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Enhancement of the Quality of Female Students' Technical Training in Table Tennis with Account Taken of the Mobility of their Nervous System

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The structure of the modern training process in table tennis has to take into account the individual characteristics of students. Depending on the type of vegetative regulation of tennis players that reflects the specificity of load perceptual, the development of fatigue, peculiarities of the competitive activity, there is selection of tools and techniques of technical training. Our researches have shown that during the implementation of technical training of students with mobility of the nervous system of different levels, it is reasonable to differentiate modes of operation and the number of elements that are trained in one exercise: a) for female students with a mobile nervous system it is advisable to be in the repeated mode of operation, for female students with an average mobility of the nervous system – in the interval mode of operation, and for female students with a labile nervous system – in the variable mode of operation; b) for female students with a mobile nervous system it is advisable to alternate with two similar technical elements after three series in one exercise, for female students with an average mobility of the nervous system – after four series, and for female students with a labile nervous system it is advisable to perform only one technical element in one exercise.

Keywords: technical training, female students, mobility of the nervous system

Introduction. Nowadays preservation of the health of the population, including students, has become a national problem in Russia. Despite the well-established opinion that young people is the healthiest category of the population, the highest growth rates of morbidity are observed exactly at the age of 15-17 years old. According to the

Ministry of Health and Social Development, 60% of students have different diseases and only 14% of high school graduates are completely healthy.

During the modernization of the economy, the Government of the Russian Federation with the order № 1507-p issued on October 29, 2002 has included the development of mass physical

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education and sport in the strategic objectives of the state social policy.

The Message of the President of the Russian Federation to the Federal Assembly of the Russian Federation made in 2005 noted that "...the result of our work should be awareness by younger generation of the need for a healthy lifestyle, physical education and sport".

On August 7, 2009 the Government of the Russian Federation approved the "Concept of the Development of Physical Education and Sport until 2020". Particular attention in this concept is paid to the development of student sport as one of the priorities of state policy in the development of physical education and sport in Russia.

In our country according to the indicators of large-scale involvement in the mass sports table tennis takes third place. In addition, number of authors recognizes table tennis as almost perfect sport for students that favours not only physical development but also the development of personal communication and socialization (Barchukova, Shprakh, 1991; Mizin, 1997; Doroshenko, Muller, 2000; Barchukova, Mizin, 2002).

Table tennis improves not only the speed of movements, but also the speed of simple and complex reaction, reaction of prediction; it develops operatory thought, concentration and attention switch. At the same time it is known that the speed of reaction is weakly yielded to the influence of training, but the personal regulators can vary to the considerable extent. There is also such a concept as a "style of activity" that supposes some variability in the performance system of one or another type of activity. It makes it possible to suggest that according to the new rules of the game athlete's success will depend on the regard for his individual features.

In all type of sports the most extensive opportunities for the demonstration of the style are possessed by the "situational" sports, one of which is table tennis (Matytsin, 2002). Individual

style helps the demonstration of existing abilities, masking them, but not fully compensating the shortcomings.

In the theory and methodology of tennis there are not a lot of works about the study of individual characteristics of tennis players and their inclusion in the training process. Basically, the literature discusses the compliance of individual features of a player with a particular playing style and offers a list of combinations of the technical elements for tennis players with different playing styles (Voronin, 1983; Matytsin, 1990; Sypachevsky, 2002; Barchukova with others, 2006). It is established that people who have the strong nervous system the most optimal style from the position of efficiency is an attacking style. Owners of the weak nervous system tend to have defensive style and in this case they show the best results.

Many issues of an individual approach in the theory and methodology of training in table tennis are in need of continuation of research. It is necessary to study the peculiarities of load perception, the development of tiredness, the specificity of competitive activity, depending on the individual characteristics of tennis player. An open question is the precise determination of the optimal playing style for the tennis player, an indicator of which should be the organism characteristic that determines different levels of its organization and regulation. One of such characteristics is the type of vegetative regulation (Ilyin, 2001). There are sympathotonic, normotonic and vagotonic types of vegetative regulation (Lukianova, 2004). Type of vegetative regulation is directly related to the peculiarities of the processes of energy production that have a great influence on the level of the development of physical qualities.

Most female students who choose table tennis as a sport specialization have not practiced this type of sport earlier in the sports

Table 1. Research data of the technical proficiency of female students

Group	Stage and differences	Test number, ictus/30 sec.			
		1	2	3	4
People with a strong high mobility of nervous system ($M\pm m$),					
Experimental N=17	Before	15,76±0,56	15,00±0,42	14,18±0,42	13,76±0,35
	After	17,24±0,28	16,24±0,35	15,53±0,35	15,18±1,42
	Differences	p=0,024	p=0,030	p=0,018	p=0,014
Control N=14	Before	15,87±0,62	14,86±0,33	13,88±0,35	13,94±0,24
	After	16,93±0,62	15,71±0,33	14,65±0,28	14,64±0,33
	Differences	p=0,230	p=0,074	p=0,096	p=0,091
People with an average mobility of nervous system ($M\pm m$),					
Experimental N=22	Before	16,59±0,51	15,68±0,040	14,36±0,034	14,09±0,29
	After	18,23±0,51	17,00±0,40	15,45±0,29	14,95±0,23
	Differences	p=0,030	p=0,025	p=0,019	p=0,023
Control N=21	Before	16,71±0,53	15,76±0,41	14,48±0,30	13,90±0,24
	After	17,90±0,53	16,71±0,41	15,10±0,18	14,62±0,35
	Differences	p=0,123	p=0,112	p=0,080	p=0,102
People with a weak low mobility of nervous system ($M\pm m$),					
Experimental N=15	Before	17,13±0,39	16,80±0,39	14,60±0,23	14,47±0,46
	After	18,67±0,46	18,20±0,39	15,40±0,31	15,80±0,39
	Differences	p=0,017	p=0,016	p=0,047	p=0,035
Control N=16	Before	17,00±0,31	16,69±0,37	14,44±0,29	14,69±0,44
	After	17,73±0,31	17,44±0,27	15,13±0,29	15,56±0,44
	Differences	p=0,103	p=0,120	p=0,107	p=0,169

Note. M – selective average; m – selective standard deviation; N – number of people in the group, test 1 – usage of speed drive from the right diagonally; test 2 – usage of speed drive from the left; test 3 – usage of chop from the left to the left, test 4 – usage of chop from the right to the right, p – reached level of distinction significance; according to the Student's t-criteria differences are statistically reliable at $p < 0.05$.

groups. The system of physical education in tertiary institutions, in contrast to the Children's and Youth Sports Schools, do not include pre-selection on the basis of human predisposition to a particular type of sport. Therefore, the teachers of physical education in tertiary institutions have to work with people who have absolutely different individual and typological features. In order to work successfully in such conditions it is necessary to use the principle of individualization. In table tennis individualization of training influence is mainly used in the training process

of high-class sportsmen (Matytsin, 1990; Barchukova, 1995; Barchukova, 2004). Failure to comply with the principle of individualization, not only in sport but also in physical education, leads to the decrease in the effectiveness of training influence. The current situation in the individual approach to the teaching of table tennis in tertiary institutions has determined the problem of our research work: the lack of ways of implementation of the individualization principle in table tennis during students training at an early stage.

The aim of our study was the development of the methods of differentiation during the technical preparation of table tennis for students at an early stage of training. In this regard, we set the following objectives of the research:

- To reveal the theoretical prerequisites to the determination of differentiation directions during the technical training in table tennis for female students at an early stage of training on the basis of the analysis of scientific and methodological literature;
- To develop and evaluate the effectiveness of differentiation methods during the technical training in table tennis for female students at an early stage of training.

We had a hypothesis that the effectiveness of instruction of female students in the technical elements of table tennis at an early stage can be increased if:

- during the practicing of the technical elements female students with the mobile nervous system will be in the repeated mode of operation, female students with an average mobility of the nervous system – in the interval mode of operation, and female students with a labile nervous system – in the variable mode of operation;
- female students with a mobile nervous system will alternate with two similar technical elements after three series in one exercise, female students with an average mobility of the nervous system – after four series, and female students with a labile nervous system will perform only one technical element in one exercise.

Organization and methodology of study.

The study was conducted in Siberian Federal University in 2009 and included 105 female students. The study consisted of three stages. At

the first stage there was assessment of the mobility of nervous system and the level of technical proficiency of students under study. Then female students were divided into two groups – control and experimental. The experimental group was divided into three subgroups: the first one with the high mobility of the nervous system (NS), the second one with an average mobility of the NS, the third one with a labile NS (low mobility). At the second stage of study control group was trained according to the traditional program, and experimental group was trained according to the experimental program. At the third stage, we again organized and conducted a study of the technical proficiency in both groups.

Content of experimental methods. In order to improve training methods of table tennis at an early stage, we have developed and proved two innovations.

It is well known that the greatest change of mental state in the direction of increasing of the level of stress in people with labile NS cause the interval and tempo modes of operation, and the smallest one causes variable mode of operation (Barchukova, 2004). In individuals with the mobile nervous system prolonged monotonous work is conducive to the appearance of the most mental stress. In connection with it, people with such a peculiarity of the NS are recommended to have an interval mode of operation. In order to create optimum operating conditions all of the female students – tennis players from the experimental group were divided into teams. Each team consisted of three people with different levels of mobility of nervous systems: mobile, medium, labile. In order to accomplish exercises each female student with a mobile NS was given six balls, and every female student with an average mobility of NS was given 8 balls. A female student with a labile NS was not given any balls. On one side of the table of every team there was a student with a labile NS, and on the

opposite side there were students with a mobile NS and NS with an average mobility. When the balls of a student with the mobile NS came to an end, she was replaced with a student with NS with an average mobility. At this time, a student with a mobile NS collected her balls. When the balls of a student with NS with an average mobility came to an end, she was again replaced with a student with a mobile NS, etc. During all the exercise female student with a labile NS stayed near the table as a sparring partner. At first glance it might seem that such a big load for students with a labile NS should cause the state of tiredness very quickly, but this did not happen. It is explained by the fact that subjects with labile nervous system operate more economically than others, that is, spend less energy per unit of work.

The proposed joint method of the work organization allowed people with the nervous system of different mobility to have the optimal mode of operation for every person. In addition, by virtue of the development of memory for the effort and length of movement that is genetically conditioned in people with a labile NS (Barchukova, 2004), the entire team as a whole showed a high motor density of training task.

The second innovation consisted in the following. Research has shown that athletes with the inertness of nervous processes are better able to master movements in the standard conditions with low variability (Barchukova, 2004). In contrast, athletes with a mobile NS are better able to master different movements and their further improvement. It is caused by the fact that monotonous work for people with a mobile NS creates the state of monotony much faster than for others. In this regard, during the accomplishment of one task, students with a mobile nervous system in every team after three series alternated technical elements. Alternated technical elements were chosen as follows. Speed drive from the right to the right was alternated with speed drive

from the left to the right, and chop from the right to the right was alternated with chop from the left to the right. The same condition was fulfilled by students with an average mobility of nervous processes, but only after four series. Variability of exercise for students with a labile nervous system consisted in the fact that during the entire exercise, they had to adapt the strokes from the right and from the left, provided that their own technical element that they practiced should not be changed to another.

Results of the research work and its discussion. From the results presented in the table it is evident that in all the tests there is a similar picture. In the experimental group, regardless of the level of mobility of the nervous system of people under study, the differences between initial and final test data of their technical proficiency are reliable, but in the control group test data are not reliable. It is explained by the fact that the alternation of similar technical elements in one exercise has reduced the risk of appearance of the monotony state in students with a mobile nervous system and, therefore, maintained the concentration of their attention.

In addition, the selection of sparring partners with a labile nervous system, distinguishing feature of which is the high stability of performance of the same movements, has created conditions for the increase of the motor density of the task. Repeated mode of operation has had a positive influence on tiredness.

Reliability of differences in students with a labile nervous system, in our opinion, is explained as follows. It will be recalled that their sparring partners after a few series of one technical element, changed it to the similar one. It created variable conditions for the return, but the same element in different conditions. In addition, variable mode of operation and the lack of balls collection increased the motor density of the exercise.

Conclusion

1. One of the reasons for the development of the content of differentiated approach in the training methodology of table tennis at an early stage is the characteristics of people with different mobility of nervous system.

2. During the implementation of technical training of students with different levels of mobility of nervous system, it is reasonable to differentiate modes of operation and the number of elements in one exercise:

a) for female students with a mobile nervous system it is advisable to be in the repeated mode

of operation, for female students with an average mobility of the nervous system – in the interval mode of operation, and for female students with a labile nervous system – in the variable mode of operation;

b) for female students with a mobile nervous system it is advisable to alternate with two similar technical elements after three series in one exercise, for female students with an average mobility of the nervous system – after four series, and for female students with a labile nervous system it is advisable to perform only one technical element in one exercise.

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Повышение качества технической подготовки студенток в настольном теннисе с учетом подвижности их нервной системы

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Построение современного учебно-тренировочного процесса в настольном теннисе должно учитывать индивидуальные особенности занимающихся. В зависимости от типа вегетативной регуляции теннисисток, отражающего специфику восприятия нагрузки, развития утомления, особенности соревновательной деятельности, подбираются средства и методы технической подготовки. Проведенными нами исследованиями доказано, что при осуществлении технической подготовки студентов с различной по степени подвижности нервной системой целесообразно дифференцировать режимы работы, и количество отработываемых в одном задании элементов: а) студенткам с подвижной нервной системой целесообразно находиться в повторном режиме работы, студенткам со средней подвижностью нервной системой – в интервальном, а студенткам с лабильной нервной системой в – переменном; б) студенткам с подвижной системой в одном задании целесообразно чередовать два схожих технических элемента после выполнений трех серий, студенткам со средней подвижностью нервной системы – после четырех серий, а студенткам с лабильной нервной системы в одном задании целесообразно выполнять только один технический элемент.

Ключевые слова : техническая подготовка, студентки, подвижность нервной системы.
