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A Guideline to Assess the Fitness Status of Professional Soccer Players Through a Personalized Health and Shape Program

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Abstract

Soccer players have been studied for their metabolic characteristics (Fat Mass, Active Mass, Hydration) as well as for many blood tests, in order to find a way to assess their real suitability to access the match or reliable parameters to exclude them from the playing team.

Keywords: ***Laboratory Tests; Impedentiometry; Nutrition.***

Introduction

In sports medicine, in particular in soccer teams, one of the main problems is the management of the performances of athletes, i.e. the assessment of their fitness status in order to be able to decide who to take to the field based on the best shape conditions.

Despite the number of publications in this field [1-5], made in different types of athletes and based on laboratory tests or impedentiometry, no study has been conducted with the contemporary evaluation of laboratory tests, body composition by means of impedentiometry and nutritional schemes, on professional soccer players.

In this paper is described the work carried out during several years in a top-level soccer team in Italy. What is reported herein was repeated every year but, for the sake of brevity it is impossible to display every year.

With the present data analysis, we hope to provide the sport physicians with a new protocol to assess the status of the athletes.

Some players chosen from the members of the team, were accurately followed for their health status and, due to the length of the season and the high number of matches to be played, also for the profile of the state of physical and mental fitness. In few words, a personalized Health and Shape Program has been developed. Each player has undergone to blood drawing in different periods of the agonistic season. The regular season consisted of pre-season retreat and athletic preparation (generally on July), first round of the championship (from the end of August to December), recovery phase and second round of the championship (from January to end of May). In addition to blood drawing, players enrolled in the study underwent to a metabolic evaluation by means of bio-impedentiometry during each phase of the season, on average four but for someone also more times. According to the results of impedentiometry and of blood parameters, in case of necessity to modulate eventual nutritional needs, suitable diet and/or supplements were administered. Each player examinated gave his informed consent to all the non-invasive procedures. The names (and birth date) of the athletes are hidden and substituted by numbers; only the height of the player is displayed.

Materials and Methods

It is important to note that this work is not a clinical research, as the blood samples were scheduled by the Sports Society only to verify the health status of the soccer players (all males aged between 22 and 29 years). Only time later the data (only the data, not the samples) obtained from the laboratory have been analyzed in relation to the findings concerning the metabolic assessments obtained by means of impedentiometry, a non-invasive technique.

Therefore, since it is not a clinical research, but only a retrospective analysis not requiring an approval by an Ethic Committee, the art. 23 of the Declaration of Helsinki and other articles of the same Declaration are not applicable to this manuscript.

Nutritional protocol

The basis of nutrition has been mediterranean diet, with a balanced ratio between carbohydrates, fats and carbs (mainly rice, pasta, potatoes, vegetables, with rarely only a small amount of cakes). Calories were divided as 45-65% from carbs, 20-35% from fat, and 10-35% from protein. The total amount of calories was adapted according to the body composition and mass of each athlete and according to its role (Goalkeeper, Defendant, Midfield of Forward, in order to maintain the characteristics of the role.

This protocol was suggested to every member of the team, to follow it at home; it has been duly performed during the phase of retreat before the matches.

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An important addition was performed at the end of the match, with the immediate administration of pasta or rice with tomato, in order to avoid the intake of other food before two hours from the end of the match. This, together with generous intake of water, helped to rapidly restore the glycogen reservoir and hydration, very useful to prevent the onset of contractures. In some cases of particular need, at least one hour after the match maltodextrins were administered at a rate of 60-80g/L with the recommendation of a slow intake.

It is important to note that the regular intake of calories and the nutrients ratio could be modified according to the different climatic conditions as better explained later.

We would like to point out that the metabolic-nutritional evaluation, for a professional athlete, is not a useless waste of time, but an important and instrumental aid to training and the treatments to which athletes undergo.

Knowing the body composition (body hydration, intra and extracellular water content, muscle mass, fat mass, active mass) and the athlete's metabolism, we can associate data with those of blood tests, thus achieving information useful to the medical and technical staff to prevent possible muscular injuries and allow to make any nutritional or technical-training corrective measures. In addition, this kind of information offers to the technical staff a scientific data that can help to choose which athletes to use for a given commitment based on their physical state.

Body composition (metabolic parameters)

Metabolic parameters were measured four or five times during the agonistic season, starting from the summer retreat, to the end of the season, at the end of April or May. Sometimes, in case of uncertainty, the measurement has been repeated for more days.

In body composition, active mass, fat mass and hydration all have great importance.

The active mass expresses the power and muscular endurance of the athlete (the optimal values are those higher than 60% and should not fall below 58%. The active mass is also an expression of competitive commitment (athletes who play less, they lose active mass).

Fat mass is an index of incorrect eating behavior, but it still has a large inter-individual variable (values between 4.5% and 9% are normal); obviously, the variations in the same individual matter.

Hydration expresses stamina but also speed; individuals with better hydration tend to express themselves more quickly.

The role of the player, in addition to his body size, is an important parameter of evaluation, since the body composition may change according to his role: generally midfielders have more fat mass than forwards who, in turn, have more hydration.

As regards the nutritional schemes and the supplements to be administered, the evaluation of the latitude and longitude of the match location was of fundamental importance, whether it was located in a mountain, marine or inland location. Furthermore, the time of the match and the expected temperature and humidity in that place at that time were taken into consideration.

In relation to weather conditions and location, nutritional and integration plans have been prepared in order to avoid any relapse on muscles and tendons. It is known that a situation of high humidity slows down the physiological capacity of thermoregulation and skin breathing; in the same way, tendons and muscles are subject to damage. The reverse occurs in situations of low humidity, with the risk of muscle injury. The type of role of the player must also be taken into account, if you need quick shots, even repeated, repeated or resistance.

Therefore, schemes as personalized as possible to the players must be prepared taking into account the physiological and saline integration needs.

Each situation of this type was compared with the metabolic assessment that was performed on each athlete monthly, in order to find the ideal balance for each.

Metabolic evaluation has been performed by an impedentiometer (DS Medica - Italy), measuring total water, intracellular water, fat mass and active muscle mass. It has been possible to measure the composition of different districts of the body: right and left side as well as trunk, arms and legs. Results have been also compared to plicometry [5-8].

Blood tests

In the interests of the Society and of the athletes themselves, it has been planned to test all athletes 5-6 times during the agonistic season, by scheduling them weekly in groups so as not to interfere with the training or their private life, and performed laboratory tests (blood count, blood iron, LDH, CPK) useful for the assessment of muscular stress, as well as other parameters able to indicate the general situation of the athlete.

Blood tests were performed by a certified Laboratory (Paideia Clinic, Rome) in different moments of the agonistic season. The parameters under study are displayed in Panel I. In certain cases, some particular tests have been performed for sudden situations (fever or suspect of contagion).

The combinate analysis of blood tests and metabolic evaluation gave us the opportunity to draw the optimal program to approach the match. Obviously, all the data were discussed with the trainer and the coach to individuate which player was the best choice for the match. Parameters that, in rare cases, have not been determined depend on the lack fasting that could modify the result. This does not affect the general overview [9-11].

Metabolic parameters and blood tests were not necessarily performed in the same day.

Results

Panel 1 reports the values of the laboratory tests performed on the players. The names and birth dates have been substituted by numbers to accomplish privacy. Only height is reported to better understand the meaning of the values.

It appears clear the behavior of the blood parameters in the different phases of the agonistic season. As an example, Hb tends to decrease in the middle of the season while Free radicals and CPK tend to increase to return to basal values at the end of the season. These values well correlate with those of body composition: the

Panel 2 shows the metabolic composition in a period comparable to that of the blood tests.

Panel 3 contains an example of nutritional scheme for a match held in the afternoon of one day in spring, starting from the previous day.

Discussion

The condition, physical and psychological, of a soccer player is fundamental for the results of a team. To achieve the best performance, a combined work of the Coach, the trainer (s), the physicians and of the physiotherapists is necessary. But nutrition has a pivotal role because the results often depend on what has been or not has been eaten. This is not only a problem of nutrients or calories, or the quality of what is introduced, but of great importance is the time of nutrition related to a match or the relationship of the different nutrients introduced, In few words, not only it is necessary the

correct amount of calories to intake divided into the main nutrients, but also when and in combination with what. As an example, proteins need three/four hours to be completely digested and absorbed; so, a meal reach of proteins could be dangerous if introduced too close to the match. At the same time, the intake of proteins too close after the end of a match or a great effort, can lead to contractures or worst because their acidic component may result in precipitation in the muscles.

For these reasons the medical staff should program together the coach and the training staff the exercises and the related nutrition. Obviously, every player has a proper characteristic and body composition; thus, it is important to run blood analyses and test of the body composition in order to set a personal program scientifically tailored.

Panel 1 shows the blood parameters analyses during the season; results can be compared to the data of body composition in Panel 2, to assess that nutrition is correct and does not affect the performance but increases it.

Panel 3 shows a general nutritional scheme administered during the day before the match and on the day of the match, when the team is in retreat and all meals can be carefully checked. On the day before the race, you try to accentuate the caloric load in order to build up an important glycogen reserve, as well as the protein load. On the day of the race, however, the meal must be light to allow rapid digestion and the best performance. Great attention shall be devoted to hydration especially with attention to the weather conditions, as previously described.

In conclusion, the role of physician in a soccer team is complex and shall range from the clinic to the laboratory and nutrition in order to achieve the best performance by the team.

This manuscript is a suggestion for a sport physician. Health and Shape Program means that it is important to take all the results, compare them both for the blood parameters and the body composition in order to have a complete panel. With such panel it is possible to decide the condition of a player and discuss it with the trainer and the coach as to his complete availability or how much risk of a damage is present.

Abbreviations

LDH: Lactic Dehydrogenase; CPK: Creatine Phosphokinase

Declarations

Ethical Approval and Consent to participate

Not Applicable

Consent for publication

Not Applicable

Availability of supporting data

Available on corresponding author upon a responsible request.

Competing interests

There are no competing interests

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No funding was necessary for this study.

Authors' contributions

I am the only author and should be easy to understand my contribution

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Encl. Panel 1; Panel 2; Panel 3