

# HOW TO UNDERSTAND TRAINING

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*In this article professor Atko Viru of the University of Tartu, Estonia, presents a simplified synopsis on training adaptation. Re-printed with permission from Modern Athlete and Coach.*

It is widely accepted that training consists of systematically performed exercises in order to improve the physical capacities and acquired technical skills of an event. Experience and, to a certain extent, the results of related studies suggest to the coach what are the appropriate exercises. The testing of physical capacities, the visual evaluation of technique and, above all, the competition results, will indicate how effective the training exercises have been (Figure 1).

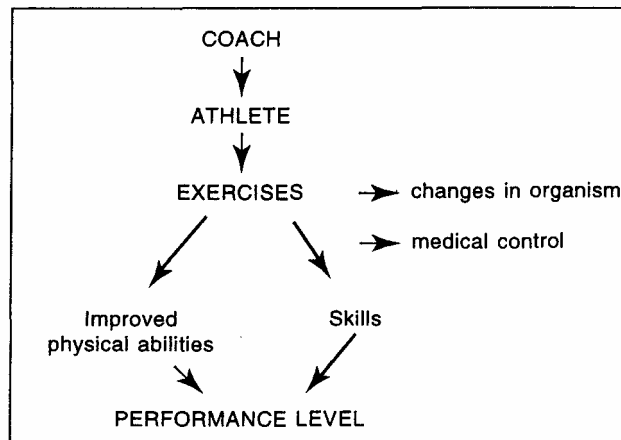


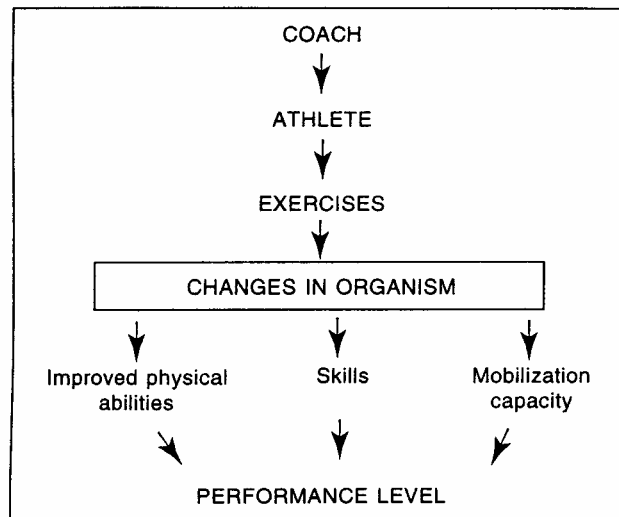
FIGURE 1

The same scheme is presented with a small modification in Figure 2. The modification consists of the additional changes in the organism that occur as the result of the performed exercises. It appears that Figure 2 represents only a small modification that emphasizes physiological knowledge. However, this modification actually means a principal change in the approach, as the new approach is based on the following established facts in physiological and biochemical studies:

1. Good performances, and top results in particular, are due to the changes in the organism that distinguishes between the 'Homo Olympicus' and a sedentary person, "Homo Sedentarius".
2. Certain changes are necessary to improve physical capacities, to acquire technical skills, and to achieve an extensive mobilization of the organism's motor potential during competitions.

3. The character, intensity and duration of training exercises, as well as the peculiarities in the involvement of various muscle groups and motor units, determine the adaptive changes in the organism when the exercise is systematically repeated.
4. The specific dependence of the changes in the organism on the employed exercises is based on the exercise-induced adaptive protein synthesis. The metabolic and hormonal changes during and after the exercise are the inductors for the specific synthesis of proteins that assures an increase in the most active cellular structures and an increase of the enzyme molecules catalyzed in the metabolic pathways.

The idea of the scheme in Figure 2 therefore indicates that each training exercise results in specific changes in the organism which are necessary to obtain the objectives of training. Collectively the changes caused by the various exercises assure an increased performance level.

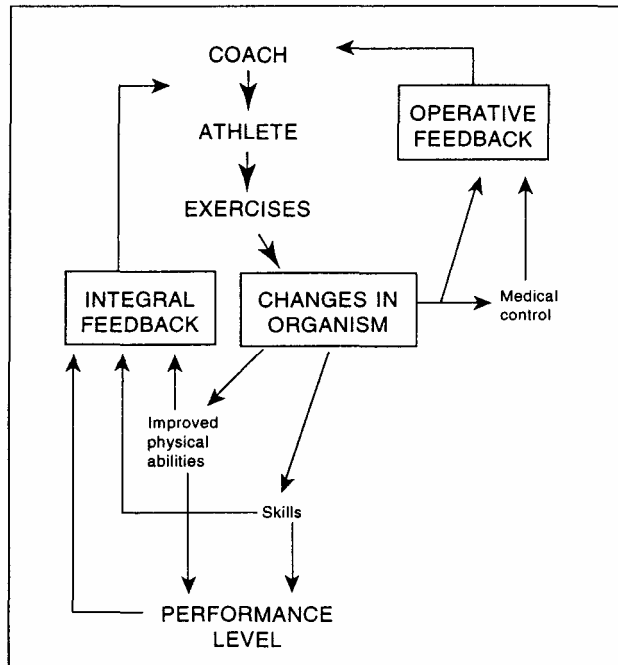


**FIGURE 2**

The advantages of using this scheme in the practical organization of training are:

- Each exercise will be performed in order to achieve a concrete objective in the form of a certain change in the organism.
- The resulting changes make it possible to check the effectiveness of each exercise (or at least a group of exercises).

“Blind” exercising will be avoided this way and training will become a well-controlled process. However, changes in the organism are not the only objective. They will also serve as means for an operative feedback to control the effectiveness of training (Figure 3).



**FIGURE 3**

The feedback from the changes in the organism is more specific in comparison to the feedback obtained from improved physical capacities and competition results. The feedback from physical capacities and competition results is an integral one, summing up the total positive and negative changes that might have occurred during a prolonged period. The conclusions made from this kind of feedback are therefore only relatively truthful, allowing the evaluation of a general trend but not the details of the whole training process.

Carrying out feedback from the changes in the organism is in reality a complicated task. There are two possibilities available to the coach:

- To use the help of sport physicians and special laboratories.
- To be supplied with tests that describe indirectly but with sufficient validity the main changes in the organism caused by certain training exercises.

Whatever the case, coaches must understand the corresponding information in order to use it for the guidance of training processes.

The practical use of the scheme outlined above requires an understanding of what are the necessary changes to achieve. The aim of training - a top level performance. This, in turn, leads to an analysis of factors that limit performances in a particular event in order to find the best solution (Figure 4).

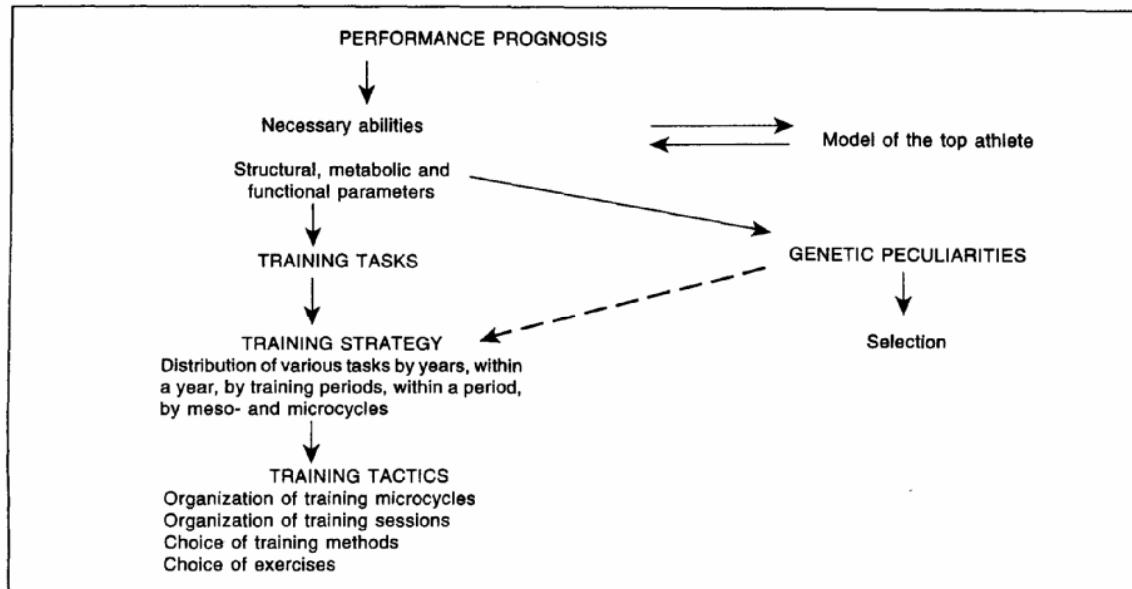


FIGURE 4

Top level competition results depend on training, as well as on genetic characteristics. However, it must be emphasized that there are no genetically induced factors that directly determine competition results in any single event. The positive (or negative) significance of genetic factors become apparent in training. There is an interrelation. Training makes it possible to use genetically induced manifestations in the improvements of performances. At the same time, the effectiveness of training in various directions depends on the susceptibility of the organism to the various training exercises.

The tasks related to the achievement of top level performances have to be rationally distributed over the whole 10- to 12-year period during which a prepubertal boy or girl is developed into a champion. The training strategy has to determine how to distribute the tasks, taking into consideration the development of the organism during adolescence. This means that the most favorable age periods have to be found to induce the necessary structural, metabolic and functional changes. The distribution of the various tasks within a year's meso- and microcycles also belong to the strategy of training.

The carrying out of the induction of the necessary changes is part of the training tactics, responsible for finding the most rational ways and finally the necessary training methods and exercises.