Some considerations on detection and selection of athletes

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Before starting this lecture I would like to make two statements :

> *"In countries where infant mortality is over 100 deaths per 1.000 births and where nutrition and health are minimal for even ordinary living, any system of selection is going to rest on an insubstantial base".*

> *"Programmes of physical education in schools are one of the key foundations of a successful system of sport in any country and an important base for the selection process".*

1. Introduction

The search of young people gifted in sport has gained increasing importance over the last years as competition at almost all levels has intensified. This has hold the attention of many researchers and trainers. An identification on a very young age seems to be more and more important since much younger athletes now are reaching the top in many sports and surpassing performances once thought to represent the peak of adult achievement (Fisher & Borms, 1989).

On many viewpoints it is interesting and necessary to know at an early age of a child, for which sport he presents all necessary aptitudes and which level of performance he eventually could obtain.

If these questions are put forward to a top trainer, it appears quickly that even the most professional within them has difficulties to give this information. They all lack specific scientific data on this subject and are using their own experience and that of their colleagues in order to guess the level of performance of their pupils.

The search of a young athlete, in view of a selection, creates in first instance a technical problem: which criteria do I have to use in order to have a selection instrument which is effective and representative ? On this question there is until now no answer in no sport.

This is mainly due to the fact that the performance factors are not yet well determined, and if in some sports some factors are known, one does not clearly know the **stability** of that factor throughout the years. This last point is very important when talking on prediction.

2. The stability of factors

Can we predict the height, width, strength, flexibility and movement... of an adult athlete if we base ourselves on the same parameters of a young athlete?

In order to answer this question, one should know the stability of the predictive factors.

The knowledge of the stability of factors needs **longitudinal studies** of a great number of subjects, lasting at least several years. These kind of studies already took place in the World. Unfortunately many of those only studied body parameters and to few analyzed motoric aspects such as flexibility and strength. To many studies were also accentuated on a **normal population** of youngsters and not on a specific group of young top athletes.

The research set up to analyze the stability of factors takes thus many years of intensified efforts and even then not all parameters can be tested. Several authors are convinced that one should study the same group on an infinite amount of parameters using a **longitudinal** way. But these methods can never be applied, which leads us to the fact that we never will be able to exactly detect and select talented youngsters. In practise, we see very often that the athletes quit with the sport (drop-out), which reduces and even eliminates the stability of the studied group and renders the results doubtful and the conclusions even impossible.

This is why some authors are convinced that in order to find the factors necessary for a performance one should better :

1) analyze **cross sectional** the results of the winners of competitions of children;
2) analyze the biography of older sportsmen and specially their performance at a young age;
3) compare these two elements and come to conclusions.

2.1.   Somatic characteristics

Mostly all studies includes somatic measurements such as : height, weight, body length, arm- and leglength, shoulder- and chest width, and some other measurements. These measurements are of no use for children if one does not include the measurement of the biological age. The determination of the biological age is important in the selection of children because late mature children have an advantage in attaining high levels of performance if they have not been burned-up by too hard training.

This is linked to a problem which renders the detection of talents very difficult : on the one hand only the children with a high performance level are interesting for the trainers. This means that the early mature children will always be more interesting for their trainers and this sometimes for their own image. The late mature children, with a more prosperous sports future will often be eliminated too soon.

It is widely known that somatic characteristics can be predicted long in advance, if at least the biological age is known. It is possible to predict the adult height within a range of 2 cm. The prediction coefficient is over 95 %.

2.2. Motoric characteristics

Concerning motoric factors, such as flexibility and strength, more problems arise. In this context one should also consider the previous training : a subject who only received a reduced amount of training will probably make more progress than a subject who already had a large amount of training.

This means that for motoric factors it is not sufficient to base ourselves on the actual performance levels in order to do predictions, but one should also have an idea of potential possibilities of the subject.

In this context, researchers use mainly as a reference the evolution in the time of some parameters, in stead of a momentary level. By that way they are trying to determine the reaction of the subject on a short training period in order to predict his reaction on a longer training period.

Most of the studies on strength within athletes, and this is the easiest way, are using maximal static strength tests in order to measure the actual strength of the athletes. These measurements are mostly related to the body weight. Arm, body and leg strength tests are commonly used.

Few authors are also using dynamic strength tests, but the difficulty to relate it to the body weight and to the biological age makes them not very efficient and useful.

Another difficulty is that the strength has to be related to the limb velocity, which is, on his turn, linked to the flexibility.

Complementary to this the strength and the flexibility has to be linked to the execution of a correct movement, and that is done only by very few research units.

The flexibility and strength factors have a predictive value of over 70 %. This means that if a man is strong at a young age, he mostly will be strong when he is older, this statement is exact for over 70 percent.

2.3. Physiologic characteristics

The most common measure used to determine the ability to sustain high levels of oxidative energy production is the maximal oxygen consumption rate (VO_2 max measured in l/min). The second most used is the anaerobic threshold, namely the highest steady state work rate before significant increases in muscle or plasma lactate concentrations develop (VO_2). The third is the submaximal energy costs (VO_2) for a given work rate, which indicates the economy of effort.
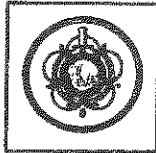
The stability of physiologic parameters have not yet been studied profoundly. These factors are mainly used to determine the degree of actual training rather than be used as a predictive factor.

2.4. Psychologic characteristics

To measure the actual psychological level, several testbatteries have been elaborated, but more research is needed in order to clarify the psychological concomitants of success.

The prediction of psychologic characteristics is rendered difficult by the personality of the athlete. Some authors are convinced that the high level athlete is characterised by the desire to perform well and to win. The athlete of course will need all optimal somatic, motoric and other characteristics for a good performance. Those authors states that it is sufficient to research and select youngsters who desire to perform well.

2.5. Social characteristics

It is more and more important that the social environment of the athlete is stimulating him to perform better. The poor influence of parents, family and friends on the performance of the children is in many cases the reason for a drop-out. Social characteristics however are very stable and have a high predictive value.

2.6. Time-space (movement) characteristics

The biggest problem concerning the prediction of sports performances is probably that of the movement prediction, because this aspect is depending of mainly all above mentioned parameters.

A second element is to know to what extend the movement characteristics are to be considered as stable factors, and thus are predictable; and if the movement characteristics are variable, to what extend could the variation be predictable.

A more difficult step is to know if the movement execution is linked to somatic, flexibility, strength and physiologic characteristics, and to what extend the movement will change if those parameters are changed.

2.7. The representativity of the examined factors

It is clear that we should only take into account representative factors before we risk a valid prediction. When all these factors are known, "the average profile" of an elite athlete per discipline could be established.

In analogy of the professiogramms used for professional selection, and where all qualities requested to fulfil a certain job are listed, some sportsphysiogrammes are made. This is called the "formation of an ideal". Meanwhile the question as whether or not a top athlete is to be considered as ideal remains without answer and whether or not changes in physiogrammes are occurring during a certain period of time. The physiogrammes of elite swimmers of the 1972 Olympic Games are e.g. fundamentally different than the physiogram of the elite swimmer of the 1992 Olympic Games.

One could ask which factors must be considered in the physiogrammes. It is evident that the answer to this question is specific to each sport : the aspects asked for a football player are different then those asked to a shot putter.

BAR-OR proposes to consider the following factors in order to predict the future performances of children :

1. Somatic data (which includes strength and flexibility),
2. The biologic age,
3. The aerobic capacity,
4. The anaerobic capacity,
5. Genetic characteristics,
6. Hormones (sexual and others),
7. Neurologic aspects (reaction time and speed),
8. Psychologic aspects (personality and capacity to learn),
9. The performance.

Complementary to this, he is giving a protocol to be followed for future studies :

"In the coming years, when more information is gained, the prediction will probably follow the following procedure :
1. Determine the basic performances of the examined subject (somatic, motoric, physiologic, genetic, psychologic),
2. Correct these information using the biological age,
3. Verify the answer using a short duration training programm,
4. Evaluate the physical condition of the family,
5. Predict the performance on a older age."

This procedure shows us the great complexity of the prediction of sports performances. We agree with certain authors who says that not only the sports performance but also the physical characteristics are a result of an interaction between genetic factors and environmental factors. One of the environmental factors which seems to be of a great importance is the intensity of training. Some authors are convinced that a great deal of the talents are determined genetically.

In the near future it will therefore be very difficult to win if one has not carefully chosen his parents. This is may be a stem in the direction of the ultima prediction, that of the programmed athlete. For the time being it is very difficult to know how far researchers are in this field, because they do not always communicate their research results and methods. When they publish their opinion and results, they very often do not mention how they obtained it and which statistical procedure they used to obtain those results. Even the amount of studied subjects is not very often published.

In the whole world, researchers try to obtain a better understanding of the hereditary factors of an athlete, by analyzing the genealogic three, by doing twins surveys, by blood analysis, by muscular biopsies, etc... But in our opinion the results of these researches are not yet operational. The pre-programmed and computer bionic athlete is thus not yet born, thanks god.

I conclude that because the selection procedure is still not operational, it is momentarily still better to accept, train and follow all athletes and not to eliminate apparently less talented children. Very often they could metamorphose to top athletes.