Assim, este estudo reforça a noção conhecida de que uma melhor aptidão aeróbia resulta em respostas fisiológicas favoráveis ao bom desempenho esportivo, mesmo em modalidades com predominância anaeróbia, como no caso do Jiu-Jítsu.

**PALAVRAS-CHAVE**: Respostas cardiovasculares, potência aeróbia, lutas.