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## Changes in mental performance indicators (volume processing visual information) girls junior grades of secondary schools

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### Kamenets-Podolsky National University named after Ivan Ohienko, Ukraine

**Summary.** The paper presents results of a study of cognitive function (as one of the components of mental capacity) the amount of visual information processing (AVIP) 40 girls second year of secondary schools in Kamenets-Podolsk №№ 5, 9. To achieve the objectives defined set of methods and means of research. Using methods psychodiagnostic testing identified indicators of mental capacity (volume processing visual information) during the year four times: at the beginning and end of the first and second semesters.

The study found that girls' mental capacity for the second year AVIP characterized by similar figures at the beginning and end of the respective first and second semester of the academic year. The data are characterized by the possibility of keeping mental capacity at the appropriate level without negative health consequences of primary school girls provided to improve the content of their physical education.

**Key words:** mental performance, girl's second grade, physical education.

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### Zmiany wskaźników zdolności umysłowej (ilości przetwarzania informacji wizualnej) uczennic szkoły podstawowej

**Adnotacja.** W artykule przedstawione wyniki badania poziomu kognitywnej funkcji (jak jednej ze składników zdolności umysłowej) ilość przetwarzania informacji wizualnej 40 uczennic drugiego roku szkół ogólnokształcących m. Kamieniec Podolski № № 5, 9. Do rozstrzygnięcia postawionych zadań wyznaczyły kompleks metod i środków badania. Wykorzystawszy metody psychodiagnostycznego testowania, wyznaczyły wskaźniki zdolności umysłowej (ilość przetwarzania informacji wizualnej) w ciągu roku cztery razy: na początku i pod koniec pierwszego i drugiego semestrów.

Podczas badania ustalono, że umysłowa zdolność uczennic drugiego roku nauczania za ilością przetwarzania informacji wizualnej charakteryzuje się podobnymi wskaźnikami na początku i w końcu odpowiednio pierwszego i drugiego semestrów roku szkolnego. Otrzymane dane charakteryzują się możliwością utrzymania zdolności umysłowej na odpowiednim poziomie bez negatywnych skutków dla zdrowia uczennic szkoły podstawowej pod warunkiem polepszania treści ich edukacji fizycznej.

**Słowa kluczowe:** zdolność umysłowa, uczennice klasy drugiej, wychowanie fizyczne.

### Problem statement.

One of the important social issues of today are the training and education of children who are students of elementary school, because at this time are the

foundations of their physical, spiritual, intellectual, creative development, so it foundations full of personality.

In connection to the nowadays education in Ukraine marked the formation of intense conceptual ideas, policies and active introduction in the educational process developed on the basis of their different pedagogical innovations for elementary school students.

However, all teachers do not doubt the fact that the successful solving problems before starting school are impossible without high mental and physical condition of children. This makes it necessary to study the peculiarities which at present marked in such a state primary school in general and the second year in secondary schools in particular.

At the present stage of development of theory and methods of physical education as a field of scientific knowledge has not yet formed a final position on the issue of such complex characteristics of the human person as a «psycho-physical condition». This is confirmed by the analysis of scientific papers in which the object of research performed is designated by the individual characteristics [4; 6] and data of literature [7; 9].

The conclusion made in the analysis of these references is that in most cases there is a combination of two complex characteristics of the individual as his mental and physical condition. Thus, in the most general form, structure and diversity of mental manifestations of mental life of the individual are formed due to the unity of mental processes, qualities and states are forms of existence of his mind. Mental quality and mental states are considered as a phenomenon that exercises direct control of individual actions. They belong to nature, needs, motives, inclinations, abilities, emotions and feelings of the individual. Regarding mental processes, they provide individual self-discovery and the environment, in particular through sensation, perception, attention, memory, and thinking. In other words, these processes are complex characteristic, and its components – emotional processes, cognitive processes and will [10].

Almost all studies in physical education study only some of these characteristics, primarily associated with emotional and cognitive processes. This is because the state of their occurrence depends largely on the effectiveness of training activities and problem solving in general physical education in particular [1; 2].

### **Objectives, structure and methods.**

Formulation of goals. Purpose – to determine the level of cognitive function (as one of the components of mental capacity) the amount of visual information processing (AVIP) girls second year in secondary school.

Methods and organization of investigation. During the study group used the following methods: general scientific – analysis, synthesis, generalization, systematization, comparison; teaching methods – observation, testing, pedagogical experiment; psych diagnostic methods – testing; mathematical and statistics.

Using psycho diagnostic testing and, in particular test that allowed children to assess cognitive function, – «ESAP» (The European Survey on Aging protocol). The used test recommended by the European Association of Psychologists after testing during the pilot project «EXCELSA-Pilot» on the territory of the EU and Ukraine for 1998–2001. [5], based on a modified technique was Wechsler-Shannon [8].

Methods of test used are included. During the 90<sup>th</sup> seconds point children in each cell protocol symbol that corresponds to certain numbers («1» to «9» inclusive); such correspondence is contained in the record, so children can always restore it from memory (Table. 1).

The problem was in the right filled during that time the highest number of cell protocol. After that, it was estimated number of correct characters and using formula stated below based on these responses were evaluated with a cognitive function that characterizes mental efficiency (ME) – the amount of processed visual information (APVI):

$$\bullet AVIP = (\log_2 \left(\frac{n}{92}\right) \times 9) \times n,$$

where: «log 2» – logarithm of «2», «n» – the number of correct characters «92» – the total number of options in the minutes.

To solve the problem of research testing performed three times a day, every day, throughout the school week from Monday to Friday inclusive, at a time in early learning activities – testing occurred at the start of the lesson schedule; after the implementation of this half – right after the third lesson; after the implementation of all training activities on schedule – as soon as the fifth lesson.

Table 1

### Sample Protocol «ESAP» for determination of mental capacity of children

1) Example to help the student – each figure corresponds to a character that should play a key protocol, given a number which you can see:

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
–	±	>	L	+	O	∩	X	=

2) The Protocol to fill student:

To repeat								The basic protocol																
2	1	3	1	2	4	3	5	3	1	2	1	3	2	1	4	2	3	5	2	3	1	4	6	3

Continuation of the underlying protocol																								
1	5	4	2	7	6	3	5	7	2	8	5	4	6	3	7	5	8	1	9	5	2	4	7	8

Continuation of the underlying protocol																								
6	2	5	1	9	2	8	3	7	4	6	5	9	4	8	3	7	2	6	1	5	4	3	1	6

Continuation of the underlying protocol																								
3	8	6	7	4	9	2	1	6	8	3	4	7	5	4	9	3	4	9	4	7	2	5	3	4

Name surname: \_\_\_\_\_

class \_\_\_\_\_ filing

\_\_\_\_\_

During the academic year indicated psycho diagnostic testing procedure was repeated four times: at the beginning of the school year; end of the first semester; at the beginning of the second semester, at the end of the school year. Used psycho diagnostic testing organization encouraged by these results, three times a day during the school day allows testing to determine the early learning activities – current (on a specific day of the week) such as cognitive AVIP. The second (right after the third lesson) and third (after the implementation of all training activities on schedule) testing reflects primarily the ability of the child support at baseline parameters studied parameters – reducing their meanings certify slowing appropriate mental reactions, reduction of mental capacity in a given period learning activities because of fatigue.

**Results.** Daily during the school week testing helped determine the dynamics of the studied parameters in this period of training activities and carried out in stages above the school year: trends in these indicators from the beginning to the end of the first semester; efficiency of recovery of the body in terms of normalization (increase) parameters of cognitive function during the winter holidays; trends in performance from the beginning to the end of the second semester.

The study was attended by 40 girl's students of second year, which at the time the experiment was 7 years old secondary schools №№ 5, 9 m. Kamenets-Podolsk.

The data obtained showed that. For each day school week at the beginning of the school year AVIP observed similar dynamics, which was to increase the value of this indicator MP from 1<sup>st</sup> to 5<sup>th</sup> lesson, but with certain features. So on Monday and Tuesday AVIP significantly (at the level of  $p < 0.05$  to  $p < 0.001$ ) increased from 2<sup>nd</sup> to 3<sup>rd</sup> test, namely 74.8 % and 35.2% respectively, while 1<sup>th</sup> to 2<sup>nd</sup> – only marked tendency to change.

The next day, on Wednesday, AVIP increased from the 1<sup>st</sup> to the 2<sup>nd</sup> test at 67.8 % ( $p < 0.001$ ), then marked tendency to decrease as the value deteriorated by 10.6% ( $p > 0.05$ ). As for Thursday and Friday, there is in all cases received only positive trend in the index values.

Summarizing the findings revealed that first, AVIP girls in the study period increased every day if Monday after the 1<sup>st</sup> test it was  $23.16 \pm 1.85 \text{ bits} \cdot \text{s}^{-1}$ , the Friday after the 3<sup>rd</sup> –  $95.86 \pm 6.52 \text{ bits} \cdot \text{s}^{-1}$  ( $p < 0.001$ ). Secondly, the last value of the index is practically no different from established after the 3<sup>rd</sup> test Wednesday – AVIP here was  $81.59 \pm 8.14 \text{ bits} \cdot \text{s}^{-1}$  ( $p > 0.05$ ).

Thirdly found that at the beginning of each new day school week were mentioned at which girls reached the day before, that after the 3<sup>rd</sup> Test eve. However, as noted earlier, AVIP girls increased during the day Monday-Wednesday, while on Thursday and Friday, although there was a definite positive trend, but the change in the index only allowed to establish its manifestation on the achieved level.

In other words, on Monday-Wednesday MP girls increased by AVIP. On Thursday, due to the inability of the body to the new school day regain their physiological resources recovery process continued during learning activities – MP growth rate slowed down due to stabilization. On Friday, due to further growth of fatigue, body defense mechanisms and limited increase in these parameters.

Use of girls in the first half of the second year of the secondary schools existing organization and content of training and motor activity contributed to some change their MP at the end of the first semester. So AVIP dynamics in each day there was a similar trend in education that was to change the values of this index MP from 1<sup>st</sup> to 5<sup>th</sup> lesson, but with certain features. In particular, Monday to Thursday inclusive AVIP increased from the 1<sup>st</sup> to the 2<sup>nd</sup> test, namely: Monday – by 109.3% ( $p < 0.001$ ), Tuesday – 39.3% ( $p < 0.05$ ), Wednesday – 45.5% ( $p < 0.001$ ) Thursday – 27.8% ( $p < 0.05$ ); from 2<sup>nd</sup> to 3<sup>rd</sup> test

changes in value of the index although they were different directions, but only reflect a trend – in other words AVIP remained at levels previously achieved.

As for Thursday last week learning the first half, it was seen as important because, as noted above, the substantial increase AVIP from 1<sup>st</sup> to 2<sup>nd</sup> test in the future (from 2<sup>nd</sup> to 3<sup>rd</sup> test) value of the index worsened by 30.4% ( $p < 0.001$ ). A similar result is obtained on Friday, except for the following: deterioration from 2<sup>nd</sup> to 3<sup>rd</sup> test was 21.3 % ( $p < 0.05$ ) and from 1<sup>st</sup> to 2<sup>nd</sup> – AVIP expression was observed on laurels level, although it showed a positive trend.

Summarizing the findings established that the first, AVIP girls in the study period grew not every day, but only the first half of the day Thursday if Monday after the 1<sup>st</sup> test value was  $33.65 \pm 3.65 \text{ bits} \cdot \text{s}^{-1}$ , then on Thursday after the 2<sup>nd</sup> –  $142.01 \pm 7.83 \text{ bits} \cdot \text{s}^{-1}$  ( $p < 0.001$ ).

Secondly, the last value of the index was the highest compared with other during the week, then took his decline, and then – to maintain the achieved level. Thirdly, in the above days (Monday to Thursday inclusive) at the start of each new day was AVIP at which girls reached the day before, that after the 3<sup>rd</sup> Test eve. Moreover, this applies both days, during which the indicator value increased, and when it recorded a decrease.

In other words, from Monday to Thursday inclusive, but by the middle of the school day, MP girls increased by AVIP. On Thursday, after the third lesson (2 tests) due to an increase in fatigue the body is unable to maintain the MP morning because his defense mechanisms reduce AVIP. The next day, due to the inability of the body to fully restore this cognitive function recovery process continues even during training activities – this indicates expression AVIP on the achieved level until the middle of the school day, but after that (due to the continued training activities) defense mechanisms reduce the level at which are cognitive functions.

After the winter break in the first week of training, at the beginning of the second semester MP girls marked by certain features. Yes dynamics AVIP

Monday to Wednesday was very similar and was in significant (at the level of  $p<0.05$  to  $p<0.001$ ) increasing values of from 1<sup>st</sup> to 2<sup>nd</sup> test. In particular, the increase was AVIP: Monday – 50.4% ( $p<0.01$ ), Tuesday – 32% ( $p<0.05$ ) Wednesday – 59.9 % ( $p<0.01$ ). As for the length of time between the 2<sup>nd</sup> and 3<sup>rd</sup> test conditions, in these days have found only a tendency to change that on Monday and Tuesday was positive, Wednesday – no.

In the days following school week AVIP expression values recorded on the achieved level, but trends in different directions, by which girls reached the highest value of the indicator is on Friday in between 2<sup>nd</sup> and 3<sup>rd</sup> tests, namely  $84.94\pm 6.74 \text{ bits}\cdot\text{s}^{-1}$ .

Summarizing the findings established that in the period under AVIP girls grew every day if Monday after the 1st test value was  $25.1\pm 1.96 \text{ bits}\cdot\text{s}^{-1}$ , Friday –  $79.46\pm 7.27 \text{ bit}\cdot\text{s}^{-1}$  ( $p<0.001$ ). However, at the start of each new day AVIP no different from girls made the day before, that after the 3<sup>rd</sup> Test eve. Expressions highest value is AVIP on Friday after the 3<sup>rd</sup> Test testified adaptation of the organism to the proposed training loads and the availability of reserves for their increase.

In other words, from Monday to Wednesday inclusive, but by the middle of the school day, MP girls increased by AVIP, especially on Monday due to growth last throughout the school day. On Wednesday, after the third lesson (2 tests) due to the increased fatigue the body is unable to maintain the MP morning because its protective mechanisms slowdown further increase AVIP, as evidenced by their expression on the achieved level. This level was maintained during the next days (Thursday and Friday), indicating the progress of the restoration not only after, but also during training activities. In this regard, on Friday created a prerequisite for the further improvement of Poland, as the largest (compared to other days of the week learning) values AVIP girls reach it that day during the 3<sup>rd</sup> Test – respectively  $84.94\pm 6.74 \text{ bits}\cdot\text{s}^{-1}$ , while on Monday the 3<sup>rd</sup> test they were  $46.77\pm 3.63 \text{ bits}\cdot\text{s}^{-1}$ , respectively ( $p<0.001$ ).



Use the girls during the period studied in the second year of the secondary schools existing content and learning and motor activity contributed to some change their MP at the end of the second semester, at the end of the school year. In particular dynamics AVIP in every day school week noted a similar trend that was to change the values of, but with certain features. On Monday AVIP increased only from 1<sup>st</sup> to 2<sup>nd</sup> test at 66.7 % ( $p < 0.01$ ), then remained at the achieved level until Wednesday, namely the end of the first half of the day. Then (between 2<sup>nd</sup> and 3<sup>rd</sup> test) revealed new AVIP increase, representing 13.2 % ( $p < 0.05$ ), and then – expression on the achieved level until the end of the school week. In other cases were recorded only tend to change AVIP that, however, there was a different orientation.

Generalization of the obtained data showed that in the study period AVIP girls grew not day and every other day (Monday and Wednesday), in the latter case – from the 2<sup>nd</sup> to the 3<sup>rd</sup> test, indicating the progress of the restoration not only after, but and during training activities. At the same time found a feature that was missing in the other study period. It was that Friday morning (1<sup>st</sup> Test) AVIP girls was significantly higher than on Thursday at the end of the school day (during the 3<sup>rd</sup> Test) – value of the index amounted to  $150.02 \pm 5.95$  and  $115.76 \pm 7.21 \text{ bits} \cdot \text{s}^{-1}$  ( $p < 0.001$ ). However, during the school day AVIP marked tendency to decrease, reaching the end (3<sup>rd</sup> Test) value of  $126.58 \pm 6.55 \text{ bits} \cdot \text{s}^{-1}$ , which was 15.6 % less than at the beginning ( $p < 0.001$ ).

As for other features, they were similar to previously established and lay in the fact that trends change, which was celebrated every school day, eventually led to the following: at the beginning of each new school day AVIP at the level achieved girls day before, after the 3<sup>rd</sup> test on the eve except the above dynamics of Friday.

In other words, from Monday to Wednesday last lesson MP girls increased by AVIP. On Thursday during the day index value remained at the achieved level, but with a tendency to improve. On Friday morning, the figure

reaches the maximum value, but all day reduced so that after the last lesson reaches a value that is much less than in the morning. This suggests that the protective mechanisms reduce AVIP, due to inability of the body to maintain expression of MP in the morning reached level.

The next step of our research was to establish the presence or absence of differences in the dynamics of MP girls in the first and last weeks of training each of the two semesters, at the beginning of the school year and the end of the first semester and the beginning and end of the second semester (at the end of the year). The calculation was based on the fact that the daily dynamics of the studied parameters MP, as highlighted in the first week of each training semester is rational, as happened after the girls a good rest during the holidays.

Comparing data between a daily dynamics AVIP girls received during the school week at the beginning and end of the first semester, found that they differ. As for the expression parameter values, there is a much higher value at the end than at the beginning of the semester due to an increase in physiological capacity of the organism and are consistent with the available data [3; 7]. Given the objectives of our study were significantly more interesting features is AVIP speakers for each day of training weeks.

In general, from Monday to Wednesday inclusive, dynamic index at the beginning and end of the first semester of each other did not differ. Its feature was to increase the values of from the beginning to the end of each of these training days. On Thursday, Friday AVIP dynamics at the beginning and end of the first semester significantly different, namely: in the first case, which signify a «rational» values of dynamics, he continued to show a tendency to increase, while in the second case, on the contrary – to and a significant reduction, especially on Thursday. The above indicated that at the end of the semester starting from Thursday body unable to maintain MP on the eve of the level achieved in the increase of fatigue during the school day, as well as incomplete

recovery of Poland, which took place against the background of training activities in the afternoon on Thursday and on Friday.

So girls MP end of the first semester is much higher than at the beginning, but since the second half of the school day (after the 3<sup>rd</sup> lesson on schedule) on Thursday it detects different from «rational» dynamics. This is due to the inability of the body to maintain performance AVIP achieved due to the dominance of these days a week learning process to restore tired, though, given the «rational» variant dynamics of these indicators, it is possible to maintain their achieved level.

Comparison of daily growth AVIP girls during the school week at the beginning and end of the second semester showed their disagreement. The value expression values of this index were significantly higher at the end than at the beginning of the semester that was due to a further increase in physiological capacity of the organism [3; 7]. On notable speakers AVIP for each day, then set a starting 1<sup>st</sup> lesson on Tuesday at the end of the second semester and she set at the beginning of this semester, which was seen as «rational» in terms of adaptation to the proposed training loads. The peculiarity of this was that after growth AVIP on Monday, the day he maintained at the level achieved, while the «rational» version was its continued growth. This indicated that at the end of the second semester on Tuesday dominated the process of fatigue recovery, and therefore the latter continued to be carried out during training activities. Although the next day (Wednesday) dynamics AVIP installed at the end of the second semester was similar to the «rational», but on Thursday, especially on Friday, the latter is significantly different in the negative direction. The above evidence that the end of the second semester, starting from Thursday, there is the second peak physiological recovery resource provides girls MP that occurs during their training activities.

So girls MP end of the second semester is much higher than at the beginning, but since Tuesday morning (1<sup>st</sup> lesson hours), and on Thursday and

Friday, reveals distinct from «rational» dynamics. This is due to the inability of the body to maintain AVIP achieved due to the dominance expressed in days to restore fatigue process, although, given the «rational» variant dynamics of these indicators, it is possible to maintain their achieved level. The latter confirms the need to implement, especially in the time specified measures to address this problem. It concerns both the first and second semester.

### **Conclusions.**

Mental performance of girls in terms of processing visual information during each day of the first and last weeks of training each of two semesters observed similar trends and changes in expression of features; the latter is associated with the period of the school year and day school week. However, the findings show the possibility of support throughout the school week MP kids on our laurels at this time level without compromising the health conditions for improving the organization and content of physical education implemented in various forms during each school day.

Prospects for further research include the study of another component of mental capacity Girls Primary School – speed processing of visual information and its possible comparative characteristics of different periods of study at secondary schools.

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