Variations of the thermoregulation and the working capacity for athletes during the fasting month of Ramadan	
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Résumé

Notre étude a eu pour objectif d'étudier chez un groupe d'athlètes l'influence du jeûne de Ramadan sur la performance physique et l'équilibre de la thermorégulation.

Dans ce domaine d'investigation, les études scientifiques mettent en évidence les dangers de la déshydratation. Quelles sont les précautions à prendre par les sportifs musulmans qui participent aux compétitions officielles pendant le jeûne du Ramadan? Question pour laquelle il n'existe pas encore de directives méthodologiques déterminées.

A travers notre recherche, on a supposé qu'une abstinence alimentaire totale diurne en particulier hydrique, était source de perturbations, entraînant une influence négative sur la performance physique et sur l'équilibre thermorégulateur.

Notre expérimentation a porté sur un groupe de 13 athlètes masculins, de l'équipe nationale d'athlétisme militaire âgés de 21 à 33 ans. Ce groupe a subi un test de course de 3000 mètres plat et ce : 11 jours avant la période du Ramadan, le 25ème jour pendant la période de jeûne, et le 119ème jour après la fin du mois de Ramadan. Ces tests ont été accompagnés par des mesures de la température axillaire avant et immédiatement après la réalisation de chaque test. Ces athlètes suivaient un programme d'entrainement individualisé, et les tests ce sont déroulés durant la période de préparation physique générale.

Au terme du travail de recherche, on a noté une régression de la moyenne des performances physiques en course et une augmentation de l'amplitude de la température axillaire pendant la période de jeûne, confirmant par-là l'hypothèse de recherche.

L'étude a permis de déduire que l'abstinence alimentaire diurne en particulier la privation hydrique entrainait une diminution de la performance physique de course de moyenne distance et augmentait

la température axillaire pendant la période de jeûne, ce qui inévitablement conduit à un état de déshydratation où le sportif peut exposer sa santé à des conséquences qui peuvent être graves.
Mots clés: Ramadan - Tests - Evaluation - Performance physique - Température axillaire.

Summary :

Our research had the objective to study in a group of athletes, the influence of fasting month -Ramadan on the physical performance and the balance of the thermoregulation.

In this context, the scientific studies highlight the dangers of the dehydration. What are the precautions to be taken by the Muslim sportsmen who participate in official competitions during the fast of Ramadan? Question for which there are until now no determined methodological directives

Through our research, it is supposed that a diurnal and total alimentary abstinence, particularly hydric was a source of disturbances, causing a negative influence on the physical performance and the thermoregulation balance.

Our experimentation concerned a group of 13 male athletes, of military athletics national team aged between 21 and 33 years old. This group of athletes has been tested on a race event of 3000 meters, and that 11 days before the period of Ramadan, 25th day during the fast period, and 119th day after the fast of Ramadan. These tests were accompanied with the measures of axillary temperature before and immediately after the realization of every test. These athletes followed an individualized training program, and the tests were conducted during the general physical preparation period

In the term of the research, it was noticed a regression of the average of the physical performances in running and an increase amplitude of the axillary temperature during the period of fast.

The study allowed to deduct that the diurnal food abstinence particularly the hydric privation, decreased the physical performance of middle-distance race and increase the axillary temperature during the period of fast, what inevitably leads towards a state of dehydration where the sportsman can expose his health to consequences which can be grave.

Keywords: Ramadan - Tests - Evaluation - physical Performance - axillary Temperature

Introduction:

Conducted researches in the field of human biology [01], [02],, has shown that all motor activities require energy, in other words, every activity needs necessary elements enabling it to make these activities . In view of this postulate, the supply of essential energy for the manifestation of motor activity is drawn from every day's feeding.

During the practice of physical activities involving important workload, in the case of insufficient rehydration, It's not only the work capacity and by the consequence reduces motor efficiency but this will also cause perturbation of hydric balance and central temperature [03]. In the case of dehydration, in particular when a person indulge in outdoor physical activities, The person can expose her state of health into potentially serious consequences.

Dr Fereydoon Batmanghelidji from the St Mary hospital's medical school of London's university talks about: " devastating effect of the dehydration of the body " [04]. Among others the case of Minnesota visking's American football player Korey Stringer. Tuesday 31th July 2001 was a hot day, during an intense training, the player break down on the ground. Suffering from heat exhaustion.His central temperature was 40°C. 13 hours after the player died [05].

During the activities mobilizing huge energy consumption, such as high-performance sport activities, the eminent professors of human physiology and kinesiology of American universities Jack H Wilmore, David L Costill, Larry Kenney in their book : " physiology of sport and work-out " explain the hydro-electric balance in the manifestation of physical exercises and the thermic cardiovascular operation. The dietician Claudine Robert-Hoarau (France) envoke the importance of hydration in particular [06].

In " Medicinal sport "Elisabeth Brunet-Guedj & coll point out the function of hydric source in the molecular composition, they explain its contribution in transporting substratum and heterogeneous between different bodies' organs and its contribution in numerous enzymatic reactions in order to insure the succession of intermediate reaction that permit the transformation of substratum into catalyst substance [03].

Summering up his final study in 2015, the nutritionist Natahlie Hutter-Lardeau (France) binds the diminution of sport performance to the dehydration that good number of sportsmen meet [07]

It is supposed that dehydration caused by workout, especially by the sudation will ineluctably involve a reduction of blood volume and increase sodium concentration in the blood. This will cause à quick corporal temperature increase thus the good organism operation in values of

corporal temperature situated between preferred range of 36C and 37.5C will be perturbed. This will cause trouble in enzymatic reaction in the activation of main intercellular mechanism [08].

1 - Problematic:

Muslim world and in particular Muslim athletes who are supposed to win medals in huge sport events find themselves facing a recurrent problem that occurs once a year, fasting during the holy month of Ramadan.

During the daytime and in particular when the temperature is high, it turns out that restocking in nutritive elements and in particular hydric will be suspended whereas training load of other athletes is in constant progress, with two or three trainings a day. Orientations in the sportive nutrition propose to sportsmen a verity of supplementation of energetic products in order to complete a nutrition often judged insufficient. Thus she advices them to hydrate themselves before, during and after the training and competitions by offering them an outfit of drink to activate recovery or to insufflate the capacity to manifest optimal effort. The Muslims sportsmen observe during a period that occupies 08,21% of the year of a sportive season to 10.13%, a daily fast (if we considered the strict recommendations of the Sunna " Siyam Essabrine " of 06 additional fasting days).

Cases have been reported mentioning athletes who participated in competing while fasting. It is said that out great champion Morceli Nourreddine had ran a championship while fasting. Among other, I will mention this Algerian athlete case who waken astonishments of French sport judges when he ran a marathon without hydrating himself during the length. After the marathon, he has been transported to the hospital for health problems. It didn’t stop at

that level, he had complication from whom he never recovered. This forced him to give-up definitively sport practicing.

No plausible mythological orientation give recommendations related to training during the fasting period. No educational training program in sport talks about the performance sport during alimentary and hydric abstinence.

During the seminar with the theme " Physical activities and Ramadan" that has been held in l'INFS / STS of Algiers in February 2005, the Pr HANIFI Rachid specifies: The necessity of the rehydration before during and after physical effort has an influence on the recovery processes that will not be optimized. This will inevitably have repercussions on the motor efficiently during physical activity that can reach the overwork.

During the symposium of physiology that have been held in Nice from 22 to 25 September 1992, in their communication related to the influence of alimentary and hydric fasting in high temperature climates, the physiologist F. CISSE and JP MARTINEAUD had confirmed [09]. Fasting is responsible of chronological perturbation causing generally diminution of sportive performance. This seems to be caused by perturbation related to alimentary deprivation.

For Dr Brikci Adbdrahim [10]: " It seems that the perturbations of the chronobiology are responsible of decrease of performance of the persons fasting in the holy month of Ramadan. However no scientific study has been carried out verify this assertion ". The same author add: " the practice of fasting, taking count of the perturbations of biological rhythm it causes, should theoretically affect negatively the physical performances ". He concluded his study with the next supposition : " During Ramadan, the glucidic wealth characterizing feeding associated to fasting and training can be a source of an eventual improvement of glycogen reserve of the subjects. This explains the source of improvement related to the physical performance from the third week of Ramadan.

Finally the work carried out by F-Marc (2005) which is an institution of research of FIFA medical commission at which had participated Dr. ZERGUINI Yacine ex-president of the medical commission of the Algerian federation of football, it results that Ramadan fasting and football competitions are compatible. In the conclusions carried out by

the FIFA commission, it's specified that with corresponding adaptation and that football player can take part of competitions while fasting.

This divergence in point of view is not specific to the aspects depending on the medico sportive or technique and methodological of the physical and sportive activities but it's vale until creating a dichotomy in the application of precept religious who are put on exergue this holy month.

During the war of Sinai in October 73, called war of Ramadan where was engaged more than 3000 Algerian warrior, the big mufti of Egypt has recommended to the soldiers to not fast. Furthermore Dr. Marouane ABOURASS, member of Palestinian legislative council, president of the league of Palestinian oulama and professor of Islamic chariaâ in the University of Ghaza, in an interview for BBC Arabic in October 2006, makes difference between pleasure sport and competition sport. For the first type, fasting must be respected, for sport involving big energetic dispenses and prepares athletes for competitions, he recommends for break the fast when they start feeling fatigue related to the effort that will not allow them to carry the fasting. Dr Ahmed MHAMED AOUF doesn't agree with this idea, he published in the review " EL ILM " of the academy of scientific research of Cairo the recommendations that allow athletes to eat during Ramadan before beginning the training, because as he said, performance sport lead ineluctably to

an important energetic dispense that will lead the athlete to fatigue which he wouldn't be able to carry out during fasting.

Those divergences and uncertainties concern the particularity of physical activity during sport practice has leaded us to engage an effective study.

2 - Hypothesis.

Considering the methodological, biological and the medical-sporting aspects concerning the importance of the hydration and dehydration process for the sportsmen, we have supposed that an diurnal abstinence hydric is a source of disturbances causing a negative effect concerning running performances over a distance of 3000 meters and an alteration in the function of the thermoregulation equilibrium.

3 - Objective of the research task.

The purpose of the study was to organize academic experiment to make a contribution regarding the influence of fasting during the holly month on the engine yield represented by a 3000 m flat running coalition on a group of compaction athletes as well as to check the possible variations of the thermoregulation equilibrium in mild climatic conditions.

It should be noted that this is the first study dealing with aspects related to thermoregulation and running performances during Ramadan for athletes. Extensive search on the internet gives no results on this topic

4 - Research organization.

4 -1 : Research task

In order to achieve the objective assigned to our study, we proceeded the realization of the following tasks:

- An appropriate bibliography study.
- A study conducted before, during and after the fasting month of Ramadan, which focus on a group of Muslim athletes practicing running, who went through a 3000 m test along with a measurement of axillary temperature [11] , before the beginning of the test and jut after its execution, procedures that was repeated before, during and after the fasting month of Ramadan
- A statistical analysis relative to the conducted study.
- Conclusion and recommendations that developed from study

4 -2 : Tasks as part of research work

4 -2 - 1: Characterization of the specimen

Table N°01 : characterization of the specimen	
Parameter	**Observations**
Number of subjects	13 subjects have under gone all test
Gender of the subjects	Male
Ages of the subject	between 21 and 33 yeas
Root region	Different regions in Algeria
Conditions of life	Military sport regime
Evolution sector	Sport center

Athletes of military athletics national team

4 -2 - 2: Organizational characteristic of the research work

4 – 2 - 3: means employed.

As part of the research work that we conducted with the group of runners, we used the following means:

- An athletic track of 400m of tartan.
- A tachometer panel
- A starting chipper.
- Chronometers.
- A team of collaborations
- Exterior thermometer, hygrometer
- Anemometer
- Usual equipments and ustensiles

4-2-4: Used method.

Evaluation test have been done before during and after the month of fasting Ramadan. These tests correspond to the following parameters.

•Physical: Test of running over a distance of 3000m flat.

•Axillary temperature measure: Just before the warm-up for the 3000m test of running and just after the test [13].

Table N°02 : organizational characteristic of the research	
Parameters	**Observations**
Tests were passed from October 2005 until January 2006 with athletes of national athletic military team	-Period characterized by a clement temperature, between 29 and 27 degree before and during Ramadan and 13 degree the day of the tests during January. -All the tests were passed between 15h30 and 17h30
3000m running test	11 days before the first day of fasting
	25 after the first days of fasting.
	119 days after fasting period
Axillary temperature test	11 days before the first day of fasting
	25 after the first days of fasting.
	119 days after fasting period
Area of the axillary temperature has been tested and the execution of the 3000m test of running	Outdoor – athletics stadium
Method of registration of the axillary temperature	Before and just after 3000m test of running.
observation	these athletes followed an individualized training program, and the tests were conducted during the general preparation period
Disposition and form of execution	•Armpit wiped with a dry napkin, the thermometer is wedged, the arms pressed against the thorax •Thermometer cleaned and reset by shaking it then maintained under the armpit for 120 seconds [12]
Wind and humidity of the environment	1- B R - wind : 09km/h / T°: 29°- Humidity : 66%
	2- D R - wind : 11km/h / T°: 27°- Humidity : 57%
	3- A R - wind : 14km/h / T°: 13°- Humidity : 44%

Note : Each and every result of our study was the subject of a specific statistical study

4 - 2 - 5 : Methodological justification of tests realisation

- **3000 m running test**

- indicates chronometric performances related to the manifestation athletes endurance capacity, intermediate distance which permit to note and detect eventual physiological variations.

- **Axillary temperature measures:**

- indicates corporal temperature and its eventual variation if it's taken in different moments (+ 0,5 to 01 degree beside buccal or rectal temperature measurement)

5 : Comments and analyses:

5 - 1: Concerning the 3000 m running test.

Results of 3000m test and their analyses obtained 11 days before Ramadan (test1), 25 days after the beginning of the fasting period (test2) et 119 days after the fasting period (test3), show according to significant statically calculation a clear diminution of performance mean realized during the fasting period, estimated respectively to -0,331m/s between test1 and test2 and +0,624 between test3 and test2. The Improvement of the average of performances after the fasting month is attributed to the development of the training process in a normal evolution conditions

5.2 : Concerning axillary temperatures measures:

Axillary temperature measures before preparatory warm-up for the 3000m test and just after the realization of the test realized 11 days before the month of Ramadan (T A1), 25 days after the beginning of the Ramadan (TA2) and 119 days after the end of the fasting period, show according to significant statically calculation that the gap of temperature between the moment prior to the test and just after the test for TA1 and TA3 is almost the same, respectively 0,85°C and 0,87 °C. Whereas during fasting, the gap of temperature is more Important: 1,14 °C.

Different means of the temperature gap measurement before preparatory warm-up for the 3000m test and just after its realization for the periods before and after Ramadan, let us note a higher thermal amplitude during the fasting period estimated to 0,29°C betweenTA1 and TA2 and 0,27°C between TA2 et TA3, whereas in normal condition this gap almost doesn't exist (TA1 - TA3 = 0,02°C), this explains the occurrence of corporal overheat during the period of fasting, which goes beyond the level in normal time. This also explains that beyond a high solicitation of a thermal equilibrium system, this can cause dehydration stat in case the athlete doesn't hydrate himself in an opportune moment, which is the case during the fasting period.

Conclusion of the research work:

Ramadan fasting and sport practicing doesn't fit together. The working hypothesis emitted at the beginning of the investigation was largely confirmed.

The results obtained through pedagogical experimentation are in close conformity with the scientific data expressed by many researchers, whose work has addressed the consequences of dehydration in less demanding conditions than the fasting of Ramadan.

Among others we will quote the recommendations of the specialist in sports medicine Dr. Mondenard J-P which states [14]. : " A fluid loss of about 02% of body weight, which is about 1 liter to 1.5 liters for a person (70 kg) , reduces work capacity by 20%, while noting that a loss of 10% of body weight can lead to death " . In the context of the research work initiated, the performances recorded before during and after fasting month of Ramadan in the race of 3000 meters, carried out in mild climatic conditions made it possible to deduce that abstinence diurnal food intake and in particular water deprivation, confirmed by a greater amplitude of the axillary thermal difference during the period of fasting, not only the latter was at the origin of the decrease in the average of the running performances of endurance, thus causing a decrease in motor efficiency during the month of fasting, but it can contribute to a large extent to cause various traumatism.

On this subject GEBERT, quoted by WEINECK [15], states that according to the proportion of fats 50 to 70% of the weight of the body consist of water. The maintenance of this level of hydric ratio is very important in so far as, among other things, water fulfils the following vital functions

- It is an important constituent of blood serum
- It is a constituent of macromolecules.
- It is involved in many enzymatic reactions
- It has an important role in the maximum oxygen absorption capacity.

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