MODULATION OF THE RELATIONSHIP BETWEEN SOME RESULTS OF TESTS FOR PHYSICAL ABILITY IN 4TH GRADE PUPILS

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RESUME

Modulation is the process of reflecting the objective reality in order to study the laws at work within and their consequences. The models are represented by equations, irregular equations, graphics, logical conditions, tables etc. In the present work an analytical model is presented which reflects the relationship between long-jump with two legs from point (x) and the results of throwing a 1kg shot putt with two hands over the head (y).

Keywords: model, modular dependence, physical ability

The object and factual systems are observed and studied in order to understand their internal structure and their behavior.

Problems from many walks of life (production, agriculture, trade, transport, sport etc.) are becoming increasingly complex. This requires perfection of methods for solving these problems and the development of new methods.

The inter-dependence between facts in sport may be represented in models.

According to V. Boshnakov (2001) the model of the object researched is every form of the researched object, materially or in terms of information, defined in language and satisfying all the aims of the research. If the model is defined in mathematical terms we are talking about a mathematical model.

The main requirement for the use of a model is to facilitate knowledge. The end target of modulation is to refurbish or check certain facts on the original, the results gained through the model must be taken from the original because the model replaces the former in the process of the research. The inter-dependence ascertained from the model is used for control, prognosis, and the search for optimal planning. In some cases representative research is used, while adhering to statistical rules: a group of subjects are chosen and studied. The information gained gives us a general conclusion concerning the entire structure. This is also a model. Mathematics has long since found a place in the research of phenomena in various branches of science. In physics, for example, classical mathematical models exist. These models are widely used as:

- A means of carrying out experiments

- Tools for prognosis
- A means of interpreting phenomena and factual processes

The aims of modulation are:

- To explain researched phenomena or processes (descriptive)
- To predict the behavior of the objects researched (prognosis)

Mathematical models can be represented in equations, irregular equations, graphics, graphs, logical conditions, tables etc.

With one and the same mathematical description different processes can be modulated, i.e. the same mathematical formula or equation can be utilized as a model in different cases. With differential equations, for example, modulated phenomena from different branches of science can be defined. Electronic calculating machines can solve all problems for which they are programmed. Furthermore, an exact mathematical record of different phenomena reflects the similarity between essentially different phenomena and processes. This furnishes the possibility of revealing their character in relation to other phenomena and processes. Modulation using mathematical equations or systems is the most complex and the most abstract. They are utilized for the description and prognosis of the phenomena. With them the dynamics and fluctuations of the observed phenomena is studied while a visual model (e.g. a picture) reproduces a given static phenomena (in a certain time span).

The aim of building a mathematical model is to clarify:

- the scale, the defining condition, and behavior of the studied system

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- quantity of conformity (mathematical laws) within this scale

The application of modulation increases because of the unexpected possibilities presented by modern calculating technology. The practical side of modulation lies in cyber-net methods of finding the optimal solution to a given problem.

We may draw the conclusion that the model is one of the methods of reflecting the world at large. The use of models is a means for scientific economic experimentation.

The structure of a given analytical model may be presented mathematically in the following fashion:

$$y = f(x_1, x_2, \dots, x_n)$$

where: y is a dependent variable, thus a resulting phenomena; x_i - non-dependent variable, which may be controlled, manifesting factor; f - functional dependence between x and y

Every model is a combination of:

- elements - it consists of parts, which in the model are calculated in a given fashion
- variables - values resulting from specific measurement. Variables are: non-dependent (x_i), which grows outside the system or occur as a result of external forces, also known as incoming and dependent (y)
- parameters (a, b, c) - constants
- dependence - describes the relationship between components. In sport dependents are correlated.
- limitation - borders of the fluctuation in variables
- target - establishing the condition of the studied object or its optimization. The method of statistical research is the method of solving the mathematical problem for research into a complex system with the aid of modulation of processes' whose evaluation is of a probable character. By using this method modulation is by equation which describes the results of unpredictable processes.

To solve the given problem with the aid of modulation many questions may be raised. Modulation furnishes the possibility of finding the expected results through statistically probable models of forecasting the behavior of objects.

Modulation saves time and resources and facilitates research possibilities which do not naturally arise. In the present research the aim is to modulate the relationship between results of tests in long-jump with two feet from a fixed point and throwing a 1 kg shot putt with two hands over the head. The study encompassed 17 pupils from 4th grade.

Creating a diagram of dispersal illustrates that an inter-dependence probably exists. In creating a regressive model we use the equation:

$$\begin{cases} \sum y = an + b \sum x \\ \sum xy = a \sum x + b \sum x^2 \end{cases}$$

x represents the results of the long-jump with two feet from a fixed point (x in cm), and y - the results of the throwing the 1 kg shot putt over the head (y in meters).

From the data we can expound:

$$\begin{aligned} \sum x &= 2720 \\ \sum y &= 113.8 \\ \sum x^2 &= 439350 \\ \sum y^2 &= 790.1 \\ \sum xy &= 18407 \end{aligned}$$

In solving the system we get the following model and the relationship:

$$y = -0.97817 + 0.0479518 \cdot x$$

$$\text{Standard assessment error } S_{\frac{y}{x}} = 1.0837146$$

The model received reflects the influence of the results of the long-jump with two feet from a fixed point test (x) on the results of the throwing of the 1kg shot putt over the head test (y).

We can also modulate the influence of y on x , but then the solution system to be used is:

$$\begin{cases} \sum x = an + b \sum y \\ \sum xy = a \sum y + b \sum y^2 \end{cases}$$

And the model is:

$$x = 11.94394 + 7.0294643 \cdot y$$

$$\text{In this case the standard error is } S_{\frac{y}{x}} = 13.214575$$

We can also calculate the co-efficient of the correlation, $r = 0.58$ which indicates a substantial inter-dependence between the modulated phenomena.

1. With an increase of 1 cm in the result of the long-jump with two feet from a fixed point, an improvement of 0,0479518 meters 4,8 cm. is observed in the throwing of the 1kg shot putt with two hands above the head.
2. If the results of the two students studied in the test for throwing the 1kg shot with two hands above the head differ by 1 meter, theoretically one would expect their results in the long-jump with two feet from a fixed point to differ by 7 cm.

The value of the tests studied should not stray outside the parameters of the interval, including the results of the test students, otherwise the model is invalid.

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