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The perception of tiredness in decathletes, in different stages of the training macrocycle

La percepción de cansancio en decatlonistas, en diferentes etapas del macrociclo de entrenamiento

A percepção da fadiga em decatletas, em diferentes fases do macrociclo de treinamento

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ABSTRACT

The control of the behavior of the perception of tiredness throughout the training macrocycle in decathletes constitutes an indicator for the assessment of the process of psychophysical assimilation of the work carried out according to the stage of the training macrocycle through which the athlete goes. However, insufficient knowledge on the subject in the decathlon has limited the use of this indicator in the psychological control of preparation in this sport. The objective of this work is to determine the behavior of the perception of tiredness in the different stages of the training macrocycle, in tiredness of the Cuban national athletics team. It is a descriptive study, in which the interview is applied for an initial diagnosis and the Borg Scale (modified) to measure the perception of tiredness.



416 measurements of the perception of tiredness were carried out during the stages of general, special and competitive physical preparation. As the main results, the perception of tiredness increased in the general physical preparation stage by a magnitude of 3.48, in the special stage by 3.43 and in the competitive stage by 2.56. The perception of tiredness in the decathletes studied increased significantly after the training loads in each of the stages studied and decreased as the training macrocycle progressed. The competitive stage turned out to be the one with the least perceived pre- and post-load tiredness, and the general physical preparation stage was the one with the greatest increase in this process.

Keywords: high performance, decathlon, training stages, macrocycle, perception of tiredness

RESUMEN

El control del comportamiento de la percepción de cansancio a lo largo del macrociclo de entrenamiento en decatlonistas constituye un indicador para la valoración del proceso de asimilación psicofísica del trabajo realizado acorde a la etapa del macrociclo de entrenamiento por la que transita el atleta. Sin embargo, el insuficiente conocimiento sobre el tema en el decatlon ha limitado el uso de este indicador en el control psicológico de la preparación en este deporte. El objetivo de este trabajo consiste en determinar el comportamiento de la percepción de cansancio en las diferentes etapas del macrociclo de entrenamiento, en decatlonistas de la selección nacional de atletismo de Cuba. Es un estudio descriptivo, en el que se aplica la entrevista para un diagnóstico inicial y la Escala de Borg (modificada), para la medición de la percepción de cansancio. Fueron realizadas 416 mediciones de la percepción de cansancio, durante las etapas de preparación física, general, especial y competitiva. Como principales resultados, la percepción de cansancio aumentó en la etapa de preparación física general en una magnitud de 3.48, en la etapa especial en un 3.43 y en la competitiva en un 2.56. La percepción de cansancio en los decatlonistas estudiados aumentó, significativamente, posterior a las cargas de entrenamiento en cada una de las etapas estudiadas y disminuyó, a medida que avanzó el macrociclo de



entrenamiento. La etapa competitiva resultó ser aquella de menor cansancio percibido pre y poscarga, y la de preparación física general, la de mayor aumento en este proceso.

Palabras clave: alto rendimiento, decatlon, etapas del entrenamiento, macrociclo, percepción de cansancio.

RESUMO

O controle do comportamento da percepção da fadiga ao longo do macrociclo de treinamento em decatletas constitui um indicador para avaliação do processo de assimilação psicofísica do trabalho realizado de acordo com a etapa do macrociclo de treinamento pela qual o atleta passa. Contudo, o conhecimento insuficiente sobre o tema no decatlo tem limitado a utilização deste indicador no controle psicológico da preparação neste esporte. O objetivo deste trabalho é determinar o comportamento da percepção da fadiga nas diferentes etapas do macrociclo de treinamento, em decatlonistas da seleção cubana de atletismo. Trata-se de um estudo descritivo, no qual é aplicada a entrevista para diagnóstico inicial e a Escala de Borg (modificada) para mensurar a percepção de fadiga. Foram realizadas 416 medidas de percepção de fadiga durante as etapas de preparação física, geral, especial e competitiva. Como principais resultados, a percepção de fadiga aumentou na etapa de preparação física geral em uma magnitude de 3,48, na etapa especial em 3,43 e na etapa competitiva em 2,56. A percepção de fadiga no decatleta estudado aumentou significativamente após as cargas de treinamento em cada uma das etapas estudadas e diminuiu à medida que o macrociclo de treinamento avançava. A etapa competitiva acabou sendo a que apresentou menor fadiga percebida pré e pós-carga, e a etapa de preparação física geral, a que apresentou maior aumento nesse processo.

Palavras-chave: alto rendimento, decatlo, etapas de treinamento, macrociclo, percepção de fadiga.



INTRODUCTION

The measurement of tiredness perceived by the athlete before and after receiving the planned training loads has become a useful procedure within the control of sports preparation, to assess the progress of the process of assimilation and adaptation to the loads (Chen *et al.*, 2022; Hamlin *et al.*, 2019; Suárez and Martínez, 2014) essentially, within the psychological control of sports training.

The subjective experience of tiredness that the athlete experiences before receiving the training load is a measure of how recovered he or she may feel before starting work. The level of recovery with which the athlete faces the load is decisive for better assimilation of the work to be done (Mukhopadhyay, 2021; Rezzonico, 2022). Meanwhile, the post-load behavior of the perception of tiredness indicates the effect that the load received has had on the central nervous system, based on the behavior of a subjective indicator.

Knowledge of the behavior of this response in each of the stages of the macrocycle allows to interpret the progress of the adaptation process to training loads, according to the moment of preparation that the athlete is going through (Suárez *et al.*, 2017). This knowledge is necessary to provide guidance to the coach and the athlete, with the aim of optimizing performance and promoting the athlete's state of health.

Previous research on high-performance Cuban judo athletes has confirmed that this perception can have a different behavior at each stage of training (Suárez *et al.*, 2017). However, it is necessary to verify whether this result is transferable to other sports and particularly to the decathlon, a modality of combined athletics events that includes 10 events (four races, three throws and three jumps) and which has been classified as a modality of extreme exhaustion (Sifuentes, 2021) that requires high psychophysiological demands from its practitioners (Montoya, 2023). The insufficient knowledge on the subject in the decathlon has limited the use of this indicator in the psychological control of training in this sport.



Based on this, the objective of the work presented is to determine the behavior of the perception of tiredness in the different stages of the training macrocycle, in decathletes of the Cuban national athletics team.

MATERIALS AND METHODS

To fulfill the objective, a descriptive study was carried out. It began by requesting informed consent from the athletes and the coach, to carry out the research, consisting of explaining to them the importance of the study and the procedure to be used, seeking commitment to the task and with the principles of bioethics.

After obtaining said consent, a diagnostic interview was applied to the athletes with the objective of evaluating their physical and mental health status, as well as their experience in working with self-assessment scales; these variables can bias the results of the study.

The criterion was to exclude those athletes who presented chronic tiredness syndrome and other physical illnesses or situational disorders, related to the emotional state of the athlete that, when manifested, can bias the results of the values of the perception of tiredness. Therefore, for the inclusion of athletes in the sample, the presence of a state of physical and mental health was considered.

The response of the perception of tiredness, measured through a scale, as is the case of this study, requires a subject with a state of physical and mental health that allows him/her to give a response of a subjective nature and of an integrative nature of several sensations.

For the aforementioned purpose, the individual and semi-structured interview was used. A guide was developed consisting of 11 semi-open questions, which explored the following indicators: personal and family pathological history, current physical and mental health status, recent illnesses, toxic habits, readiness for training, quality of sleep, presence of conflict and experience regarding work with self-assessment scales. General data, chronological age and sports age, were also recorded.



Subsequently, the instrument for measuring the perception of tiredness was applied. For this, the Borg Scale (modified) was used at the empirical level. It is an instrument that measures the perception of tiredness, ascending, on a discrete 11-point scale, where zero means the non-existence of this state and ten means the greatest tiredness that can be perceived. This scale was applied before and after receiving the planned training loads throughout the preparatory and competitive period.

To carry out the measurements, a series of conditions were taken into account, which determined their inclusion or exclusion, and which are explained below.

- Schedule of measurements. It constitutes a physical environmental variable; whose control becomes relevant in the context of sporting activity. Criteria such as the influence they can have on the response to certain stimuli, the changes that occur in the organic behavior of the individual with the passing of the day founded the requirement for this condition. Only those measurements that were carried out in the morning session were then established as inclusion criteria; those carried out at other times were excluded.
- Location of measurements. It is also a physical environmental variable; whose control becomes relevant in the context of sporting activity. Criteria such as the influence they can have on the response to certain stimuli and the environmental conditions of the physical space were the basis for the requirement of this condition. It was then established, as an inclusion criterion, to consider only those measurements that were carried out in the training area, excluding those carried out in other physical spaces.
- Physical load prior to taking the measurement. Control of the previous physical load allows to infer with a greater degree of reliability the influence of the type of work performed on the athlete's body and minimize the influence of other external loads. The inclusion criteria were then established as only those measurements from athletes in whom the condition of absence of intense physical exercise prior to the preload measurement was met. Measurements from those who performed intense



physical exercise prior to this measurement were excluded, which implied failure to comply with the following routine.

Once they got up in the morning, they only had to carry out personal hygiene activities, transfer to the breakfast place and to the training area, spaces that were close, so that the minimum of activity and/or possible mobility before the first measurement could be guaranteed; in any other case the measurement was excluded.

- The state of physical and mental health of the athletes prior to performing the preload measurement. As an inclusion criterion, the acceptance of only those measurements from athletes who did not present alterations in the indicators of physical and mental health status before the preload measurement was established.

To this end, it was planned that, before carrying out the preload measurements, an exploration of the physical and mental health status of the athletes would be carried out, through a process of communicative interaction, consisting of a brief conversation or individual questioning, in an informal, with the coach and the athletes in a quick and dynamic way, in which the indicators were explored: quality of sleep, willingness to train, symptoms of physical or mental illness or of some worry and previous burden.

The existence of alterations in these indicators (alterations or disorders in sleep, unwillingness to train, unfavorable mood, presence of a physical or mental illness or some other situation that affects their mood, performance of intense physical activity prior to measurement) determined exclusion from measurement.

By requiring this condition, the biases that may be generated in the results are minimized and the permanence and stability of the state of physical and mental health required to be part of the sample is guaranteed. With this procedure, the influence of the maturation factor is also minimized, consisting of the physical, physiological or psychological changes that the research subjects may suffer over the time of the study, as a result of their own biological, psychological and social development.



- Compliance with the work with the required intensity. The control of the intensity of the work performed provides greater certainty to reach conclusions in relation to the estimation of the influence that those offered by the planned sports workload stimuli on the central nervous system. The intensity was controlled in each training session, after finishing what was indicated, the heart rate data, performed by the athletes themselves, according to the coach's guidance, were taken as a reference, which must be within the established parameters, according to the planning of his/her exercise.

Therefore, those measurements from athletes who did not complete the work performed with the required intensity were excluded. The responsibility for taking the heart rate was given to the athletes, based on their experience in this task and the high level of commitment to it.

Finally, the sample was made up of a total of 416 measurements of the perception of tiredness, 208 before and 208 after receiving the planned training loads, during the three stages that make up the training macrocycle, according to the plan discussed and approved by the Technical Management of High Performance of the National Athletics Commission.

These stages were: the general physical preparation stage, in which 208 measurements were made (104 before and 104 after receiving the training load), the special preparation stage, in which 144 measurements were made (72 before and 72 after receiving the training load), corresponding both to the preparatory period and the competitive stage, belonging to the competitive period, in which 64 measurements were carried out (32 before and 32 after receiving the training load).

The measurements were carried out on 4 decathlon athletes from the Cuban national athletics team, who constituted all the members of said team at the time the study was carried out, with a chronological age range between 16 and 31 years old, for an average of 21 years and a range of experience in the practice of this sport between 9 and 15 years for an average of 11 years of sporting experience.



The measurements made were subjected to statistical processing. For the statistical analysis of the data, an Excel file was built with all the values of the pre- and post-load measurements of the perception of tiredness, in each of the stages investigated. SPSS Software for Windows (version 20.0) was used to process the information.

The analysis of the results started from the calculation of the average, a descriptive measure of position that allowed to determine the value around which the values oscillated, pre- and post-load of the perception of tiredness, in each of the stages and periods in general.

It is valid to point out that the applied load consisted of the provision in the training session of different sports work stimuli to the athlete. These stimuli were planned, organized and distributed in a training plan that responds to the periodization model of Matveev (2001), with volumes and intensities that varied, based on the management of the number of executions, work time, mean used, work time pause and in accordance with the objectives of the stage in question, as planned, discussed and approved in the training plan of the national decathlon team by the High Performance Technical Directorate of the National Athletics Commission of Cuba.

The calculation of the difference in means of the values of the pre- and post-load measurements in each of the stages and periods in general was also used, this made it possible to perform an interpretation of the behavior of the variable studied, after the sports workload applied, in relation to the magnitude of its values.

The ranges in which they moved, the minimum and maximum pre- and post-load values in each stage and periods in general were also estimated, to interpret their variability.

RESULTS AND DISCUSSION

The results of the interview carried out at the initial diagnosis show that the athletes do not report pathological, personal, family history or alterations in their current physical and mental health status; they do not report recent illnesses or toxic habits; they express high



levels of readiness for training; there are no alterations in the quality of sleep or presence of conflict areas that imply emotional disturbance. They all agree on having experience in working with self-rating scales. Therefore, all the athletes are physically and mentally healthy to be part of the study.

In relation to the behavior of the perception of tiredness, Table 1 shows the average values reached by the perception of tiredness scale before and after the load, in each of the stages studied and the difference; as well as the level of significance of the variation obtained between before and after Table 1 (**Table 1.**)

Table 1. - Results of the Student T Test for the behavior of the perception of tiredness in each stage of the training macrocycle in decathlete athletes of the Cuban national athletics team

Stages	Measurements			Means		Mean difference	Significance level
	Before	After	Total	Before	After		
General physical preparation	104	104	208	2.29	5.77	3.48	,000
Special preparation	72	72	144	3.34	6.77	3.43	,000
Competitive	32	32	64	0.78	3.34	2.56	,000
Total	208	208	416	2.42	5.75	3.33	,000

Table 2 (**Table 2.**) shows the range of minimum and maximum values between which the perception of tiredness is shown before starting the load and after receiving it, in each of the stages investigated.

Table 2. - Results of the behavior of the range of the minimum and maximum values, of the perception of tiredness before and after the load, in each stage of the training macrocycle in decathlete athletes of the Cuban national athletics team

Stages	Preload measurements			Post-load measurements		
	Minimum Value	Maximum value	Difference	Minimum value	Maximum value	Difference
General physical preparation	0	6	6	3	8	5
Special preparation	1	4	3	4	9	1
Competitive	0	2	2	3	4	1
Range	0	6	6	3	9	6



The results by period, where the preparatory period is compared with the competitive period (Table 3), show that:

Table 3. - Results of the Student T Test for the behavior of the perception of tiredness in each period of the training macrocycle in decathlete athletes of the Cuban national athletics team

Periods	Measurements			Means		Mean difference	Significance level
	Before	After	Total	Before	After		
Preparatory	176	176	352	2.72	6.18	3.46	,000
Competitive	32	32	64	0.78	3.34	2.56	,000

Table 4 shows the results obtained in relation to the behavior of the range of the minimum and maximum values between which the perception of tiredness is shown before starting the load and after receiving it, according to each period (Table 4).

Table 4. - Results of the behavior of the range of the minimum and maximum values, of the perception of tiredness before and after the load in each period of the training macrocycle in decathlete athletes of the Cuban national athletics team

Periods	Preload measurements			Post-load measurements		
	Worth Minimum	Worth Maximum	Difference	Minimum value	Maximum value	Difference
Preparatory	0	6	6	3	9	6
Competitive	0	2	2	3	4	1
Range	0	6	6	3	9	6

The analysis of the results presented in Table 1 allows to corroborate that the perception of tiredness increases in all stages after receiving the training loads. An increase that is significant, reaching a probability value lower than the adopted α value of .05. These reasons allow to reject the null hypothesis and propose that the increase in the experience of tiredness that occurred in each stage was due to the training loads and not to fortuitous or random causes.

The application of the student's T test for related samples makes it possible to determine whether the mean differences were significant or not. The significance of the numerical differences of the mean, pre and post load, are determined through a statistical hypothesis



test. This corroborates that the difference in the means recorded, based on the behavior of the variable studied before and after the applied training load, is due to the incidence of the load and not to the existence of fortuitous behavior or chance.

It is started from a null hypothesis (H_0), that is, that the average of the differences before and after the application of the training load received is equal to zero. This hypothesis is rejected when the p value is less than the significance level $\alpha = .05$, and it is then said that the differences in the mean are due to the effect of the loads executed, and not to chance.

Although it is difficult to associate the perception of tiredness with the variable training load, purely and individually, and, as some authors suggest, it is necessary to take into account that this experience also depends on other personological and emotional factors (Falces *et al.*, 2020), of the different nature of the load stimuli or the individual nature of the psychological response to training loads (Suárez and Martínez, 2014); the present research allows to make a significant statistical inference that gives the applied training load an important participation in the generation of this response.

These results find confirmation in criteria such as that of García (2001) who considers that, frequently, the tendency to explain various emotional responses in the athlete is sought in other phenomena or circumstances and not in the load executed, when in reality these manifestations can be directly associated with it.

Table 1 also shows that the increase in the perception of post-load tiredness decreases as the training macrocycle progresses. The greatest increase is found in the general physical preparation stage and the smallest in the competitive one.

These results are consistent with the objectives declared for each of these stages in the training plans of the athletes studied. The objective of the general physical preparation stage is to contribute to the development of aerobic endurance, strength and technique, to create the bases for assimilation of loads.

For its part, the special preparation stage is aimed at improving coordination in the rhythm of the impulse race for the high jump, long jump and pole vault, as well as in the javelin



throw. While the objective of the competition is to maintain the levels of preparation and achieve the planned result, as stated in the training plans discussed and approved by the High-Performance Technical Directorate of the National Athletics Commission of Cuba, for the decathletes studied.

So, in the general physical preparation stage, in which the greatest increase in the perception of tiredness was obtained, the decathletes studied received the greatest volumes of physical load to meet the planned objective.

However, when the average values of pre- and post-load tiredness perception are observed, reflected in Table 1, the highest values are found in the special preparation stage. It is at this stage where decathletes report Borg Scale values that indicate that the work carried out begins and ends with a greater experience of tiredness. The above may be the result of the effect caused, on a mental level, by the repeated and systematic provision of training loads from the beginning of preparation.

Although this phenomenon can also be explained in the findings of Suárez *et al.* (2017) who, in a study carried out on judo athletes from the Cuban national team, showed that the pre- and post-load values of the perception of tiredness have a significant relationship; that is, what preload changes can bring about postload changes. Therefore, the existence of higher afterload values corresponds to a similar behavior in the preload values, as happens in the case of the special preparation stage in this study. This constitutes an inference, as this research did not set out among its objectives to determine the correlation between pre- and post-load values.

Similar results to those presented so far are those carried out in high-performance Cuban judo athletes (Suárez and Martínez, 2014; Suárez *et al.*, 2017) with the difference that higher pre- and afterload values are achieved than those obtained in this study, except in the special preparation stage in which decathletes report higher magnitude afterload values. This strengthens the idea of the importance of characterizing the behavior of this variable for each particular sport, and is based on the assumption of the different psychophysiological demands that each sporting modality demands of the athlete.



It is important to highlight that in the special preparation stage in the decathlon, the variety of means used to meet its objective can raise the perception of the level of complexity of the task and influence, in turn, the experience of tiredness experienced.

It is striking that the pre- and afterload values in a modality such as the decathlon, in which energy expenditure is high, are lower compared to those obtained in studies with high-performance judo athletes. However, it may be asked whether this difference is significant or not, and constitute a future line of research or the possible influence of personological factors on the behavior of this subjective variable, as recognized by Montoya *et al.* (2021) in a study carried out on a heptathlete from the Cuban national athletics team.

The truth is that the causes of this response are conceived differently by various authors. Some of them have considered that the response of perceived tiredness depends on sensory, somatic, emotional factors, personality characteristics, moods, the social context in which the measurement occurs, experiences of tiredness, level of pain tolerance, level of physical and psychological preparation, among others, integrated in a kind of Gestalt concept configuration (Suárez and Martínez, 2014). While other studies (Suárez and Martínez, 2014; Suárez *et al.*, 2017) and the one presented confirm the influence of load.

There is no doubt that the perception of tiredness is a highly complex response. Hence, the continuity of its study in various sports disciplines and in relation to multiple variables is recommended (Suárez *et al.*, 2017).

When analyzing Table 2, it is found that as the preparation stages progress, the pre- and post-load values have less variability. The range of difference between the minimum and maximum values is smaller, which indicates that as the training macrocycle progresses, the perception of tiredness is experienced in a more uniform and homogeneous way by the athletes studied.

The analysis by period reflected in table 3 indicates a behavior similar to that observed in each stage. There was a significant increase following the training load provided in both the preparatory and competitive periods. It turns out to be greater in the first of these periods.



That is, in the competitive period, the athletes studied perceive less tiredness, a condition that favors their sports performance.

The results of the behavior of the range of the minimum and maximum values (table 4) and the perception of tiredness before and after the load in each period of the training macrocycle are similar to those found in each stage. As the macrocycle periods progress, the pre- and afterload values have less variability. The difference range between the minimum and maximum values turns out to be smaller in the competitive period.

So, in afterload the athlete perceives greater tiredness in each stage and periods in general; however, perceptions of the highest level of post-load tiredness were never obtained in the sample studied, despite being a modality that demands high demands on the psychophysiology of the organism (Montoya, 2023). Phenomenon associated with the training and work assimilation capacity developed by athletes who have years of sporting experience in this event. As well as by the characteristics of the event itself that requires the development of multiple skills and abilities.

In summary, the perception of tiredness increases significantly after the work carried out in each of the stages and periods studied, a higher score of perceived tiredness after the load is shown as a trend. Suárez *et al.* (2017) report that this demonstrates the toning effect of loads on the central nervous system and the dependency relationship that exists between this variable and the load executed.

A decrease in the increase in the perception of tiredness is also corroborated as the sports training macrocycle progresses. The competitive stage turns out to be the one in which the decathletes studied indicate less perception of pre- and post-load tiredness; while, in the general physical preparation stage, the greatest increase in this experience occurs.

The present research shows results in relation to the effect that the training load causes on the psychological response of tiredness in the different stages and periods of the training macrocycle in athletes who practice the decathlon, in its subjective expression, called without distinction by different authors perception of tiredness, fatigue, perceived effort or



subjective perception of effort (Martínez and Martín, 2021; Martínez and Suárez, 2015). Which provides a tool to interpret the process of assimilation and adaptation to the load and to provide feedback to the coach and the athlete.

However, carrying out longitudinal studies that allow the analysis of the behavior of the perception of tiredness throughout the microcycles and mesocycles that make up the different stages and periods of the training macrocycle is recommended as a future line of research that allows reaching conclusions with a greater degree of specificity, in relation to the dynamics produced in response to the management of the variables volume, intensity and means that characterizes the planning and distribution of training loads in the decathlon.

Likewise, it must be clear that the behavioral measure of the perception of tiredness is not the level of central tiredness experienced by the athlete, studied based on objective indicators such as the level of cortical activation (Clemente and Díaz, 2019; López, 2022; Montoya and López, 2021; the perception of tiredness may or may not correspond to this fatigue; some longitudinal studies on high-performance Cuban judo athletes show that they may have different behavior (Suárez *et al.*, 2017).

Self-assessment scales used offer a measure of the subject's personal self-assessment in the face of a certain demand (be it perceived effort, perceived tiredness, etc.), but not the measurement of fatigue. You can have, based on a certain self-assessment, an approximation of the magnitude of the process, but you must be careful when generalizing it (Martínez and Suárez, 2015).

Hence, scholars of the subject recommend combining subjective and objective methods to obtain a more comprehensive view of the psychological response to tiredness (Rodríguez *et al.*, 2022; Suárez and Rielo, 2019). However, the diagnosis of the perception of tiredness experienced by the athlete is still important to be taken into account during the psychological control of training, as it constitutes an integrative response (Suárez and Martínez, 2014).



CONCLUSIONS

The perception of tiredness in the decathletes of the Cuban national team increased significantly after the training loads in each of the stages studied, this demonstrated the toning effect of the loads on the central nervous system and the dependency relationship that exists between this variable and the executed load.

The increase in the perception of tiredness decreased as the sports training macrocycle progressed. The competitive stage turned out to be the one in which the decathletes studied reported the least perception of pre- and post-load tiredness; while, in the general physical preparation stage, the greatest increase in this experience occurred. Behavior that is in correspondence with the characteristics of sports training planning, so the decrease in the increase in the perception of post-load tiredness constitutes a reflection of the adaptations that the central nervous system develops on the way to obtaining sports fitness.

REFERENCES

- Chen, Y.S., Clemente, F.M., Pagaduan, J.C., Crowley-McHattan, S.J., Lu, Y.X., Chien, C.H., Bezerrea, P., Chiu, Y.W., y Kuo, C.D. (2022). Relationships between perceived measures of internal load and wellness status during overseas futsal training camps. *PloSOne*, 17 (4). <https://doi.org/10.1371/JOURNAL.PONE.0267227>
- Clemente, V. J. y Díaz, M. (2019). Evaluación de la fatiga central por el umbral crítico de fusión de parpadeo en ciclistas. *Redicuc. Repositorio Universidad de La Costa*. Colombia. <https://doi.org/10.1007/s10916-019-1170-03#>
- Falces-Prieto, M., Canyelles-Niño, H, Rodicio-Palma, J. y González-Fernández, F. (2020). Estado emocional en jugadores jóvenes de fútbol tras varios partidos consecutivos. *RICCAFD*, 9(3), 102-115. <https://doi:10.24310/riccafd.2020.v9i3.972>
- García, F. (2001). Las emociones como consecuencia de las cargas de entrenamiento. *Rev. Digital. de Educación Física y Deportes*, Buenos Aires, 7(41). <http://www.efdeportes.com/efd41/emocion1.htm>



- Hamlin, M.J., Wilkes, D., Elliot, C.A., Lizamore, C. A., y Kathiravel, Y. (2019). Monitoring training loads and perceived stress in young elite university athletes. *Frontiers in Physiology*, 10 (JAN). <https://doi.org/10.3389/FPHYS.2019.00034>
- López, L. (2022). Comportamiento de la frecuencia crítica de fusión ocular en atletas de carrera de la preselección nacional de atletismo. *Podium*, 17(2). http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1996-24522022000100149&lng=es&tlng=es
- Martínez, F. I., y Martín, A. (2021). La percepción subjetiva del esfuerzo como herramienta de monitorización en fútbol profesional. *Revista Iberoamericana de la Actividad Física y el deporte*, 10 (1). <https://doi:10.24310/riccafd.2021.v10i1.11164>
- Martínez, J. A., y Suárez, M. C. (2015). Algunas consideraciones sobre la fatiga en el deporte. En *Psicología, Actividad Física y Deporte. Investigaciones Aplicadas*. Depósito legal: Ifx04320157961760.
- Matveev, L. (2001). Teoría general del entrenamiento deportivo. Paidotribo. <https://altorendimiento.com/teoria-general-del-entrenamiento-deportivo/>
- Montoya, C. (2023). Predisposición psicológica de heptatletas y decatletas cubanos, evidencias de su asociación con el rendimiento competitivo. *PODIUM. Revista de Ciencia y Tecnología en la Cultura Física*, 18(1). http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1996-24522023000100002&lng=es&tlng=es&tlng=es
- Montoya, C., Arzola, G., y Deschappelle, I. (2021). Intervención psicológica para favorecer rendimiento en tareas de potencia aeróbica de una heptatleta. *Rev. Cub. Med. Dep. & Cul. Fís.*, 16(3). <https://revmedep.sld.cu/index.php/medep/article/view/510>



Montoya, C. A. y López, L. (2021). Métodos para el control psicológico en altitud: frecuencia crítica de fusión ocular y perfil de polaridad. *Deporvida*, 18(47).
<https://deporvida.uho.edu.cu/index.php/deporvida/article/view/653>

Mukhopadhyay, K. (2021). Physiological basis of adaptation through super-compensation for better sporting result. *Advances in Health and Exercise*, 1 (2), 30-42.
<https://www.turkishkinesiology.com/index.php/ahe/article/view/13>

Rezzonico, G. (2022). Monitoreo de la fatiga: un estudio de caso en boxeo profesional femenino. *MLS Sport Research*, 2 (2), 36-53. <https://doi:10.54716/mlssr.v2i2.1688>

Rodríguez, A. D., Suárez, M de la C., y Mesa, M. (2022). Relación entre la activación cortical y los estados de ánimo en judocas de alto rendimiento. *PODIUM. Revista de Ciencia y Tecnología en la Cultura Física*, 17(2).
http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1996-24522022000200672&lng=es&tlng=es&tlng=es

Suárez, M de la C., y Martínez, J.A. (2014). Comportamiento de la percepción subjetiva de cansancio en las diferentes etapas del período preparatorio en judocas. *Rev. Cub. Med. Dep. & Cul. Fís.*, 9 (2).
<http://www.revmedep.sld.cu/index.php/medep/article/view/174>

Suárez, M. C., Martínez, J. A., y Mesa, M. (2017). Comportamiento de la fatiga central durante los mesosistemas de la preparación en judocas. *Rev. Cub. Med. Dep. & Cul. Fís.*, 12(3). <http://www.revmedep.sld.cu/index.php/medep/article/view/98>

Suárez, M.C y Rielo, B. (2019). Valoración de la respuesta psicológica de la fatiga central en judocas de alto rendimiento. *Rev. Cub. Med. Dep. & Cul. Fís.*, 14 (2).
<http://www.revmedep.sld.cu/index.php/medep/article/view/34>

Suárez, S. (2020). Comportamiento de la activación cortical en los deportistas de gimnasia artística. *Acción*, 16. https://redib.org/Record/oai_articulo3735738-comportamiento-de-la-activaci%C3%B3n-cortical-en-los-deportistas-de-gimnasia-art%C3%ADstica



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The author declares that there are no conflicts of interest.

Author's contribution:

The author is responsible for writing the work and analyzing the documents.



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