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Effects of Active vs. Passive Recovery on Blood Lactate after Specific Judo-Task

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ABSTRACT

Touguinha HM, Silva FF, Carvalho W, Freitas WZ, Silva E, Souza RA. Effects of Active vs. Passive Recovery on Blood Lactate after Specific Judo-Task**. JEPonline** 2011;14(6):54-61. Previous studies indicated that blood lactate disappearance was facilitated during active recovery compared to passive recovery, but these effects associated with a judo specific technique such as Uchi-Komi is still unknown. The aim of this study was to investigate the effects of active vs. passive recovery on blood lactate after specific judo-task in highly trained judokas. Eight judo competitors volunteered to participate in this study. All athletes have international level experience, and they have integrated the Brazilian male judo team. The judokas performed in random order, over two separate sessions, consisted of a Judo Task-induced hyperlactacidemia (*Uchi-Komi* technique) with 9 min of passive (PR) or active recovery (AR). After 9 min of recovery, no differences were found when comparing PR and AR to reduce hyperlactacidemia. However, both recovery protocols (PR and AR) led to decreased levels of blood lactate concentration when compared with the post-task moment.

***Key Words**:* Blood lactate, Combat sport, Judo athletes

INTRODUCTION

Judo is an Olympic sport characterized by short duration, high intensity and intermittent exercise (20). To be successful in international competitions, judo athletes must achieve complex skills and tactical excellence associated with a high level of physical fitness condition during training (e.g., strength, anaerobic, and aerobic power (12). In this sense, the energetic requirements of a competitive match need to be analyzed to provide parameters for developing athletes and for improving their training and recovery (6).

The primary source of energy during a judo match is the anaerobic lactic system, which provides the short, quick, and all-out bursts of maximal power during the match. Additionally, the aerobic system contributes to the judoka´s ability to sustain effort for the duration of the combat and to recover during the minimal interval between the matches (10,11,17,20). In order to obtain an understanding of the physiological capacity that underlies judo performance, the analysis of blood lactate concentration in specific situations of judo has been reported (1,4,10,11). In addition, the lactate measurement allows for the clarification of important points. First, it allows for the analysis of the athlete’s aerobic capacity to determine the appropriate exercise intensity for training and scientific investigation (9). Second, information about the athlete’s lactate provides insight into the stress exerted on the muscles during a workout (2).

Recently, it has become commonplace to find research articles about the effects of active recovery (AR) vs. passive recovery (PR) after a judo match, particularly in regards to blood lactate removal (10,11,16,25). For PR periods of 10 to 35 min, some studies have indicated that it is not sufficient to reduce the blood lactate to a resting concentration. The suggestion then is that PR is an incomplete recovery in judokas (16,25). On the other hand, lactate removal in highly trained judo athletes has been reported to improve with AR (10,11).

In recognition of the fact that an athlete can perform more than 5 matches on the same day with an interval of 10 min between two consecutive matches, an adequate recovery is crucial to success in competition (1). Thus, new studies (particularly in regards to PR vs. AR) that support the use specific judo tasks in the metabolic recovery process are encouraging. The aim of this study was to determine the effects of active vs. passive recovery on blood lactate after specific Judo-Task in highly trained judokas.

METHODS

Subjects

This study consisted of eight judo competitors (mean age 20.6 yr and body weight 83.3 kg) with international level experience who integrated the Brazilian male judo team. All judokas had 1st Dan Black belt, and had practiced the sport for at least 9 yr. None of the subjects was taking drugs, medication, or illegal supplements. None had any endocrine or other medical problems that would confound the results. All were informed about the risks of the research before giving their written consent, and all procedures were in accordance with Brazilian ethical and legal issues in research involving human subjects.

Procedures

The subjects were familiarized with the procedures adopted and the tests were individually conducted at the same time of day. Figure 1 identifies the design of the experimental protocol. The blood lactate measurements occurred prior to and following the Judo Task-induced hyperlactacidemia (JTih) and at the 3th, 6th, and 9th min during recovery (Figure 1). To ensure the success of hyperlactacidemia protocol, heart rate (HR) was monitored. After performing the JTih, the subjects were randomly submitted to 9 min of either AR or PR. After a time interval of 24 hr, the procedures were repeated in which only the type of recovery was changed.

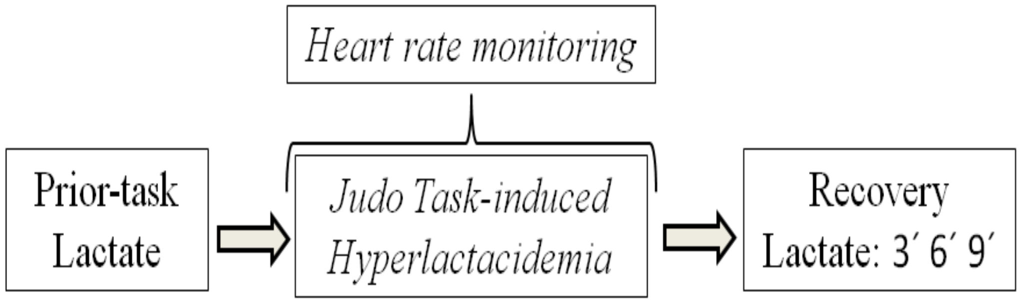

Figure 1. Experimental protocol design.

Judo Task-Induced Hyperlactacidemia

After 5 min of warm-up, the subjects were individually submitted to the JTih (1). The *Uchi-Komi* (a classical drill training for the development of overall judo skill) practice technique of *ippon-seoi* (i.e., one of the 20 throwing techniques in the Nage No Te list) was used to induce hyperlactacidemia. The intensities were controlled by sonorous stimulus (55 beepers per min) given to participant until the judoka became exhausted, thus reaching the maximum load (ML). The exhaustion was determined by two consecutive errors of sync between the judoka´s motion and sonorous stimulus. During JTih, the subjects HR was monitored using a chest strap HR monitor (Polar, Accurex Plus, Kempele, Finland). This test allowed the adjustment of work load for the AR to 60-70% of HR achieved at the ML moment.

Recovery

All participants underwent both an AR and a PR protocol, therefore serving as their own control. The time of recovery consisted of 9 min in both protocols. During PR the subjects stayed only seated at the tatame. During AR the subjects performed *Uchi-Komi* technique (repeated entries) at a velocity corresponding to 60-70% of HR achieved at the ML moment. The judoka stopped the AR only at the moments of blood lactate measurement. Blood samples were taken according to Figure 1 for both PR and AR. All blood samples were drawn via the standard, hygienic finger puncture method. About 25 micro-liters were drawn for each sample. All samples were analyzed immediately using an Accusport portable lactate analyzer (Boehringer Mannheim, Indianapolis, IN, USA).

Statistical Analyses

The distribution of the data was analyzed by the Kolmogorov-Smirnov test. The results showed a normal Gaussian distribution. The dependent Student's t-tests for paired samples were used to compare changes among the blood lactate concentration prior to and post performing JTih (significance level of 5%). A 2 x 4 repeated measures analysis of variance (ANOVA) was used to compare changes among the groups PR and AR (significance level of 5%). When appropriate, a post-hoc analysis (Tukey-Kramer test) was used to determine where the location of the significant differences. Statistical evaluations were analyzed using SPSS software version 11.0 (SPSS Inc, Chicago, IL, USA).

RESULTS

Influence of Uchi -Komi Technique on Lactacidemy Levels

Figure 2A shows the blood lactate concentration of judokas prior to and post performing JTih. The *Uchi-Komi* technique increased the levels of blood lactate approximately 4 times (P=0.05). In Figure 2B, the athletes achieved a mean value of 86.3% of maximum HR. This value represents about 2.5 times the initial values (P=0.05).

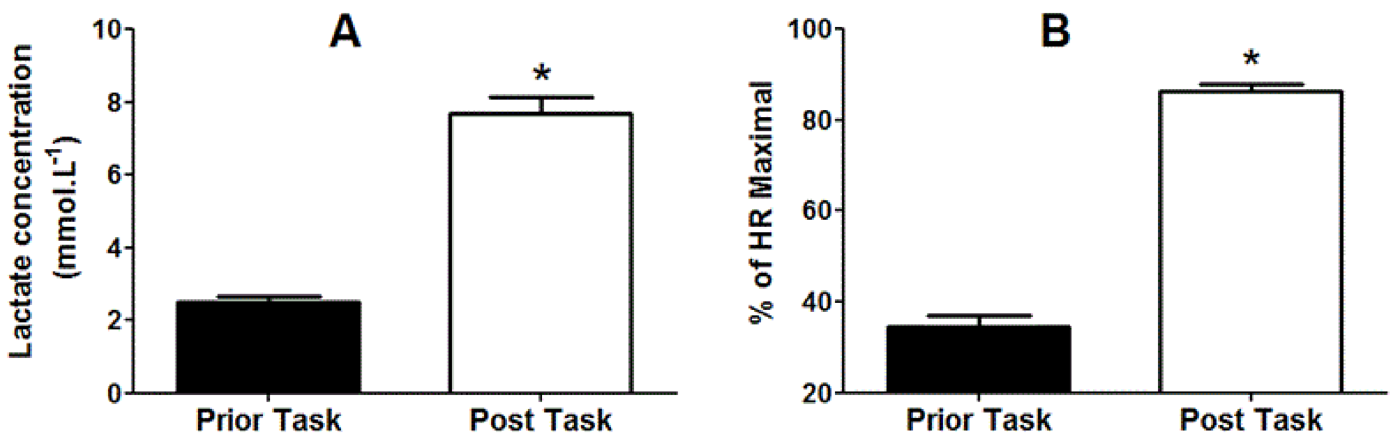

Figure 2. A: Comparison between lactate concentration prior and post judo task-induced hyperlactacidemia, and B: Comparison between percent of heart rate (HR) maximal prior to and post judo task-induced hyperlactacidemia. Values are expressed as mean and standard error. *Indicates P=0.05.

Blood Lactate during Recovery Protocols

At the end of 9 min, both recovery protocols (PR and AR) led to decreased levels of blood lactate concentration when compared with the post-task moment (Figure 3; P=0.05). However, these changes did not differ between recovery protocols in all minutes analyzed (P>0.05).

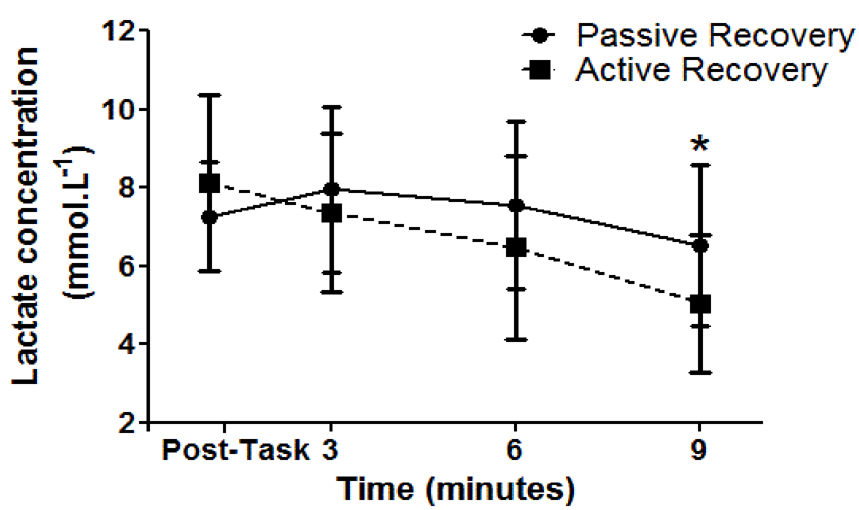

Figure 3. Lactate data for both passive and active recoveries. Values are expressed as mean and standard error. *Indicates P=0.05 vs. post-task moment for both recovery protocols.

DISCUSSION

Using a protocol not widely tested, though widely practiced by athletes, the present study evaluated the influence of the *Uchi-Komi* technique on lactacidemy levels and its lactate removal ability. It was found that the *Uchi-Komi* technique adapted with the JTih protocol resulted in an increase in the levels of blood lactate associated with high HRs. Also, the findings of the study demonstrated the efficacy of lactate removal for both recovery protocols (PR and AR). These results indicate that the JTih protocol induces hyperlactacidemia, and that there are no statistically significant differences between the AR and the PR protocols to decrease hyperlactacidemia.

Although the importance of monitoring blood lactate is always being debated, it is nonetheless recognized that elevated levels of skeletal muscle and blood lactate are associated with impaired muscle function and exercise performance (14). Even though the cause-effect relationship between lactate and fatigue remains unclear (13), it is understood that the accumulation of lactate may at least indirectly contribute to reduced performance. Clearly, the conversion of lactic acid to lactate releases H^+ that leads to a metabolic acidosis with subsequent inhibition of glycolytic rate-limiting enzymes, lipolysis, and contractility of the skeletal muscles (5). Independently, therefore, if lactate production causes or leads to fatigue, it is reasonable to use it as a measurable marker because of its correlation with muscle fatigue and performance (14). As a result, it is relevant to design strategies that clears blood lactate after high intensity exercise bouts, as this enables a faster recovery of the athlete and may also support subsequent high-intensity exercise that leads to greater overload and enhanced training adaptation and success during competition.

The effects of lactate on performance have been studied in relation to AR and PR for over 30 yr using a great variety of protocols and athletes of many different sports (7). However, there is no consensual scientific information available, except for the findings in this study. For example, while it has been described that AR promotes faster removal of blood lactate to liver, heart, and slow twitch muscle fibers than PR, other studies have attested that PR improves the regeneration of phosphagen system, which acts as a proton shuttle (ATP + Creatine + H^+ ? PCr + ADP) that helps the cell to control its internal pH (18).

Considering the combat sport of judo that depends highly on the anaerobic lactic system, numerous studies have been conducted to verify if AR applied after a judo match results in a better performance when compared to PR. Some studies have indicated that PR periods of 10 to 35 min were not sufficient to remove the increase in blood lactate to resting levels, suggesting an incomplete recovery (16,25). Also, it has been described that the lactate removal was improved with AR when compared to PR, but AR did not improve performance in a subsequent intermittent anaerobic exercise (10). Additionally, Franchini and colleagues (11) indicated that the minimal recovery time reported in judo competitions (15 min) is long enough for sufficient recovery regardless of the adoption of AR or PR.

Even so, a significant decrease in blood lactate after 9 min of hyperlactacidemia was found for both recovery protocols (AR and PR). Thus, even without differences in the AR or PR results, it is interesting to note that the odds ratio of winning a match increased 10 times when a judoka performed AR and his opponent performed PR (11). It is probable that the measurement of blood lactate is not a sensible marker to predict the success of muscle recovery. Perhaps, more important than simply the monitoring of blood lactate is the assessment of athletic performance in terms of more accurate methodologies.

For efficient control of judokas training loads and performance, it is also necessary to evaluate the athlete at specifics situations, at least similar to judo practice (26). Thus, similarly, searching for a specific evaluation of judo practice, the present study used the *Uchi-Komi* technique (1,21). Because the muscle performance was not measured, others studies should consider doing so to verify the neuromuscular aspects of recovery. This is an especially important recommendation since a recent study has suggested that some exercises performed before the Special Judo Fitness Test can result in improvements in the test index and anaerobic power of judo athletes (15).

CONCLUSIONS

The results of this study add to the growing body of knowledge regarding PR and AR protocols in regards to judokas. In particular, it was concluded that *Uchi-Komi* increases blood lactate levels and that there are no statistically significant differences between performing after an AR or a PR (in regards to reduced hyperlactacidemia). Of course, it is important to state that additional studies are necessary to clarify the role of blood lactate and muscle recovery.

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