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# STUDY OF THE PSYCHOMOTOR ABILITIES AND QUALITIES OF THE STUDENTS CONDITIONED BY BIORYTHMS AND THEIR PERSONAL AND PSYCHOLOGICAL CHARACTERISTICS

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**Abstract:** *One of the most important problems of modern science is the search for new reserves aimed at increasing the efficiency of educational, work and training activities by using biological rhythms. The temporal sequence of interaction of various functional systems of the body with the environment, developed in the course of evolution, contributes to the harmonious coordination of various biological processes and ensures the normal functioning of the entire organism. This reveals the important adaptive value of biorhythms for the body's vital functions. However, certain principles and provisions of biorhythms in sports are insufficiently highlighted and scientifically justified, but without a doubt, scientific research in this direction brings the expected practical result. We also mention the problems of psychophysiology, the solution of which largely depends on the success of using biorhythms to improve the efficiency of sports and students learning activities [1]. The dynamics of the circadian rhythmicity of the psychophysiological functions is reflected in the volume and intensity of the applied training and competition tasks, as well as in the performance recovery after performing them. Three biorhythms are known that significantly influence human performance: physical, emotional and intellectual ones.*

***Key Words: Biorhythms, Personality and Psychological Characteristics of Physical Development, Capacity, Somatotype, Psychomotor Skills.***

## INTRODUCTION

Human **physical biorhythm** represents a 23-day cycle. The first half of the cycle is characterized as a positive phase, accompanied by a satisfactory state of health and activities that do not require excessive physical effort. The second half of the cycle represents the negative phase, and the critical days are those when a person shows a decrease in physical performance accompanied by a disruption of motor skills.

**Emotional biorhythm** of a person determines his creativity and also affects his interpersonal relationships. In the first half, creative activities can be carried out, friendly interpersonal relationships are formed as a "discharge phase". The next - called the "reset phase" - is less successful, with painful reactions to failures and resentment.

**The intellectual cycle of a person** is 33 days. The positive phase is characterized by mental intelligence, easy and quick solving of all proposed tasks, including tactical and technical ones in sports. In the negative phase the person feels the lack of intellectual information and tries to reduce his discomfort by reading literature, conducts and teachers' advice. In the phase of the decline period (the negative period) the potential energy is accumulated for a subsequent peak in the positive period [13, 19, 23 .

The human body works according to certain biorhythms - the period of activity is followed by a period of regression, according to scientific data on chronobiology, as many functions as the human body has, as many types of biorhythms are known: the morning type is the "larks", the evening type - " owls" and the intermediate ones - "pigeons".

The "Owl" type is characterized by maximum performance in the second half of the day, the work capacity increases in the evening and at night.

The "Lark" type - their maximum activity phase is in the first half of the day, around 22:00 or 23:00 they feel the need to go to sleep.

The "Pigeons" type is a cross between owls and larks. The work activity is divided equally throughout the day, with the closing time being 11:00 p.m.

According to scientists, 9% of the population are "owls", 5% are "larks" and 13% are "pigeons". The pace of life of students is more suitable for "larks" and "pigeons" [4].

Also, during the study and sports training process, the personality type of students - introverts, extroverts and ambiverts - must be taken into account - a fact that can significantly influence the quality of pedagogical impacts, as well as the dynamics of performances throughout the day or the week.

"Extroverts" are a kind of "spark" to others in their gang, to college mates, they are open to the world. Sports games, martial arts, water slalom and rock climbing are recommended.

"Introverts" are influenced by their inner world, have a low level of sociability, are good listeners and can have pleasant conversations, rely on their own abilities. Introverts rely on their own abilities and experiences rather than the opinions of others. They like to read, plan their business and work productively in a quiet environment. They are recommended sports that require full attention and involvement, such as sprinting, playing chess, playing checkers, yoga, pilates and stretching.

"Ambiverts" represent the mediation between extroverts and introverts, they are able to extinguish any clash and have no conflicts with anyone. Depending on the situation, they can act as both introverts and extroverts. They prefer group activities where exercises are performed independently and interaction with other athletes is not required. They are recommended any sports - spinning and aerobics, fitness and cycling [5, 25].

In addition to knowing chronotypes and personality types, it is desirable for teachers during the study process to be guided by the dynamics of students' work capacities during the day or week, when planning the instructional-educational process. The maximum working capacity increases between 10:00-12:00 and 16:00-19:00 respectively. This does not remain constant on different days of the week, but is characterized by three stages: on the first day after the weekend, the work rhythm is gradually entered; on the second, third and fourth days of the week, the working capacity is high, and on the fifth and sixth days - it decreases due to fatigue developed against the background of physical and mental effort [9].

**The purpose of the study** consisted in assessment of physical development, students' capabilities, their psychomotor skills in the conditions of biorhythms and physical performances, briefly determining the effectiveness of their sports and training activities.

**Research methodology and organization.** The ascertaining pedagogical experiment [2, 18] was carried out with the participation of tennis athletes (6 boys, 4 girls), students of the State University of Physical Education and Sport in Chisinau, Republic of Moldova. All tennis players were tested four times, according to the following schedule:

- **reflexometry -**for the evaluation of simple motor reactions to light-visual-motor (LVM), sound-auditory-motor (SAM) stimuli.
- **the ruler drop**- to evaluate the complex response of the reaction to a moving object (RMO).
- **the Romberg test -**the evaluation of static equilibrium (ESD) [6, 8, 9].
- **tapping-test, 10 s -**maximum speed of movement (MSM) evaluation.
- **target accuracy** - throwing the tennis ball at a target - distance of 2 m [11, 14, 15, 16□.

**Anthropometric testing method** represents the research method of physical growth and development with the help of different measurements, based on the assessment of the morphological and functional values of the body. It is an objective method and provides data expressed in figures, which gives us precision and allows us to make an exact comparison with the data of other subjects or with our own figures obtained from one examination to another. It was used for the assessment of physical development, the vital capacity of the lungs, the maximum isometric strength of the hands, the maximum strength of the legs [7, 9, 12], the ability of physical development by the index method.

**Mathematical processing** of the data was performed according to the recommendations of specialists in the field [2, 24].

**Results and discussion.** Human life, like any activity in nature, is closely related to time factors. One of the effective forms of adaptation of the body to the external environment is the rhythm of physiological functions. Daily or circadian biorhythms most significantly affect human performance: physical, emotional and intellectual. There are

"peak" days in a person's life, when he achieves perfection in everything, but also critical days, which can be accompanied by various negative consequences.

Human biorhythms do not act independently, each of them has an impact on the others, according to the principle of synergy - the cooperative interaction of biorhythms and psychomotor capabilities [4].

In the student's vital activities, when considering biorhythms, the presence of critical days as a transition from one phase of the biorhythmic cycle to another, whether positive or negative, must be taken into account. Any critical day is accompanied by a state of instability, regardless of activity. For example, the physical biorhythm of a person affects his general condition, the negative side affects the emotional and intellectual sphere of vital activities. During the peak days of a person's emotional biorhythm, the negative value of the physical cycle significantly reduces creativity and academic performance [1, 22, 25□.

It has been established that the morphofunctional state of an athlete largely determines the sports ability and the possibility to improve in the chosen sports event due to the gender - male or female [4, 6, 8, 9]. That is why, among the many characteristics of the athlete, physical development parameters are of great interest, which have a significant impact on the motor activity of athletes [13, 18].

A comparative analysis of psychomotor activity showed a total superiority of tennis players - boys compared to girls, except for statodynamic equilibrium.

In addition, the core of the athlete's technical training is formed by psychomotor skills, which represent sensorimotor actions, coordination and vestibular stability (balance), ensuring the functioning of all the physiological systems of the body, the optimal amplitude of movements, the rational distribution of muscle effort, energy efficiency and increasing the efficiency of motor actions [8, 17].

Also, in tennis a determining factor of the reaction and anticipation of the opponent's actions is the reaction speed expressed during the visual-motor, auditory-motor reactions; the maximum movement speed, the response reactions to the moving object,

the accuracy of the targets, in relation to the maximum force of the wrist and the leg [22] under the influence of biological rhythms.

We determined that female tennis players are superior to male tennis players in statodynamic equilibrium during positive and negative periods of biorhythms by 20.1% and 27.8%, respectively. In the visual-motor and auditory-motor performance parameters, the fast-moving target accuracy test, male tennis players outperformed female tennis players by 1.8%, 1.5%, and 5.4%, respectively, in the positive period of biorhythms. On the moving object response test and target accuracy, male tennis players also outperform female tennis players in the positive period (11.8% and 28.8%).

It is necessary to pay attention to these tests, as well as to particular physical qualities [8, 9], among which the decisive role belongs to the control of force parameters of movements in game activity [12, 18]. The accuracy of hitting the ball is usually not a mechanical process, but a manifestation of the athlete's intelligence, the active side of his mind in the conditions of physical and intellectual development and biorhythms (P+I) [18].

It was found that the parameters of psychomotor skills of tennis players are directly interconnected with the periods of biorhythms. Moreover, in field tennis a determining factor of the reaction and anticipation of the opponent's actions is the reaction speed expressed during the visual-motor and auditory-motor reactions, the maximum speed of movements, the sensitive reactions to the moving object under the influence of the biological rhythms of the athletes' body

However, the influence of biorhythms on the level of psychomotor functions has an individual character. The analysis of the interrelationship between biorhythms and the variability of results in field tennis showed that this connection has an individual group character.

For example, in sports masters the highest sports performance in tennis is manifested at favourable values of E-biorhythm (emotional) ($r = + 657$, $P < 0.05$) with a combination of E+I (intellectual) ($r = + 0.750$, $P < 0.05$) and E+P (physical)+I ($r = + 0.675$). In some

of the tennis players the highest performance was observed with optimal biorhythm values P ($r = + 0.780$, $P > 0.05$), I+P ($r = + 0.810$, $P < 0.01$) and E+ P+I ($r = 0.650$), which is reflected in the level of certain psychomotor functions. It should be noted that the most significant correlation of biorhythms with tennis performance was observed in the combination of E+I or P+I.

Thus, some morphofunctional indicators are observed, on which depends to a certain extent the successful insight into the mechanism of biorhythms and the possibilities of their use in the theory of physical education and in sports practice.

Starting from the above, information about the morphofunctional state should become a mandatory part of the medical and pedagogical control program together with the consideration of the athletes' biorhythms [7, 13].

In addition, the organization of biorhythms of each person has individual characteristics. According to [8], there are three chronotypes: the morning one - larks, the evening one - owls, the intermediate one - pigeons.

„Owls" they are people who reach their peak work capacity in the afternoon, which means they can last until the evening and late at night.

"The Lark" wakes up easily early in the morning and shows increased activity in the first half of the day, but around 10:00-11:00 p.m. falls asleep.

"The pigeons" represents the middle ground between "owls" and "larks". They wake up a little later than larks (around 7-9 am). Their daily activity period is constant, being evenly distributed throughout the day, without significant peaks or drops. People with this chronotype go to sleep around 11:00 p.m.

At the same time, 9% of "owls", 5% of "larks" and 13% of "pigeons" have a pronounced chronotype. A large number of the world's population (73%) represents a mixed (intermediate) chronotype according to their biological rhythm, of which 41% are "larks - pigeons" and 32% are "pigeons and owls".

The "owls" reach three peak phases of their mental capacities: Phase I - between 13:00-15:00; the II - from 18:00 to 20:00 and the III - the most productive - from 22:00 to 1:00. "Owls" are not recommended to exercise in the morning, the ideal time for its execution is between 19:00 and 23:00 - during this period of time increases the growth of muscle mass in strength training.

"Pigeons" represent a diurnal chronotype, effective time period for mental and physical activity is between 10:00 and 18:00, they go to sleep around 23:00.

"Larks" represent the morning chronotype. They manifest increased mental and physical activity between 9:00 a.m. and 2:00 p.m. [1, 4, 10].

Changes in work activity at different chronotypes are associated with the flow of the hormones serotonin, melatonin and cortisol. For example, in "larks" the level of melatonin decreases towards the evening, while in "owls" it reaches its maximum level [3].

Thus, the body's activity is essentially genetically predetermined by human diurnal (circadian) chronotypes in the long-term adaptation of the body, expressed in three chronotypes.

Students with the chronotype**"pigeons"** are most suitable for activities in contemporary society. Their internal biorhythm is similar to the generally accepted norms of work: they easily wake up early in the morning, do not get tired too easily and do not get sleepy frequently. All this helps them more easily overcome the changes in their daily routine of two or three hours when moving west or east.

It has also been shown that students with nocturnal chronotype,**owls,** have lower academic performance than their peers with intermediate and early chronotypes, although the intelligence level of owls may be higher than that of other chronotypes. The reason for owls' poor academic performance is their inability to synchronize their biorhythmic clock with social rhythms.

At the same time, this chronotype copes more easily with voluminous tasks, taught for home: work capacity increases in the evening, while in larks and pigeons, on the contrary, it decreases, they want to go to bed [21, 22].

In the context of the above, students are recommended that the training program include physical education classes in the second and third "lesson", on Tuesday and Thursday, when the physical performance of the body is at a high level, thus increasing the effectiveness of the pedagogical impact [12, 13, 22].

The rhythm of life of students is more suitable for "larks" and "pigeons" - early awakening, productive learning and sports activities during the day. "Larks" have higher overall health indicators. However, "larks" are less resistant to temporary changes in the rhythm of life and need more time to adapt to long-term changes - a sleepless night can make them feel worse for several days , and changing the time zone requires a long adaptation.

"Pigeons" quite easily tolerate changes in the daily rhythm by 2-3 hours forward or backward, but they are more prone to stress and depression than "larks" and "owls". "Owls", due to the lack of awakening effect, are forced throughout the working day, in order not to fall prey to sleep, to consume tonic drinks (strong tea, coffee), but, nevertheless, in the first half of the day they have a low level of activity [1, 10, 19].

Usually, university groups tend to include students who have different somatotypes:

- *ectomorphs* – tall and thin with thin bones, they are recommended resistance exercises and sporting events such as long-distance running, swimming, cycling and aerobic gymnastics.

- *endomorphs*- are the opposite of ectomorphs - short, with a slightly overweight physique. They show performance in physical exercises that require muscle strength - weightlifting, wrestling.

- *mesomorphs* are real athletes. They are easily given any type of activity: sports games, tennis, rowing [1, 5, 12].

In addition, during the study and training process it is also recommended to take into account the type and personality of the student - introverts, extroverts and ambiverts, who are prone to activities due to personal and psychological characteristics, which can significantly influence the quality of the pedagogical impact.

It is known that during learning, training and sports activities, the performance of the human body does not always remain at the same level, but changes due to the influence of biological rhythms. The dynamics of work capacity includes several stages: warm-up, constant work capacity at the optimal level, fatigue in a monotonous activity.

## CONCLUSIONS

The study of the reciprocity between the biological rhythms of the athletes and the psychomotor activity and their reliability showed that, to improve the results, the testing of the psychomotor functions of the subjects should be carried out at least three times: on the general day of the examination; in the phase of decrease and increase of their biorhythms, which will allow a more accurate diagnosis of the subjects' psychomotor abilities and predict their successful performance in competitions and other stressful tests in biorhythmic conditions.

It has been established that man's work capacity is the summary of several factors, which depends not only on physical training, personal and professional skills and abilities, but also on the chronotype, physical parameters, personal and psychological state, time of day, days of the week, which must be taken into account when scheduling the "Physical Training" discipline, in training and sports activities.

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