Revista Motricidad Humana
Mot. Hum. 2016;17 Supl 1:10-13

Meeting Abstract

Muscle mass and athletic performance

Masa Muscular y Rendimiento Deportivo

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Success on sports is related to the accurate management of the training stimulus, in order to facilitate the adaptations in skeletal muscle which promote the desired performance.

There are two levels to consider, the index muscle / bone whose ideal values in strength sports is 5/1 (5 kilos of muscle per kilo of bone), lower ratios in endurance sports are usual and on the other hand, muscle / adipose index, which expresses how many kilos of adipose tissue has to carry each kilo of muscle mass. As a while as the value is lower, greater efficiency.

In the last few years, a renewed interest has been directed toward to different training methods based on high-intensity and short duration (1). It has been reported that high-intensity training (HIT - 90% of VO_2peak -) allows metabolic adaptations similar to regular endurance exercise, both in maximum oxygen consumption and mitochondrial content in skeletal muscle (2,3).

The water balance has a crucial importance. The reserves of muscle and liver glycogen represent in an adult of 80 kg, around 500 grams. Each 1 gram of glycogen is stored with 3 grams of water, so, the metabolic reactions in response to exercise, may cause weight loss in athletes. If every gram of glucose or glycogen provides 4 kcal of energy, it means that this person will have a reserve of about 1500-2000 kcal of carbohydrates, enough energy how to maintain a race about two hours of exercise energy.

During intermittent high-intensity exercises in the race, the intake of carbohydrates and electrolytes solutions, has been demonstrated to improve the exercise ability (4) and performance (5,6). Hyperhydration has no advantage on thermoregulation (7), but it may delay the onset of deshidratación (8), which may report a small benefit on performance (9).

Ganio et al. (10) and Amstrong et al. (11), the studied athletes who ran 5000 and 10,000 meters, well hydrated and with a diuretic-induced dehydration. With a dehydration of 2% of body weight, running speed it decreased significantly in both distances (6-7%). However, Zouhal et al. (12), in marathon runners showed a significant linear relationship between the degree of loss on

body weight and the time of finishing in the race, so, those with greater weight loss, they achieved the best results.

A recent study has shown how as fluid restriction for 24 hours, it is associated with substantial changes on strength (-7.8%) (13). Several research indicate that it is necessary to recover 150% of the weight lost to be hydrous properly (14). This recovery brings on the possibility to continue exercising on next days and improve physical performance. For this, the aim is to recover as soon as possible the weight lost during physical activity (15).

To increase mechanical stress stimulates further growth in the percentage of muscle fibers, while also promote a faster and coordinated response of the fibers activation (16). This emphasis on the mechanical stress can promote muscle growth at the expense of a higher percentage of fibers and to facilitate strength gains through improved neurological recruitment patterns (17). Therefore, it is recommended to do exercises such as: bench press, pull-ups, squats and Olympic lifts (clean and snatch).

With the intention to increase our muscle mass, we should not intake drinks like coffee, which works as a release of cortisol, the catabolic hormone that destroys the muscle releasing glucose and amino acids (AA) in the bloodstream. To improve our ability to increase our force development we recommend:

1. Use more free weights on our trainings (barbells, dumbbells and plates), with body-weight exercises or elastic bands. Do not abuse the use of machines.
2. Protein should not be the main dietary intake. The increased consumption of carbohydrates for energy, it avoids using proteins and therefore the increase of catabolic enzymes such as cortisol. Protein catabolism increases when the consumption of glycogen deposit reaches between 30-55% and with the intensive physical exercise.
3. Do not use diuretics, if not the opposite, staying hydrated, due to that 73.2% of the fat free mass is water. Dehydration increases levels of cortisol and catecholamines.

Regarding of proteins, their intake in the required dose and relative to physical exercise is necessary. AA as leucine, isoleucine and valine, from the liver, they can prevent the rate of endogenous protein breakdown during exercise. These nutrients must be administered in the form of shakes, which facilitates the absorption and assimilation. Whey protein contains the highest biological value of all known proteins (whey protein concentrates).

A diet rich in protein to build muscle should be accompanied by sufficient water intake. About 3.5 liters per day are suggested.

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Recibido: 01-03-2016 **Aceptado:** 15-03-2016