The use of biochemical and hematological analyses in the prevention of prevention of overtraining in judo – showcase study

**ABSTRACT:** The aim of this study was investigate the factors which lead to the overtraining, through a showcase study of a high level Judo athlete who presented this phenomenon in his preparation for the 2000 Olympic Games. To collect data, the monitoring of biochemical and hematological exams which the athlete accomplished was used, through the Cosendey’s (1997), the Physical Conditioning Biochemical and Hematological Monitoring Method. As a result, it was verified the overtraining and suggested recovery procedures, along with two interview questionnaires, one for the athlete and the other for physical and coach, made to obtain data on training routines and the athlete’s life habits, so that their influences on this process of chronic fatigue could be analyzed. The results of the interviews showed a profile of overtraining risk, as high self-motivation and determination, difficulty in the control of the training loads in function of the athlete’s behavior and the use of several training places, lack of rest, inadequate eating habits, discouragement and performance loss and appearance and/or increase of injuries. The results of the Biochemical and Hematological Monitoring presented the physiological consequences of effort excess which he was going through, providing recommendations for his recovery. The athlete of this study endured high daily training loads without damage, either in terms of volume or intensity, without allowing the necessary recovery. The athlete’s conduct, so much in relation to the training sessions as for his private life habits, presented as a more significant factor for the overtraining process than the amount of training administered. The observation of signs related to the overtraining syndrome should not be used as a prevention program, because the appearance of those signs means that the athlete’s physiological impairment is already at a quite advanced level. For this, it is recommended the use of the Physical Conditioning biochemical and hematological Monitoring Method as a prevention program form and an objective identification of the overtraining.

**Keywords:** Judo, overtraining, recovery, monitoring.

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Submitted: May / 2003 Accepted: June / 2003

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RESUMO

O uso de análises bioquímicas e hematológicas na prevenção do sobretreinamento no judo – estudo de caso

O objetivo deste trabalho foi investigar os fatores que levam ao sobretreinamento (overtraining), através de um estudo de caso de um atleta de Judô de alto nível que apresentou este fenômeno na sua preparação para as Olimpíadas de 2000. Para a coleta de dados, utilizou-se o acompanhamento de exames bioquímicos e hematológicos que o atleta realizou, através da metodologia de Cosendey (1997), Monitoração Bioquímico-Hematológica do Condicionamento Físico, que constatou o overtraining e sugeriu procedimentos de recuperação, juntamente com dois roteiros de entrevista, um destinado ao atleta e o outro para o seu técnico e preparador físico, elaborados para levantar dados sobre a rotina de treinamento e hábitos da vida particular do atleta, para que se pudesse analisar suas influências sobre esse processo de fadiga crônica. Os resultados das entrevistas mostraram um perfil de risco de overtraining, como elevada automotivação e determinação, dificuldade no controle das cargas de treino em função do comportamento do atleta e do uso de vários locais de treino, falta de repouso, alimentação inadequada, desânimo e perda de rendimento, aparecimento e/ou aumento de lesões. As monitorações bioquímico-hematológicas apresentaram as consequências fisiológicas do excesso de esforço a que ele vinha se submetendo, fornecendo recomendações para a sua recuperação. O atleta deste estudo suportava, com prejuízos, elevadas cargas diárias de treinamento, tanto em volume quanto em intensidade, sem que se permitisse ao seu organismo a necessária recuperação. A conduta do atleta, tanto em relação às sessões de treino quanto aos hábitos de sua vida particular, apresentou-se como fator mais significativo para o processo de overtraining do que a quantidade de treinamento administrada. A observação de sinais relacionados com o síndrome de overtraining não deve ser utilizada como forma de prevenção, visto que o aparecimento desses sinais significa que o comprometimento fisiológico do atleta já está em um nível bastante avançado, sendo recomendada a utilização da metodologia de Monitoração Bioquímico-Hematológica do Condicionamento Físico como forma de prevenção e identificação objetiva do overtraining.

Palavras-chave: Judô, sobretreinamento, recuperação, monitoração.

INTRODUCTION

The body capacity to endure physical efforts is related to some devices of adaptation to the demands, which the body undergoes, from external and internal agents. For this reason, it is important to pay attention to the biological individuality in practice of the physical activity as once mentioned by the Greek philosopher Aristotle (384 – 322 a.C.) (KOOGAN; HOUAISS,1994). There are several publications, in which is mentioned how hard is to control the physical training intensity, as described in the Guidelines for Exercise Testing and Prescription of the American School of Sports Medicine (1995).

The search for the improvement of sports performance finds in the training some encouragement generators of the process of adaptation of the organism, aiming at perfecting its performance in the accomplishment of specific skills. However, the excess of stimuli leads to biomechanical adaptation and contains an over-demand of the system, with a momentum of damage (COCCHIARALE,2001; WEINECK,2000).

High competitiveness of some sports favor the establishment of an overload which, if it is not properly controlled, can easily lead to an excessive load, for it can evolve and set a situation of overtraining, more often found among professional athletes or participants of international competitions.

In combat sports as fights, the permanently physical contact is a factor which favors the development of injuries, and thus judo is no exception, for it possesses some characteristics which can easily make practicers achieve high levels of degradation of energetic reserves (FRANCHINI:2001). Therefore, the carelessness in regard to recovery can easily lead the judoka to status of fatigue, so much during the period of competition, as during the training sessions. If these individuals are not properly monitored, they will easily undergo overtraining (COSENDEY,1997).

Judo originated in Japan in 1882. It was designed by Jigoro Kano to be a method of moral and physical development which, at the same time, could bring out the culture and its people’s habits (RUAS,1998). This sport was introduced in Brazil about 1908 together with the Japanese immigration and became an official modality in the Olympic Games in 1964.

In this study, by means of the Physical Conditioning Biochemical and Hematological Monitoring Method, we could monitor an international level judoka, classified in the second place in the
Olympic selective trials, therefore, member as occasional substitute of the judo Brazilian team. Several physiological alterations were detected due to the organic incapacities of recovery from the applied training and, mainly, the enthusiasm which the athlete would dedicate to the physical work. The repose and adequate training sessions were changed in order to straighten up the possibly physiological alterations resulting from the physical activity excess. Mellerowicz & Meller (1979) had already drawn the attention to “the more intense the athlete’s social life (professional life, social conflicts, infections, and so on), the lesser the training hours.” In this sense, the perception of the alteration in the physical and mental state of the athlete should be seen as a warning for adaptation of a training program. With this, it might be avoided possible damage which could pose some risk to all the planning of high performance.

MBHCF® has been efficient for proving physiological deficiency resulting from excessive efforts in studies concerning with soccer athletes (COSENDEY et al.:2001a), Olympic athletes (COSENDEY et al.:2001b), and basketball athletes (COSENDEY et al.: 2001c). The use of MBHCF® allowed us to evidence the overtraining and recommend that the athlete and his technical team made use of some recovery procedures, and thus ecoming a new tool in the load control for the physical training sessions (COSENDEY:1997).

**MATERIALS AND METHODS**

In this study, a judoka of international level was examined by MBHCF during the preparation for 2000 Olympic Games in Sydney. This examination detected a process of overtraining (CALLISTER et al.:1990). During this study, the athlete was at 26, 179.5 cm, body mass of 80.8kg, ranked in the category middleweight (+73 to 81 kg) in judo, and fat percentual of 8.7% (according to the method of Drinkwater and Ross.1980). The evaluation of the body composition was conducted by the Brazilian Confederation of University Sports. on 2nd October of 2000.)

Data were collected through taped interviews with the athlete, the coach, the training instructor. The aim of the interviews was elicit some information from the athlete’s, training instructor’s and the coach’s viewpoints, from personal life style. repose, eating habits. before and after the appearance of the overtraining condition. The interview questionnaires were analysed and validated by a panel of experts (FERNANDES FILHO.2003) composed of three Ph.D. doctors from the University Castelo Branco of Rio de Janeiro, a master from Federal University of Rio de Janeiro who is also ranked seventh degree (dan) black belt and Brazilian team coach. and doctorating of the School of Physical Education and Sports - São Paulo University. also judo black belt.

The athlete’s biochemical and hematological exams were monitored. For it, it was used the mythology proposed by Cosendey (1997). together with strategies and training program adopted for his/her recovery.

MBHCF is a methodology which makes of use of more than 70 different blood analyses at present. where the interpretation of the results is assisted by diagnostic systems and artificial neural network (MOREIRA; COSENDEY,2002), produced from a database made during 19 years of research with high performance athletes and control groups, comprising approximately 637.000 biochemical and hematological analyses resulting from more than 15.650 case studies.

According to this methodology, every moment of biochemical and hematological monitoring comprises three stages:

1st. Initial appointment for the sample blood collection, anamnesis and objectives;

2nd. Making of the analysis for the biochemical and hematological variable with specific methodology and interpretation of results; and

3rd. Final appointment with a report containing the results and analyses of how they have been influencing the performance and, yet, some recommendations for the athlete and his/her technical team, based upon guidelines along the research for the creation of this method, statistically the greatest incidences of correction the physiological alterations found.

The sets of equipment used for the monitoring were (Figure 1): Cobas Mira plus, trademark Roche (Switzerland), for the biochemical analyses: ABX micros 60, trademark ABX (France), for the hematological analyses. The latter were confirmed by the observation of cells with a Nikon eclipse E200 microscope (Japan). For the sample collect, throw-away needles and two vaccutainer hemogard tubes for the blood collection were utilized, trademark Becton Dickenson (France), one without anticoagulant for the biochemical analyses, and another one with sodium salt of ethylenediaminetetraacetic (EDTA-Na) for the hematological analyses.

The blood collections were held in the morning after a recommended overnight fast with hybrid allowed ingestion.

The athlete was informed of the objective and research procedures, and signed a document of free consentment, as well as he authorized the publication of the results of the monitorings for

![Figure 1 - Equipment used in MBHCF](image)
RESULTS

During the year 2000 the athlete underwent five monitorings. The main physiological alterations presented in the Table 1. The identified alterations represent the interpretation of the relations between several biochemical and hematological analyses (between 45 and 70, according the case at issue), in conformity to the methodology developed by Cosendey (1997). It was not possible to mensurate in numbers.

The analysis of taped interview contents allowed us to view some behavioral aspects of the athlete that portray strong indicators for the profile of overtraining risk. The Chart 1 presents some snippets of the interview that characterize this profile.

Another interesting point to highlight, which can be taken into account in the recovery, was the paradigmatic change in athlete’s conception about his conduct during the training sessions. After scientific evidence, through the results of biochemical and hematological exams, of what it might happen to his organism, he changed the way of thinking and acting, beginning to worry about the nutritional reposition and hydration during the training sessions more, and seeking not to overload his organism any longer. The Chart 2 present some snippets of an interview that demonstrates this change.

DISCUSSION

The carelessness in the observation of how the athlete has been responding to the training demands and the lack of relation between the kind of imposed overload and the required time for his recovery can lead from a decrease in the sports performance, to a chronic fatigue, with physical and psychological manifestations of his physiological impairment, called overtraining. All those alterations were verified after the athlete’s weak performance in European Circuit, where the sportsman and coach realized that something was not going well in the competitions. As the results presented were insufficient for the athlete’s and applied training’s quality, new tools that assisted in the physical preparation were researched, hence the interest in MBHCF.

The first monitoring (recognition monitoring) suggest that the athlete should take complete rest from the training sessions for 30 days, with special attention to the food, hydration and the use of nutritional supplements. The recommendations aimed at reducing major muscular injuries, providing guidelines so that the protein food could improve and made some iron and factor replacement for absorption, for the method pointed mainly to the deficiency of folic acid, pyridoxine and vitamin C. The loss of iron can be related to poor diet in iron or lack of factors related to absorption, as the vitamins B6, B12, C and folic acid (CAMPBELL; FRISSE, 1985; DAVIDSOHN; HENRI, 1969, 1974; TIEZ, 1995). Minimum figures of iron can be found up to two days after intense physical exercises (GLESSON et al.:995). It is likely that the iron deficiency in the eritropoesis, as well as iron deficiency anemia, promotes the decrease of physical performance (KLEINER, 1998).

A new cycle of training was set with a small basic phase, and restarting the entire work aiming at the 2000 Olympic Games. Also indicated by MBHCF, the athlete’s return was held pausefully, and the training intensity was being gradually increased.

**Table 1 – the physiological alterations presented in this table represent the interpretation of the result of several biochemical and hematological analyses based upon the Cosendey’s proposal (1997)**

<table>
<thead>
<tr>
<th>physiological alterations presented</th>
<th>1 monit 27 jan</th>
<th>2* monit 14 mar</th>
<th>3* monit 05 mai</th>
<th>4* monit 28 jul</th>
<th>5* monit 02 ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscular cell injury</td>
<td>↑↑↑</td>
<td>Ok</td>
<td>↑↑</td>
<td>↑</td>
<td>NR</td>
</tr>
<tr>
<td>Bone stress</td>
<td>↑</td>
<td>Ok</td>
<td>↑</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Deficient hydration</td>
<td>↑↑</td>
<td>↑</td>
<td>↑</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Hepatocytes stress</td>
<td>↑↑</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Carbohydrate availability</td>
<td>↓</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Protein availability</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Lipid availability</td>
<td>↓</td>
<td>↑</td>
<td>Ok</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Increase in the nucleoprotein catabolism</td>
<td>↑↑</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Deficiency in the availability of nucleoproteins</td>
<td>↑</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Ideal oxygenation</td>
<td>↓</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Ideal iron</td>
<td>↓↓</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Hemolysis</td>
<td>↑</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Unbalance of calcium X phosphorus</td>
<td>↑</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Viral, bacterial and parasital infections</td>
<td>↑</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
<td>NR</td>
</tr>
<tr>
<td>Emotional stress</td>
<td>Ok</td>
<td>↑</td>
<td>Ok</td>
<td>Ok</td>
<td>Ok</td>
</tr>
<tr>
<td>Presence of alergical states</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
</tr>
</tbody>
</table>

Arrow downward (”) means that there is some deficiency of some factor or physiological alteration due to the decrease of elements or near the lowest limit.

Arrow upward (”) means that there is some alteration above the expected limits or organic excesses. The inscription Ok means that some alteration absence was observed, or the results are within the expected for the physical training.

NC – analysis not conducted.

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Fit Perf J, Rio de Janeiro, 2, 4, 202, Jul/Ago 2003
more properly. Galloway (1999) affirms that hydration is a key
performance, we could observe the figures of the conducted analyses
mainly in the red series, for they were hemoconcentrated. If kept
hydration correction might lower even more the figures found,
of perspiration comes from the plasma (EICHNER:1996). The
was attentive to hydration, for as great part of liquid lost by means
deficiencies was observed and was recommended that the athlete
was in a silly training, a silly handori. My foot got broken...

... for dozen times I lied to my coaches, (...) I would get out of Paulo’s training and go straight to Carlinhos to swim, and
would say that I hadn’t done any of them. You know, this way both of them would assign less training, for I would like them
to teach the best they could...

"... he wanted to train, the only thing he does is train, then we need to stop Flavio’s impulses. But the problem is that he
decieves everybody, he promises he will be quiet, (...) but he never rests, he wants to train, train and train."

He is a highly determined athlete; he is top notch for training. He hardly ever asks to stop, he always asks for more. He is
very much worried about evolving, and thus, he overtrains..."

| Difficulties in the training session control in function of the athlete |
|---------------------------|-----------------------------|
| Athlete                   | Coaches                     |
| "... he is an athlete that hardly ever is satisfied with the training done, then he is always asking for more, training more. You
determine that he should perform 10 repetitions and performs 20."
| "... and, still, the difference of going through a process under several coaches, training fields, during trips, different physical
preparation, during training on dojo, and the lack of homogeneity among trainers."
| "... so on Mondays I would train at university. On Thursdays I wouldn’t go where I didn’t know exactly. On Wednesdays, I
would then go to somewhere else, (...) each place I used to train the way they had been training there. (...) I had to do all of
them, I should never miss one, I could be exhausted, (...) but I had to train."

<table>
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<th>Lack of rest and inadequate food</th>
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| "It’s another thing that I have never had, (...) it’s as important as the training indeed. It’s when we rest, eat well, eat at the
right times, sleep at the same time, have a good daily sleeptime. I’ve never done this. I would always eat each day at diffe-
rent times..."
| "... he doesn’t have a regular time. Sometimes you think that he went to bed, but he is doing something else...

|isco..."
| "... I have just waken up now, you know, I had just lain down, had already left home for training. So, I was always tired and
full of shadows under the eyes..."

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| "... I was got to say ‘everything is psychological’, so, when I started to feel that... I am feeling ill, I’m not well, training ba-
dly..., it seemed that the more I trained, the less I produced.”
| "... I started to think that..., I think it’s time to stop, I’m not in mood for it , I’m not satisfied with what I’ve been going, (...) I
started to think to myself whether I was in the right place, whether it wasn’t the time to find another way..."
| "... during the training, I noticed that he, (...) for example, if he feel down to the ground, he would spend more time on it, he
didn’t have the agility to stand up and keep the training..."

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| "... I’ve started to believe that, sometimes, I would leave a training session without being tired, and would have trained well
indeed, but this didn’t mean that I wasn’t tired, that I hadn’t trained well...”

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| "... I’ve learned that if you really train less [...], you train much less, you are going to evolve much more than training a lot.
This was hard for me to understand..."
| "... I’ve started to sleep at the right time, eat more or less at the same time and be professional with myself, something that I
have never been before...”

In the second monitoring, a correction to the previously detected deficiencies was observed and was recommended that the athlete
was attentive to hydration, for as great part of liquid lost by means of perspiration comes from the plasma (EICHNER:1996). The
hydration correction might lower even more the figures found, mainly in the red series, for they were hemoconcentrated. If kept
so this good hydration, besides some improvement in the performance, we could observe the figures of the conducted analyses
more properly. Galloway (1999) affirms that hydration is a key factor which should be taken in account before, while and after
the exercises. It was also recommended that he proceeded with food and supplementation suggested, maintained the volume and
exercise intensity at the levels in which they were, for they were compatible with a considerable gain of performance, without
excess and causing injuries.

In the third monitoring, interruption of iron-based supplementation was recommended, once the indication of eating cooked red

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| "... my motto was: How can I become a champion and achieve what I want to? I must train two times more than everybody
does, I must train much more than the others.”

- Difficulty in the training session control because of training facilities
- High self-motivation and strong determination
- Appearance and/or injury increase
- Discouragement and loss of performance in the training sessions
- Lack of rest and inadequate food
- Practice and/permission increase

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| Athlete                   | Coaches                     |
| "... and, still, the difference of going through a process under several coaches, training fields, during trips, different physical
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| "Some contusions and the first signs of acute fatigue started to appear during the training sessions and competitions, espe-
ially in a trip to Europe.”
| "... I suffered a severe contusion in the ankle, I tore the retinaculum that holds the short and long fibular in the ankle. (...) It
was in a silly training, a silly handori. My foot got broken...”

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the exercises. It was also recommended that he proceeded with food and supplementation suggested, maintained the volume and
exercise intensity at the levels in which they were, for they were compatible with a considerable gain of performance, without
excess and causing injuries.

In the third monitoring, interruption of iron-based supplementation was recommended, once the indication of eating cooked red

meat and supplements worked. The excess of iron might inhibit the zinc absorption and, in some particular cases, they might begin to increase the risk of cancer, cerebral vascular aneurysm and coronary disease (MATSUDO, 2001). Besides the possibility of occurring acquired hemosiderosis, there might also be the possibility of hepatic injury (HENRY, 1995). It was also advised that food and hydration was maintained, for they presented positive results; and that the volume and/or training intensity was reduced, once they proved to be excessive. It was also recommended more attention to the increase of repose between the periods of training sessions and competitions, therefore, due to enthusiasm about training more, the athlete was “stealing” some repose that he should have for cellular organelle restructuring, unstructured by the intense stress of training sessions.

In the fourth monitoring, the athlete showed some signs of improvement in the hydration. This was the first time that he maintained the hydration level within the ideal figure for her situation. He presented normalization in the carbohydrates, in the lipicid part, and in the nucleoprotein catabolism. However, he still showed an injury on the muscular tissue, according to the figures of blood dosage of muscular enzymes, despite being smaller than the last exam, maintaining still the level of muscular activity with excessive stress. We verified that the applied training had been causing these muscular injuries, possibly for excess in the load and volume of exercises which were considered stressing, and prolonged with sufficient time for cellular recovery. The absence of bone stress was observed and, yet, the inexistence of hepatic injury. He did not present any alteration in the balance calcium/phosphorus; however, there was a considerable decrease in iron concentration. The analyses of the red series portrayed very low indices and compatible with the beginning of anemia. This fact indicated the possibility of having occurred some carelessness in the food, between the third and fourth monitoring, causing a lack which added up with the withdrawal of iron replacement. Another possibility was that of the athlete not having been attentive enough in relation to the repose, maintaining a strong training, what proved to be evidenced by the high concentrations of muscular enzymes analysed, compatible with cellular muscular injury. The leucocytes also showed a decrease in number and compatible cellular aspect with muscular stress detected.

The recommendations in function of this report were made so that the athlete maintained hydration, ingestion of carbohydrates and, mainly, cooked red meat, besides returning to the administration of iron-based medicine, folic acid and pyridoxine to avoid the anemic condition that was beginning. It was advised that he was especially attentive to obeying the coach’s determinations, such as the repose, for the athlete used to “steal” it, doing other activities like going nightclubbing and surfing during the schedule for repose. This discipline in relation to the repose made him not recover thoroughly from cellular injury, what might produce a loss of performance.

In the last monitoring in August, a partial study was conducted consisting only of a hematological investigation which showed some signs of improvement of the results of the erythrocytary study. The leucocitary study also showed having occurred a great decrease of physical and emotional stress, demonstrated mainly by the normalization of leucocitary condition, as in number as in cellular aspects, what was confirmed during the interview.

GENERAL CONSIDERATIONS

The study demonstrated that the athlete had been enduring harmfully high daily loads of training, as in volume as in intensity, without allowing his organism necessary recover, indispensable for the reorganization of his cellular structures, what led him to a negative overload, consequently to overtraining (COCCHIARALE, 2001).

One of the stressing factors for the athlete was the needs of controlling body mass, once he himself found in the superior limit of the rank of his category of weight (middleweight: +73 to 81kg), and the next band – average weight – comprised athlete from +81 to 91kg, what might cause a body disadvantage. The need to maintain the weight low probably was the main problem, for the nutritional deficiencies occasioned by a diet favored a deficit of nutrients which contributed for the bad recovery, triggering the appearance of injuries and, consequently, the loss of performance.

The athlete used to do judo since he was 13 years old and, besides, he had always been involved in other physical activities on the side, such as swimming and surfing. This fact made this repose difficult, for he was not accustomed to being idle. However, after the scientific evidence provided by the results of the monitorings, he had changed his way of thinking and acting, beginning to worry about the nutritional reposition and hydration during the training sessions more, and seeking not to overload his organism any longer, as reported during the interview.

Possibly, his conduct, in relation to the training sessions and personal life habits, was a key factor to the process of beginning of the overtraining, once as the administered overtraining quantity as the lack of repose lived up to his expectations.

This study also pointed out that just a signal observation related to the syndrome of overtraining cannot be utilized as the only way of prevention or still as precise way of warning, inasmuch the appearance of these signals take place when an athlete physiological impairment is already occurring and that, probably, this might be in a very advanced state.

It is recommended that the use of the Physical Conditioning Biochemical and Hematological Monitoring Method, as one of the indicated patterns of behavior to prevent the installation of excessive load and to avoid that the athlete does not reach the state of overtraining. It made clear that, only from the analysis of the physiological answers of organism to the stress of the training, the beginning of cellular injuries was identified, what made it possible the optimization of loads of work, providing greater gains in the training, without committing excesses, and giving guidelines in regard with the athlete’s recovery and the balance of the functions of his organs and systems.
REFERENCES


