Variations in students' visual perception of gymnastic movements and their ability to quickly grasp the concept

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Abstract

Objective of the study was to analysis of the variations in how students perceive gymnastic movements visually and the time it takes for them to form an impression of these movements.

Methods and structure of the study. The chosen model was to create a mental image of a relatively simple physical activity. This was achieved by presenting students from the Faculty of Physical Education (n=188, aged 18-23) with a series of images that depicted the different phases of the movement. The subjects were asked to form a holistic mental image of the physical activity. The study was conducted using the tachystoscopic method, which involved two stages. The first stage involved gradually increasing the duration of the display of the object, allowing the subjects to perceive and identify it. The second stage involved repeatedly displaying the object for a fixed duration, which corresponded to the duration of the physical activity.

Results and conclusions. It is evident that the extent to which individuals differ in their ability to quickly create a mental image of a visual stimulus is influenced by both the method of presenting the stimulus and its complexity for comprehension. The identification of variations in students' visual perception of gymnastic movements and their capacity to swiftly grasp the concept of these movements can be viewed as a multifaceted human capacity for rapidly forming a mental representation of a motor action.

Keywords: *physical exercises, training, individual differences, abilities, perception features.*

Introduction. Didactic research in the field of physical education and sports makes real learning processes their object, reveals the essential characteristics of the main elements of this process [6]. In the practice of physical education and sports, the subject of study is motor actions (physical exercises), where the main one at the initial stage of training is the visual method (more precisely, «methods of ensuring visuality»), ensuring visual, auditory and motor perception of the studied and completed educational tasks. As a result, students develop an idea of the learned motor actions, which, according to I.M. Sechenov, is a regulator of human movements. «In order to perform its function, this reflection must be objectively correct» [3, 152 p.].

Consequently, the more accurate the sensory image, the faster and easier (all other things being equal) motor skills and abilities are formed on its basis. Most physical exercises are short-term in nature of execution, which creates difficulty in forming a sensory image: the subject may not have time to perceive the demonstrated motor action in one demonstration. Improving the conditions for perceiving such exercises may be associated with: 1) increasing the time of showing the exercise, 2) multiple showings with the same presentation time. The latter concerns those exercises that cannot be broken down without disrupting the structure of the motor action. Based on a number of works [1, 4, 9], it can be assumed that under these conditions, individual differences in the perception of physical exercises by students play a special role: those who perceive the motor action being studied more quickly and fully, form an idea of it more quickly. Therefore, identifying the factors that determine the

differences in the success of visual perception and the formation of ideas about physical exercises is a pedagogically important problem in the context of individualizing the learning process when using the method of providing clarity.

Objective of the study was to analysis of the variations in how students perceive gymnastic movements visually and the time it takes for them to form an impression of these movements.

Methods and structure of the study. As a model, we chose the formation of an idea of a relatively simple physical exercise by presenting students of the Faculty of Physical Education with successively alternating graphic images (movement phases), upon perception of which the subjects had to form an idea of a complete physical exercise.

The study used the tachistoscopic method. The equipment consisted of a slide projector with a time relay connected to it and a translucent screen. The subject sat at a table at a distance of 70 cm from the screen. Based on the technical design of the relay, the tested test objects were presented at the following exposures: 0,45; 0,91; 1,33; 1,50; 1,69; 2,00; 2,33 and 2,50 s. Before presenting the test objects, the subject was adapted to the experimental conditions: stimulus material not used in the main experiment was used at the shortest exposure – 0,45 s. The study consisted of two series.

The 1st series is generally accepted, associated with an increase in the time of the object, used to determine the time of perception or recognition of the latter. The 1st test object shows a stand on the shoulder blades, arms and head with support by the hands, usually performed in gymnastics classes independently and in various combinations. The 2nd test object shows a forward roll in the form of three static poses. Both test objects were presented with an increase in the exposure time until the subjects had fully formed an image of the exercise being exposed, which we judged by the identity of the presented image with its graphic sketch by the subject. This option imitates the demonstration of the physical exercises being studied, which can be «expanded» in the time of their execution in order to facilitate their perception by the students.

The 2nd series is associated with repeated presentations of the object on a constant exposition, which corresponds to multiple demonstrations of physical exercises, the demonstration of which is characterized by short duration and cannot be extended in time, and, therefore, creates a time limit for their perception. The 3rd test object depicts a half-squat, a squat, and a kneeling position; the 4th test object – individual phases of a forward somersault (different from the 2nd test object). The number of presentations of the stimulus material required for the subject to form an image of the exposed object was recorded. The duration of the experiment did not exceed 20 minutes. The subject was given the following instructions: «Look carefully at the screen, where an image will be presented for a very short time: various gymnastic poses. After each presentation of the image, graphically sketch what you saw. The image will be presented until it is completely graphically reproduced». The study involved 95 young men and 93 young women from the Faculty of Physical Education, aged 18-23 years.

Results of the study and discussion. Hypothetically, the 1st and 3rd test objects are simpler for visual perception than the 2nd and 4th, since the first are represented by gymnastic poses, homogeneously located in space (all poses are in a vertical position) and have less pronounced angular dimensions than the second. The results obtained confirmed the correctness of the assumption (Table 1).

It was necessary to clarify the issue of the identity of the manifestation of the ability to perceive physical exercise regardless of the time mode of presentation of the test object: an increase in the exposure time and the standard exposure time (0,45 s). Spearman's rank correlation was used: the results of the subjects in the 1st series were ranked by the time of formation of the visual image, and in the 2nd series – by the number of repetitions with standard exposure. The high statistical significance of all correlation indicators allows us

Table 1. Average group indicators of speed of formation of a visual image

Gender	Test objects presented					
	1 series (s)			2 series (number of repetitions)		
	1	2	p	3	4	p
Boys	1,25±0,03	1,41±0,04	0,01	3,1±0,14	4,2±0,14	0,001
Girls	1,35±0,04	1,50±0,03	0,01	3,2±0,13	4,4±0,20	0,001

Table 2. Rank correlation coefficients

Gender	Correlation options					
	1	2	3	4	5	6
Boys	0,66**	0,62**	0,35*	0,53**	0,46**	0,50**
Girls	0,66**	0,52**	0,43**	0,51**	0,68**	0,51**

* - $p<0,05$; ** - $p<0,01$.

Table 3. Variability (in %) of individual data in visual perception indicators

Gender	Speed of formation of a visual image			
	1 series		2 series	
	1 test object	2 test object	3 test object	4 test object
Boys	12	16	24	28
Girls	19	14	24	26

to think that, regardless of the time mode of presentation of test objects and their complexity, the same ability to perceive the tested material is studied (Table 2).

The analysis of individual results demonstrated by students during the study of the speed of formation of a visual image of the exposed material revealed the presence of individual differences. Thus, the time required by the subjects to form a visual image in the 1st series was in the range of 0,45-2,00 s for boys for the 1st test object, 0,91-2,33 s for the 2nd test object; for girls, respectively, 0,91-2,33 s and 0,91-2,50 s. The number of repeated presentations on the standard exposure (0,45 s) in the 2nd series was in the range of 1-5 times for boys in the 3rd test object, 2-7 times in the 4th test object; for girls, respectively, 2-5 and 2-10 times. In mathematical statistics, the standard deviation serves as the main measure of the variability of features. Based on the fact that in our study the features are expressed in different units (seconds and number of repetitions), we calculated the coefficient of variation for each test object, which is a relative number expressing the variability of features in percent [5]. It was found that the degree of manifestation of individual differences in the speed of formation of a visual image depends both on the method of presentation of the stimulus material and its complexity for perception (Table 3).

Thus, the values of the variation coefficients (individual differences) for repeated presentations of test objects at a constant exposure of 0,45 s (series 2) were higher than for repeated presentations with an increase in exposure time (series 1). Based on the fact that the experimental conditions imitate the methods of demonstrating motor actions in real educational conditions, their demonstration should be associated with taking into account the individual characteristics of students' visual perception in the first case more than in the second, i.e. when it cannot be expanded («stretched») in time. When comparing the absolute values of the variation coefficients by the complexity factor of the tested material (the 1st and 3rd test objects are simpler than the 2nd and 4th), it was found that for the 2nd and 4th test objects these coefficients are higher than for the 1st and 3rd (except for the 2nd test object for girls). This means that the more difficult the exhibited material is for visual perception, the greater the individual differences in its perception. Consequently, when demonstrating motor actions that are difficult to perceive, it is necessary to take into account the individual characteristics of visual perception and the speed of creating an idea of the students. This is especially true for physical exercises of a dynamic nature (2 and 4 test objects). The manifestation of individual differences in the speed of image formation in all test objects are not errors in perception, as Fechner once believed, but reflect «systematic tendencies that appear in the perception and evaluation of different groups of individuals with different personality structures» [2, 84 p.]. In accordance with the point of view of B.M. Teplov [10], E.P. Ilyin [4], they are interpreted by us as abilities that are not limited to knowledge, skills and abilities [7, 9]. Consequently, differences in these abilities should be identified and taken into account in the process of teaching students physical exercises. Failure to comply with this provision will negatively affect the quality of their learning:

the time and number of demonstrations of the exercise being learned may not be optimal for them.

Conclusions. Individual differences in students' visual perception of gymnastic exercises and the speed of forming an idea about them were revealed, which can be interpreted as a complex human ability to quickly form an image of a motor action.

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