

## On the Method of Using Variance Analytical Skills in Sport-Pedagogical and Biomedical Research

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### ABSTRACT

Researchers are actively working to improve the training process of athletes, as demonstrating theory and correctly interpreting the results provide an opportunity to be advance about the effectiveness of the proposals. Important tests are based on variance analysis. The purpose of the research is to develop a method for the training of practical skills using variance analysis to analyze the results of sports, pedagogy and biomedical research for students in the field of physical education and sports. The present work suggests a method of forming students practical skills to perform variance analysis of sports-pedagogical and biomedical data is proposed. The implementation of the method involves focusing students' attention on performing variance analysis using computer programs. Automating the calculation process allows students of the department of physical education and sports to perform high-level statistical data processing.

**KEY WORDS:** TRAINING, ANALYSIS, FACTORS, STATISTICS, RESEARCH.

### INTRODUCTION

Sport often comes with maximizing the reserve of the body's function. Therefore, at present, the evolution of scientists in order to optimize the training load is increasingly realistic in sports training practice. However, the quality of the study directly depends on the adequacy of the applied statistical analysis methods, because the use of false statistics negates the significance of the research activity. In fact, the publication of research results involves authoritative statistical processing of empirical data like the Fundamental Principles of Research Jobs

for Higher Education Graduates in Culture of Sports. Only under such conditions, theoretical results can be used for reasoning in sports practice. Therefore, a highly qualified expert in physical culture and sports should be well versed in statistical research tools, (Byshevets, 2017) Byshevets and Denysova 2019, Kostiukevych et al. 2019).

An assessment of scientific, methodological and specialized materials, reflecting the issues preparing students for the field of physical education and sports, shows that today, scientists are widely used Mathematical and statistical apparatus to prove their findings (Stroganov and Sergienko 2013). Incorrect use of statistical methods and criteria can lead to deviations in test results and false conclusions. In experimental medicine and in the field of physical culture and sports, there are scientific works, the published results raise suspicion (Lang and Sesyk 2016). Evidence-based medical research of Leonov, (2017) suggests the use of mathematical estimates of the probability of its influence or absence under the variance analysis to analyze sports and education data

### ARTICLE INFORMATION

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education and biomedical. An analysis of variance is influence of scientific studies the athlete models leads to decide to apply a specific training method. Therefore, future experts need to have statistical knowledge and formulate practical skills in the processing of empirical data statistics.

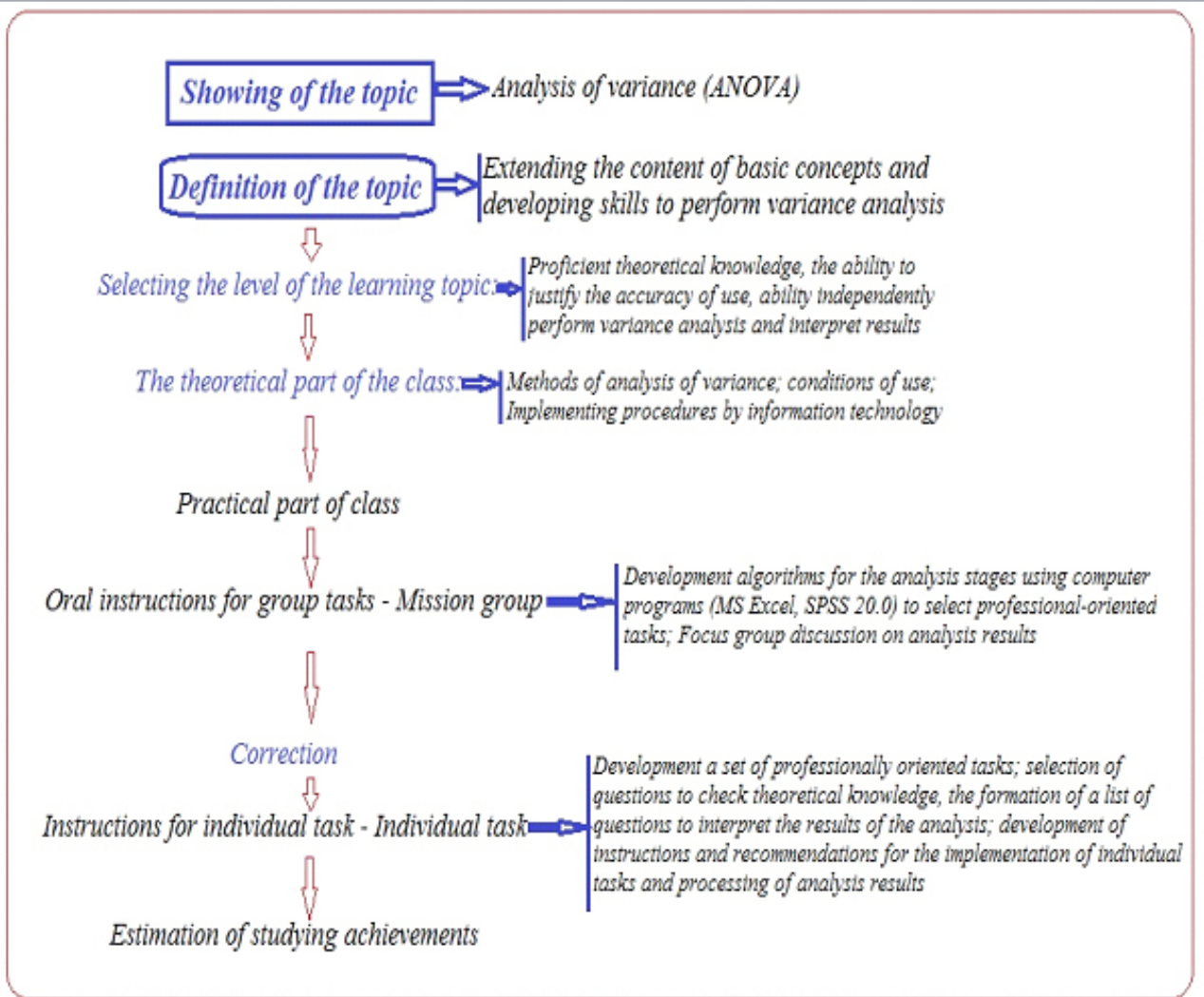
When analyzing literary sources, it is shown that currently experts have not presented methods for forming practical skills in using students' a well-known method for assessing the statistical importance of differences between sample populations, developed in the 1920s by English mathematician Fisher; it was the basis of a broad class of important criteria (Glantz, 1998). Looking at the practical aspect of using variance analysis to improve the system of sport choices (Drozdovska, 2015). Research purpose - to develop a method of forming practical skills using variance analysis for students in physical education and sports to analyze the results of sports and pedagogical research and biomedical. The methods of this study included analysis of scientific literature and related methods, internet sources, data and other

mathematical statistical methods, including standard computer data processing.

During the study, we identified pedagogical conditions to form practical skills in using variance analysis for sports, pedagogy and biomedical data at high facilities. Among such conditions should include:- Expand the theoretical basis for methods of analysis of variance, conditions of use, characteristics of the ANOVA process;- Use of professionally oriented tasks;- A clear algorithm is available for the analysis phase using IT methods of student formation, where the practical skills for performing variance analysis are shown in Figure 1.

The study considers methodological implementation to develop students' practical skills in performing variance analysis of sports-pedagogical and biomedical data. It should be noted that: The peculiarity of the proposed method is due to the professional training content of future experts on sports and sports culture. First, they are:

Figure 1. Method of forming students' practical skills to perform variance analysis of sports-pedagogical and biomedical data



**Minimize theoretical reports;- Focus on forming practical skills in students:** Automate the ANOVA counting procedure. At the stage of the theoretical part, students are informed that the purpose of variance analysis is to test hypotheses about the relationship between certain characteristics and unrelated research elements in terms of quantity, as well as to establish the level of influence on the factors - circumstances affecting their results and interactions. The basis of variance analysis, considered a parameter criterion for comparing media between several sample sets, is the study of the components of variance. We emphasize that a variance analysis, depending on the number of factors, is equal to a one-way ANOVA, two-way ANOVA, or multivariate analysis. The results emphasize the need to meet the following conditions: the normal distribution of the characteristics from which the sample is taken; equality of dispersion of experimental properties (Gusev, 2000). At the stage of practical skills formation, we suggest problem-solving. For example, 34 athletes with the same fitness level were trained in four different methods. At the end of the study, they performed a pilot exercise. The input data is shown in Figure 2. The task is to assess the impact of the training method on the outcome of the test exercise.

Using the variance uniformity criterion for Leven's Test, we test the hypothesis that all distributions of the dependent variables for the compared samples have the same variance. As can be seen in Figure 2 (a),  $p > 0.05$ , so the variances of the groups were compared to be homogeneous, meaning that there was no qualitative difference between them. Therefore, it is reasonable to use one-way ANOVA variance analysis.

After performing the standard procedure for calculating Fisher criteria using MS Excel or SPSS 20.0 (b), we established the presence of statistically significant differences between the results of the test exercise in the transport teams. The motivations were compared with Fisher criterion ( $p < 0.05$ ). Therefore, the training method has a significant impact on the results of the test exercise performed by the athletes. Figure (2) shows that Method 4 turns out to be the most effective and Method 1 turns out to be the least effective. In addition, the use of the procedure for comparing pairs of means both by Bonferroni (c) and by Scheffe (d) proves that the difference is statistically significant ( $p < 0.05$ ) between results. of the test exercises performed by athletes involved in methods 1 and 4.

Figure 2: Perform an analysis of the variance factor in the SPSS 20.0 program

	MS Effect	MS Error	F	p
<b>Result</b>	<b>0.025121</b>	<b>0.211356</b>	<b>0.131724</b>	<b>0.960312</b>

Effect	Degr. of Freedom	Result SS	Result MS	Result F	Result p
<b>Intercept</b>	1	1321.721	1321.721	1426.215	0.000000
<b>Technique</b>	3	11.720	3.829	4.078	0.007641
<b>Error</b>	30	18.017	0.912		
<b>Total</b>	33	31.025			

a) Estimate the variance homogeneity for Levene's Test; b) Fisher test calculation

Cell No.	Technique	{1}	{2}	{3}	{4}
		7.1426	8.0060	7.6000	9.2600
<b>1</b>	Technique1		0.620790	1.000000	0.013702
<b>2</b>	Technique2	0.620790		1.000000	0.307824
<b>3</b>	Technique3	1.000000	1.000000		0.109822
<b>4</b>	Technique4	0.013702	0.307824	0.109822	

Cell No.	Technique	{1}	{2}	{3}	{4}
		7.1426	8.0060	7.6000	9.2600
<b>1</b>	Technique1		0.506371	0.904083	0.022875
<b>2</b>	Technique2	0.506371		0.902421	0.260019
<b>3</b>	Technique3	0.904083	0.902421		0.136743
<b>4</b>	Technique4	0.022875	0.260019	0.136743	

c) Collating averages for Bonferroni test; d) Collating averages for Scheffe test

That is, method 4 is more effective than method 1. Apparently the use of computer programs allows you to automatically simplify the calculation process and greatly simplify the process of data analysis. This allows students in the field of physical culture and sports, who often do not have a solid mathematical background, to process statistical mathematical data. Research shows that analysis of variance is quite common in psychology and pedagogical studies. Clearly, due to the increasing demand for the quality of science work in physical education, the evolution of practical skills to apply dispersed analysis among students of institutions higher education to analyze sports results - pedagogical and biomedical research. A method of forming students' practical skills to perform variance analysis of sports and biomedical data is proposed. Its characteristic feature is to focus the attention of future experts on physical culture and sports on the practical part of performing variance analysis by IT.

The prospect for further research is to illustrate methods for forming statistical knowledge and practical skills of students in the field of physical education and sports for statistical analysis of data in physical studies sports, education and health. Gusev (2010), addressed the characteristics of analysis using variance in empirical studies. Indeed, analysis of variance helps to solve a number of journalistic issues related to estimating differences between sample averages of different number of groups, surveys or differences between groups identified by factors. The factors are controlled and the influence value of each factor and their interactions determined (Lupan and Avramenko 2010), these reasons make it quite important for analyzing sports and educational data. The present study has paid attention to the importance of learning the basics of variance analysis. For the training of future statisticians: Lupan and Avramenko (2010) proposed practical tasks to analyze variance and give examples of their solutions using the most popular computer statistics packages.

In addition, it has long been tested and has a famous system algorithm for computing. Some computer programs automate the implementation of the ANOVA procedure, which makes sense. Prospects for analysis using variance for a variety of researchers. However, though, students of higher education and health institutions have no clear idea of the purpose of analyzing variance and interpreting the results of computational procedures. Theory and practice of sports training require more accurate and reasonable research results. The scientific level of empirical work depends on the proficiency of the scientific and pedagogical community studies by empirical statistical data processing methods. Misuse of

the statistical system falsifies test results and leads to erroneous conclusions. One of the tasks of the student training system in the field of physical education and sports are to formulate research results handling skills, they have the necessary theoretical knowledge, practical skills and skills in using modern information technology to solve professional tasks. Analysis of variance involves establishing a relationship between qualitative (nominal) and quantitative (continuous) variables.

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