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## HOMOGENEITY OF STUDENT GROUPS BY THE INDICES FOR PROFESSIONALLY SIGNIFICANT INTELLECTUAL CHARACTERISTICS OF PHYSICAL EDUCATION DISCIPLINE AT THE UNIVERSITY OF MINING AND GEOLOGY „ST. IVAN RILSKI“

Iv. Stavreva\*

Department of Physical Education and Sports, University of Mining and Geology “St. Ivan Rilski“, Sofia,  
Bulgaria

### ABSTRACT

In profессиograms for the different professions, it is obligatory to indicate the professionally-significant qualities of the successful realization of experts. In our work, we have focused our attention on the professionally-significant intellectual qualities for engineers, at the mining branch. The aim is to investigate the level of development of these qualities with students, educated for the profession at the UMG „St. Ivan Rilski“-Sofia and establish the variability of some educational groups (Basketball, Table tennis, Fitness and Football) of the subject „Physical education“. From the investigated six professionally-significant intellectual (cognitive) indices, the results on two of them -*precision and quality of the operative thinking*, define the groups as homogeneous. With three of indices, the groups are determined as comparatively homogeneous—*concentration of attention, speed of operative thinking and visual memory*-exclusion is the football group which is heterogeneous. As regards the *logic thinking* the four investigated groups are highly heterogeneous, with the exception of the Table tennis group, which is comparatively homogeneous. In conclusion, it is recommended by suitable means and methods, to work persistently on building and perfection of cognitive characteristics that will ease the realization of future experts.

**Key words:** students, cognitive, professionally-significant, qualities, physical education, mining industry

### INTRODUCTION

Contemporary methods of education and training at the universities constantly improve and make perfect the results at acquiring the teaching materials. Acquiring of knowledge from various world sources is getting more and more accessible at the libraries and different world platforms. Along with the knowledge, it is often mentioned the availability of qualities, important for the future professional realization of students.

According to K. Spasov, „the suitability of any person to a given profession has very generalized content, manifested in not only knowledge and skills, but in availability of physical qualities, capacity (capacity for work), neuropsychological qualities, characterizing one of the most important sides of the fitness of human beings to a given profession “ (1). To a certain extent, the application exams help the universities to admit school leavers of similar level of knowledge on educational subjects (2). According to profессиograms prepared for experts in Mining sector, the importance of the high level of development of the intellectual qualities is also indicated (3). Surveying the profессиograms, as regards the psychic qualities (psychomotor and

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\*Correspondence to: *Ivanka Stavreva, PhD, Department of Physical Education and Sports, University of mining and geology “St. Ivan Rilski“, Sofia, Bulgaria, 1700, Sofia, Studentski grad, Email: e-mail: vania.stavreva@abv.bg, Mobile: +359 (0) 886 050 587*

intellectual) the quality *logic thinking is outlined*, followed by the qualities *concentration of attention, operative and analytical thinking*, as well as *the good memory* (4). Comparing the significant intellectual qualities for engineers from the Mining branch with those of economists, some coincidences have been established at eight of the qualities *analytic, logic, operative and prognostic thinking, concentration and steadiness of attention, visual and strong memory* (5). In a survey of the correlation between male and female students, attending basketball activities at the UNWE, no statistically significant correlations have been established between the volitional qualities and ways of thinking with the students of both sexes (6). In another investigation of the influence of the type of sport practiced, on perfection of the intellectual qualities, it is established that students - basketball players at the UNWE, statistically reliably improve their results on six discussed intellectual qualities. In the remaining two, there is an improvement but same is not supported statistically (7). Some investigators compare the intellectual qualities between students, practicing basketball and fitness (8), as well as between those doing table tennis and football in the physical education hours, at Russe University (9). In a dissertation work, results of homogeneity of investigated groups of male and female students doing basketball in educational groups have been received. As for the psychomotor and intellectual qualities, the students outline as comparatively homogeneous. Exception is *the speed of operative thinking*, on which the group is heterogeneous. The results are the same for female students too, while apart from *the speed of operative thinking*, with the *logic thinking and visual memory* too, the group is determined as heterogeneous (10).

Reporting the importance of intellectual qualities for development and success in the future labour activity of a given profession, it is important to investigate this issue, in order to establish the level of development and indicate the ways of improvement and perfection of this type of quality, by the help of means and methods of physical education.

## PURPOSE, TASKS AND METHODS

**The aim** is to establish the level of development and homogeneity of educational groups by the indications for significant intellectual qualities for the profession of the engineer, at Mining branch (*concentration of attention, operative thinking (precision, speed and quality) logic thinking and visual memory*).

**The tasks**, we have set are the following:

1. To establish the level of development and the average levels of *concentration of attention, operative thinking (exactness/precision, speed and quality), logic thinking and visual memory* with students from all four investigated aggregates;
2. To establish the level of variability of educational groups towards these indices;
3. To compare the indices for homogeneity between the investigated contingents and to make recommendations for future work with students in the occupations on physical culture discipline.

## METHODS

The investigated contingent are students-men I and II year, enrolled for an elective sport in groups on Basketball, Table tennis, Fitness and Football, attending sport activities from Physical culture discipline –elective obligatory form of education, at the UMG „St. Ivan Rilski“. Number of students (men) participants in sport-pedagogical experiment from the groups is as follows: Basketball-13, Table tennis-21, Fitness-18, Football -17. The total number of students included is 69 (sixty nine) of various specialties, at the UMG „St. Ivan Rilski". The experiment has been carried out in spring (May), 2018.

For defining the level of concentration of attention, the Test of Scthulte has been used. Five Tables with figures from 1 to 25 in different combinations, given consecutively. The individual, under inquiry is demanded to find out on the tables, to enumerate loudly and show in ascending order, each one figure from the respective sequence. Time in seconds for fulfillment of the task is reported, using chronometer, for the purpose. For defining the level of concentration of attention, the average arithmetic time is taken for indicating the figures from Tables Nos. 2,3,4 and 5 (11). The level of operative thinking was assessed when the

investigated individual settles a set of series of combinations of different complexity. For each combination, the accuracy (number of motions) and speed (time for settlement of combination) are measured. These indices are transformed by a formula into a coefficient (quality) of operative thinking (12). Logic thinking is determined when on the basis of a specific assertion (or a number of assertions), the formal correctness of one or other logic deduction is to be specified. The factual reality does not play any role. For fulfillment of the indicated 12 tasks, 8 minutes are given (13).

All results have been subjected to variation analysis for defining the average levels and variability of the investigated indices at each of the observed aggregates, as well as the coefficient of variation (V) of the investigated indices.

### ANALYSIS OF THE RESULTS

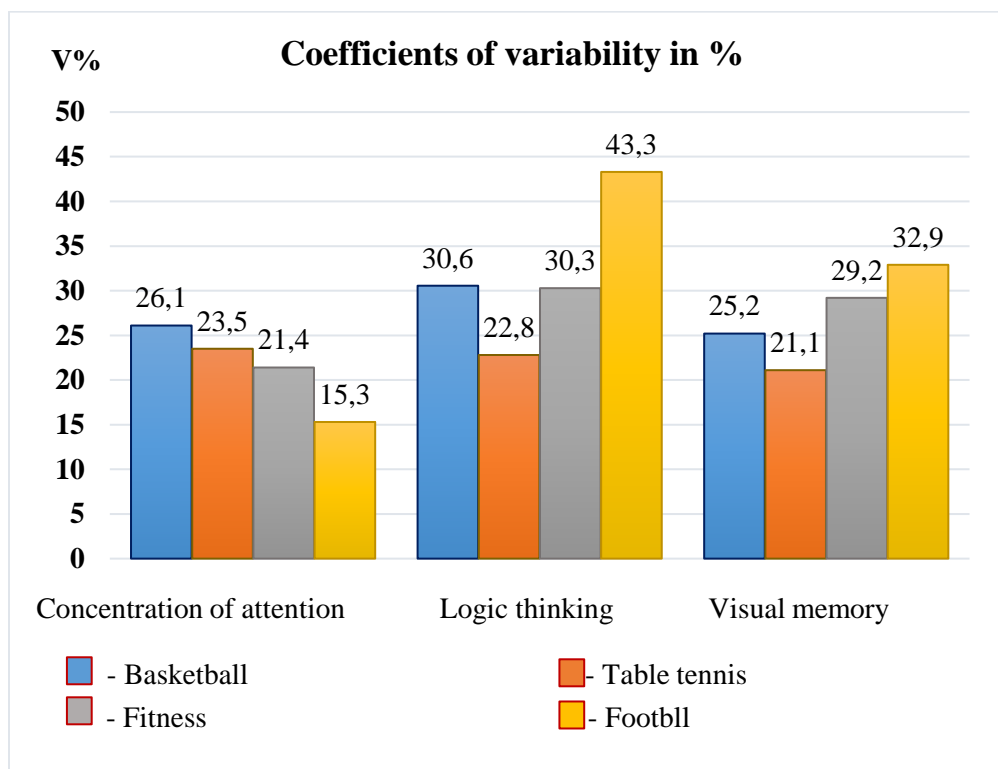
It is generally accepted in the sport science, to interpret the dispersion of the indication into several stages – the excerpt is homogeneous when the value of coefficient of variation (V) is up to 10%. With indices of coefficient of variation between 10 and 30%, the excerpt is defined as comparatively homogeneous. When the index V exceeds 30%, the dispersion of indication is big the excerpt is non-homogeneous (14).

Subjecting the results got from the testing of students from the educational groups on all four

sports, we have got the average levels and values of the coefficient of variation V, defining by it the homogeneity of the educational groups. On **Table 1**, are shown all results of variation analysis for concentration of attention, land visual memory of students from all four sports. All three qualities are established as significant for the experts from the sector. As regards the concentration of attention, the spread R is within limits between 20,6 s for football, to 27,2 s Basketball, and the average indices for all four groups are with close values- from 30 s for basketball, to 33,8 s for Table tennis. Results of the coefficient of variation V define the four groups as comparatively homogeneous. For the logic thinking, indices for R and the average quantities are within the range of 4 points to 6 points. Values of V for the Table tennis group define it as comparatively homogeneous (V=22,8%), while the remaining three groups are defined as heterogeneous. The third index shown on **Table 1** is the Test for visual memory. The spread of the results with all four educational groups is in close outlines - from 7 points for Basketball and table tennis, to 8 points for the Fitness and Football. The average indices are with values from 7,4 points with fitness, to 9,5 points for the basketball group. The values of the coefficient of variation define the groups as comparatively homogeneous (basketball-25,2%; table tennis-21,1%; fitness-29,2%). Exception is the homogeneity of Football group, defined as non-homogeneous (V=32,9%).

**Table 1.** Variability of the results for concentration of attention, logic thinking and visual memory, with students from all four educational groups

Sports	n	X min	X max	R	□□	S	V%	Ex	As
<b>Concentration of attention</b>									
Basketball	13	21,0	48,2	27,2	30,0	7,8	<b>26,1</b>	0,94	0,88
Table tennis	21	18,2	42,2	24,0	30,3	7,1	<b>23,5</b>	-0,92	0,11
Fitness	18	19,2	43,9	24,7	33,8	7,2	<b>21,4</b>	-0,76	-0,50
Football	17	24,8	45,4	20,6	32,4	5,0	<b>15,3</b>	1,81	0,97
<b>Logic thinking</b>									
Basketball	13	1	7	6	5,0	1,5	<b>30,6</b>	3,47	-1,66
Table tennis	21	3	7	4	5,0	1,1	<b>22,8</b>	-1,03	-0,22
Fitness	18	2	6	4	4,6	1,4	<b>30,3</b>	-1,38	-0,28
Football	17	2	8	6	4,0	1,7	<b>43,3</b>	0,47	1,15
<b>Visual memory</b>									
Basketball	13	6	13	7	9,5	2,4	<b>25,2</b>	-1,34	-0,16
Table tennis	21	6	13	7	9,1	1,9	<b>21,1</b>	-0,55	0,28
Fitness	18	4	12	8	7,4	2,2	<b>29,2</b>	-0,24	0,47
Football	17	3	11	8	7,9	2,6	<b>32,9</b>	-1,13	-0,57



**Figure 1.** Homogeneity of educational groups as regards the concentration of attention, logic thinking and visual memory

On the next **Table 2**, are shown the values from application of variation analysis of the results from the Test for operative thinking. Both, the preceding qualities and these are significant for the profession of engineer at the Mining sector. As for the precision of operative thinking the spread of the results (R) varies from 12 motions/runs for the Fitness group, 19 motions/runs for Football group and 20 motions each of Basketball and Table tennis groups. The average results with all four groups are very close - from 68 runs for the Football group to 71,6 runs for Table tennis group. Values of the variation coefficient are very low - Basketball-6,9%; Table tennis-8,6%; Fitness-5,2% and Football-7%. These values define all four investigated groups on this index as homogeneous.

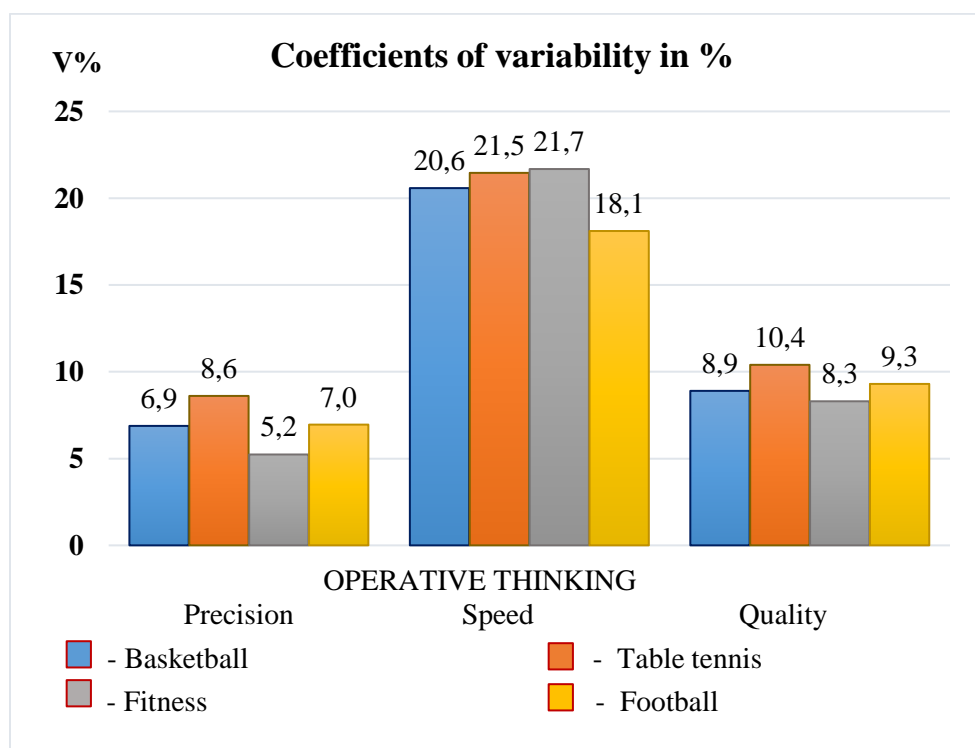
The spread and average indices of speed of operative thinking of the investigated educational

groups are close per values (**Table 2**). Coefficients of variation are respectively 20,6% for Basketball group, 21,5% for Table tennis group, 21,7% for Fitness group and 18,1% for Football group. They all define as comparatively homogeneous, the groups on the index for speed of operative thinking.

The third index for quality of operative thinking (**Table 2**) is a function of the preceding two indices. The spread of the results is within the limits from 0,5 to 0,7 marks/grades. The average values of all four groups are almost equal -1,6 and 1,7 marks. The values got for the coefficient of variation define the groups as homogeneous (Basketball-8,9%; Fitness-8,3 and Football-9,3). Only the value of Table tennis group ( $V=104\%$ ) defines the group as comparatively homogeneous (**Figure 2**).

**Table 2.** Variability of the results for all three components of operative thinking – precision, speed and quality, with the students of all four educational groups

Sports	n	X min	X max	R	□ □	S	V%	Ex	As
<b>Operative thinking-precision</b>									
Basketball	13	64	84	20	70,2	4,8	<b>6,9</b>	5,72	1,95
Table tennis	21	64	84	20	71,6	6,2	<b>8,6</b>	-0,94	0,43
Fitness	18	66	78	12	69,3	3,6	<b>5,2</b>	2,31	1,61
Football	17	64	83	19	68,0	4,7	<b>7,0</b>	5,87	2,10
<b>Operative thinking-speed</b>									
Basketball	13	24	53	29	33,7	6,9	<b>20,6</b>	5,04	1,82
Table tennis	21	26	54	28	37,1	8,0	<b>21,5</b>	-0,07	0,88
Fitness	18	26	63	37	36,4	7,9	<b>21,7</b>	7,56	2,27
Football	17	24	49	25	34,6	6,3	<b>18,1</b>	0,82	0,16
<b>Operative thinking-quality</b>									
Basketball	13	1,4	1,9	0,5	1,6	0,1	<b>8,9</b>	1,52	0,95
Table tennis	21	1,4	2,0	0,6	1,7	0,2	<b>10,4</b>	-0,39	0,46
Fitness	18	1,5	2,0	0,6	1,7	0,1	<b>8,3</b>	3,09	1,54
Football	17	1,4	2,1	0,7	1,6	0,1	<b>9,3</b>	5,53	1,63



**Figure 2.** Homogeneity of educational groups as regards all three components of operative thinking – precision, speed and quality

## CONCLUSIONS AND RECOMMENDATIONS

1. Homogeneous are all groups on the indices for *precision and quality of operative thinking*. Exception is the Table tennis group, defined as comparatively homogeneous on the index for *quality of operative thinking*;

2. Comparatively homogeneous are all educational groups on the index for *speed of operative thinking, concentration of attention and visual memory*, excepting the Football group, defined as heterogeneous on the index for *visual memory*;

3. Heterogeneous are the groups on the index for *logic thinking*, excepting the Table tennis group, the value of which V, defines it as comparatively homogeneous;
4. It is recommended, by suitable means and methods at the occupations, as a permanent process, to work for building up and perfection of the cognitive characteristics that would ease the realization of the future experts.

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