

Functional Features of the Neuro-Muscular System in 35-39 Years-Old Women in Sports Training Regime

T V Borisova^{1,a*}, Ya V Latyushin^{1,b}, O N Kondakova^{1,c},
O A Klestova^{1,d}, and S V Gertner^{1,e}

¹ Ural State University of Physical Culture, 1 Ordzhonikidze str., Chelyabinsk 454091 Russia

^{a*}tatyana_b1979@mail.ru, ^bdocchel@mail.ru, ^ckondakova-o@mail.ru, ^dsahka2004@mail.ru,
^evarvara_kalashnikova2295@mail.ru

*Corresponding author

Keywords: neuro-muscular system, sports training, women 35-39 years old

Abstract: The study of the functional features of the neuromuscular system in women of different age groups is based on the study of the training process, as well as the control of the functional state of the neuromuscular system in 35-39 years-old women. During the study, results were obtained that confirm the effectiveness of the developed sports training program for women aged 35-39. This is evidenced by the positive dynamics of the level of physical development, physical fitness, and the psychoemotional state of women's health.

1. Introduction

Changes in the neuromuscular system of the female body, when adapting to the regime of sports training, are one of the current problems in the physiology of motor modes [1; 2; 3; 4; 5]. To date, the functional properties of the neuromuscular system of the female body have not been the subject of systematic study [6; 7; 8; 9; 10]. In this regard, the development of a regime of sports training should be related to the feature of the female body, which is an important task, the solution of which will significantly increase the level of physical fitness and women's health.

Based on the analysis of scientific and methodological literature, positive changes were revealed in the body of mature women under the influence of the training regime, namely, improvements in indicators of the level of the lability of the cortical department of the visual analyzer, and the speed of attention switching. Systematic training is connected with the restructuring of all functional systems of the human body and its components. Thus, the characteristics of the female body dictate a strict choice of means and methods of physical activity, necessary not only to improve performance but also to preserve their reproductive function [6; 7; 8; 9].

2. Materials and Methods

In humans, under the influence of long-term physical loads, there is a decrease in the functional mobility of nerve processes and neuromuscular system, as well as functional disorders.

Studies of the functional state of the neuro-muscular system in the 35-39 years-old women were carried out at the Department of Anatomy of the FSBEI HE Ural State University of Physical Culture, with students of the faculty of distance learning. In particular, 30 women took part in the research.

In order to determine changes in the neuro-muscular system of women in a sports training regime, the following methods were used:

1. Pedagogical: pedagogical experiment; survey (questionnaire); control and pedagogical tests.
2. Biomedical: methods for studying the functional state of the neuromuscular system (a simple visual-motor reaction, tapping test, determination of the level of critical frequency of light flicker, or CFLF).
3. Definition of a psychoemotional state: assessment of health, physical activity, and mood (HAM).

4. Mathematical data processing methods.

Method for determining the strength of neuro-muscular processes

The functional state of the neuro-muscular system of women can be determined by identifying the maximum frequency of hand movements (tapping test) [21]. The method is based on determining the dynamics of the maximum pace of hand movement. The methodology of sensorimotor studies allows us to identify the typological features of the neuro-muscular system and functional state. And also, to determine the strength, balance, and mobility of nervous processes.

Determination of the level of critical frequency of light flicker

Lability is investigated using a test of the critical frequency of light flicker fusion (CFLFF). This is the maximum frequency at which the subject can still distinguish individual rhythmically supplied light flickers with increasing frequency, after which the flickers turn into a continuous light spot.

The study of the critical frequency of light flicker discrimination (CFLFD) is a continuation of the test (CFLFF). This is the maximum frequency of rhythmically transmitted light flickers at which the subject begins to distinguish between them. At first, the person sees only a solid light spot, and at the moment of even faint flickering, he/she should press a convenient button.

Differential self-assessment of psychoemotional state (HAM)

The method is intended to assess the current (subjective) psychoemotional state of a person. The test is developed based on the principle of semantic differential.

We surveyed 30 women from the Faculty of Distance Learning. We determined the factors that lead to the emergence and exacerbation of diseases. Such factors include workload at work and classes, psychoemotional overvoltage, as well as sleep disorders. The analysis of the questionnaire data characterizing the psychoemotional and functional state of women is graphically presented in Figure 1.

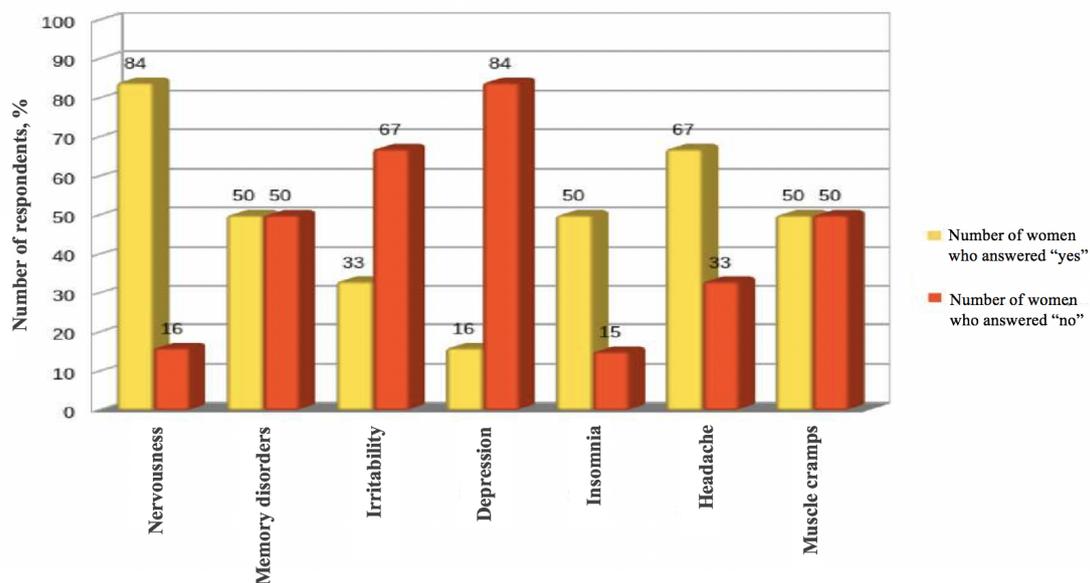


Fig. 1. The results of the analysis of questionnaire data characterizing the psychoemotional and functional state of women.

The next method determines the psychological state of women before the start of sports training. Further, the functional state of the neuromuscular system was investigated using the method of determining the level of excitability (SVMR), and the method of determining the level of mobility of the cortical section of the visual analyzer (by critical frequency of light flicker – CFLFF) [1; 3].

3. Results

Analyzing the results of a study of the psychoemotional state, we see that after the implementation of the sports training program, the state of health improved by 10%, and the level of mood rose by 27% in all subjects. Dynamics, according to the HAM method, are shown in Fig. 2.

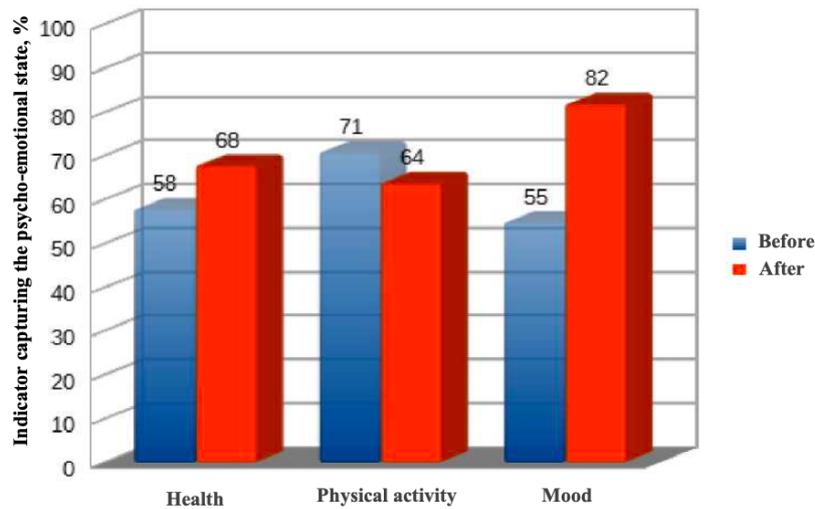


Fig. 2. The results of the study of psychoemotional state in 35-39 years-old women.

The state of the nervous system (mobility and balance of the nervous processes) is connected with the sensorimotor reaction. For example, if the functional indicators of the body lag behind the normal values, then the indicators of the sensorimotor reaction also decrease.

Thus, the results of the study can be concluded about the importance of sports training for women 35-39 years old.

The results obtained by the method of “Simple visual-motor reaction,” shown in Figure 3, allow us to conclude that after the implementation of sports training subjects, all women moved from the average (210-230 ms) to a high level (195 ms).

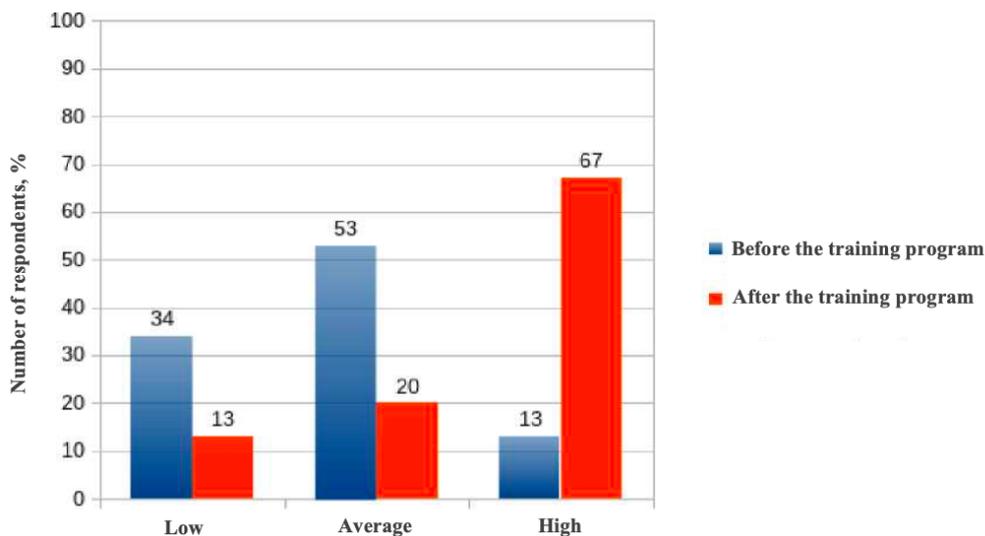


Fig. 3. Results of the study of simple visual-motor reaction in 35-39 years-old women.

The tapping test determines the frequency of movements, which is an indicator of the neuro-muscular system (speed).

A comparison of the results of the level of endurance and speed of the hands (tapping test) allows us to draw the following conclusions. Before the experiment, the maximum pace of movements (8.1-8.3 Hz) was detected in 11 women (36%), and after the implementation of sports training – in 21 women (72%), which

indicates the development of a strong type of neuromuscular system in women engaged in motor mode (sports training).

The results of the tapping test are shown in Figure 4.

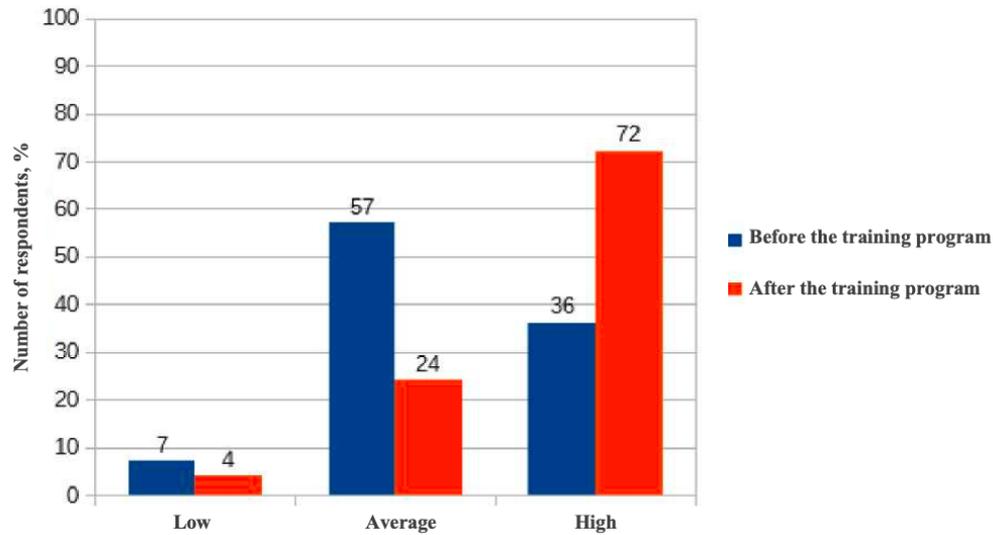


Fig. 4. The results of the study on the method of tapping-test in 35-39 years-old women.

The program of sports training consists of three parts, where the selection of each exercise has an optimal training effect. The proposed program includes strength exercises, aerobic load, and recovery and relaxation exercises. According to this program, women were engaged two times a week for a month (February-March 2019).

As a result, the functional status of the neuromuscular system in women has improved:

- The number of women with low SVMR decreased from 10 people (34%) to 4 people (13%), with an average rate dropped from 16 people (53%) to 6 people (20%), and the number of women with high SVMR increased by 16 people, accounting for 54%.
- The number of women with a high level of the lability of the cortical section of the visual analyzer significantly increased by 10 people (33%), with a low level decreased by 8 people (27%), with an average level decreased by 2 people (6%).
- The number of women with a maximum pace of hand movements increased by 10 people (36%), women with an average speed of hand movements decreased by 9 people (33%); similarly, the number of subjects at a low level of tapping decreased and amounted to 1 person (3%). Such dynamics are caused by a significant transition to the level of high tapping (8.1-8.3 Hz).

We see that the psychoemotional state of women improved in terms of “health” by 10%, and “mood” by 27% in all subjects. However, their physical activity is reduced by 7%, because women arrive in a relaxed physical condition after the implementation of the sports training program.

For all indicators, a positive trend is tracked.

4. Conclusion

As a result of applying the sports training program for women, the functional state of the neuromuscular system has improved. Particularly, the reaction rate decreased to 195 ms, the cortical lability of the visual analyzer increased, and the similar results were confirmed by the tapping test. Also, women have improved their psychological state by three indicators (health, physical activity, mood).

It should be noted that the implementation of the proposed program of sports training improves the energy supply of various processes in the body, increases the supply of tissues with oxygen, reduces subcutaneous fat interlayer.

Thus, the results of the study confirmed the high efficiency of the developed program of sports training with 35-39 years-old women, as evidenced by the positive dynamics of the level of physical development, physical fitness, and psychoemotional state of health and women.

References

- [1] Shutova, S. V. (2013). Sensomotor reactions as a characteristic of the functional state of CNS. *Bulletin of TSU*, 18(5), 283-284.
- [2] Nalobina, A. N. (2007). The effect of fitness on women of reproductive age. *Physical Education in Siberia*, 1, 56-59.
- [3] Sysoev, A. V., & Popova, I. E. (2014). Neuromuscular apparatus of female basketball players in view of their age features. *Theory and Practice of Physical Culture*, 3, 69-72.
- [4] Kalinkin, L. A., Morozov, V. N., Bobkov, G. A., Gusarov, A. V., & Ereshko, N. E. (2017). The effect of static exercise with deflection on the tone of the paravertebral muscles when engaging in physical culture with middle-aged women 30 to 40 years. *Bulletin of Sports Science*, 1, 54-60.
- [5] Gavrilov, D. N. (2002). Pedagogical and organizational features of the motor regime of people of mature and old age. *Theory and Practice of Physical Culture*, 4, 44-47.
- [6] Pashchenko, L. G. (2016). Characteristics of motivational sphere of the women of mature age, engaged in improving physical culture. *Bulletin of Science and Practice*, 9(10), 246-250.
- [7] Pankov, V. A. (2000). Physical culture and sport in a healthy lifestyle for women. *Theory and Practice of Physical Culture*, 6, 20-22.
- [8] K. Prusik, & K. Prusik (2011). Organization of motor activity of senior females. *Theory and Practice of Physical Culture*, 1, 57-60.
- [9] Chirushkina, A. G. (2011). Individual approach to classes of gymnastics exercises with middle-aged women in view of physical status and motivation. *Theory and Practice of Physical Culture*, 12, 7-10.
- [10] Aikina, L. I. (2007). Motor activity of women in different periods of development of the society. *Physical Education in Siberia*, 1, 63-66.