ATLANTIS PRESS

Advances in Health Sciences Research, volume 17

4th International Conference on Innovations in Sports, Tourism and Instructional Science (ICISTIS 2019)

Monitoring the psychophysiological status of highly skilled aerobics athletes

Chayun Danil Viktorovich
Postgraduate student, Department of Technology of Physical Education and Sports Activities, Institute of Physical Education,
Tyumen State University
Tyumen, Russia
d.v.chayun@utmn.ru
0000-0002-3364-6479

Manzheley Irina Vladimirovna
Doctor of Pedagogical Sciences, Professor, Department of Technology of Physical Education and Sports Activities, Institute of Physical Education,
Tyumen State University
Tyumen, Russia
i.v.manzhelej@utmn.ru
0000-0001-5402-9755

Abstract. The purpose of the study is to monitor the psychophysiological status of highly skilled athletes from aerobics in preparation for the main competitions of the season. Materials and methods. The study was conducted in 2017 with the participation of members of the Russian national team in sports aerobics. The study of the psychophysiological status of athletes was carried out using the diagnostic system UPFT - 1/30 - "Psychophysiologist." Results. The informativeness of psychophysiological diagnostics for controlling the effectiveness of the training process before the main competitions is proved. Conclusion. Monitoring the psychophysiological status of athletes from sports aerobics is one of the effective methods of training management, which allows making scientifically-based adjustments to the training and competitive activities of athletes. During the study, the parameters and control points for assessing the psychophysiological status of highly skilled athletes were determined, a bank of model characteristics of such athletes was created.

Keywords - control, psychophysiological status, sports aerobics, highly skilled athletes

I. INTRODUCTION

Sports aerobics is a sport that combines elements of acrobatics, sports and rhythmic gymnastics, which are performed by athletes with musical accompaniment at a high pace. A landmark event in the development of sports aerobics was its inclusion in 1994 in the International Federation of Gymnastics (IFG). However, instead of combining efforts for improving the rules and requirements for competitive activity, this sport was divided into two areas: IFG and FISAF.

For the past 20 years, sports aerobics has been struggling for the status of an Olympic sport. Modifications of competition rules, requirements for athletes and judges are reflected in the inclusion of sports aerobics in a number of key sports: the European Games (2015, 2019), the World Gymnasiade and Universiade (2011), the World Games [10, 11, 12].

The performance of the Russian team at the World Games started at the V World Games held in 1997 in Lahti (Finland), where medals were won in all disciplines.

The World Games are an analogue of the Olympic Games for sports that are not included in their program, so preparation for these competitions must be scientifically substantiated.

Sports aerobics, like any sport that involves complex movement coordination, requires athletes to demonstrate a high level of dexterity skills. Continuous improvement of the competitive program in terms of aerobic movements, linking, difficulty elements and pyramids determines high requirements for the psychophysical status of the athlete. And since no rehearsal is similar to another, since there are always minimal (barely visible but obvious for an athlete) deviations from the usual exercise, there is a need for psychophysical control for finding the optimal solution to the problem in the shortest possible time. As pointed out by N. A. Bernshtein, “dexterity is the only quality in which we cannot state with full confidence that there is more mental or physical activation. However, the central nervous system plays the main role in managing this quality” [2].

When describing the need to monitor the psychophysiological status of highly skilled athletes, V. F. Sopov [7] points to the so-called “champion syndrome” in which the athlete does not achieve the necessary performance before important competitions (final fight, game, performance) and begins to think of his/her championship (underestimating the opponent’s abilities, overestimating his/her own abilities), which can lead to a negative result. The author characterizes this syndrome as a psychosomatic breakdown (lack of adequate interaction between the psyche and somatics). Moreover, a self-assured athlete may call into question the training method as a result of the ongoing processes of monotony, leading to mental satiety.

A. V. Rodionov, V. N. Nepopalov, V. F. Sopov [5] developed a technological model of psychophysiological training, which includes 9 blocks, the implementation of which is aimed at achieving the maximum sports result. The authors single out the neurodynamic characteristics (strength, lability, mobility and balance of nervous processes) of athletes as one of the main components of training. Each physiological change affects the indicators of mental and emotional state. This requires to rely on sensory experience and reassess past training influences.

Yu.S. Filippova conducted a study of the psychophysiological characteristics of females aged 19-22 years engaged in sports aerobics [8, 9]. The author revealed that aerobics is characterized by a predominance of persons with a weak nervous system, somewhat increased aggressiveness and less pronounced left hemisphere functional asymmetry compared to students who are not involved in sports aerobics.

Psychological stress in sports is considered as an adequate state of an athlete, in which all body systems are mobilized for achieving maximum results. However, psychological tension should be considered as an unfavorable condition based on fear of competition or training load, insufficient motivation or lack of confidence in one's strengths, and negative changes in team relationships.

II. Materials and methods

The purpose of the study was to control the psychophysiological status of highly skilled athletes from aerobics during their preparation for the main competitions of the season.

The study was conducted with the participation of the Russian national team in sports aerobics (8 women and 10 men, of which 1 honored master of sports, 8 international masters of sports, 9 masters of sports) during their preparation for the 2017 World Games in three cities: Omsk, Moscow and Wroclaw (Poland).

The psychophysiological status of athletes was assessed using the UPFT-1/30-Psychophysiologist system and its module with psychomotor tests. The study was divided into three stages. The first stage took place in Omsk and involved 7 psychophysiological methods: a complex visual-motor response to a light stimulus (CVMR-LS), a simple visual-motor response to a moving object (SVMR-MO), mobility of nervous processes (by A.E. Khilchenko) (FMNP), response to a moving object (RMO), static tremor 3 mm, 5 mm and 7 mm (ST) and dynamic tremor (DT). The second stage was conducted in Moscow and consisted of 4 methods: CVMR-LS, FMNP, RMO and DT. The third stage took place in Wroclaw and included 3 methods: CVMR-LS, FMNP and DT. At the first and third stage, the study was accompanied by psychological methods: the Zung self-rating depression scale (ZDS) and self-assessment questionnaires (SAQ).

Fig. 1. An example of the results of psychophysiological testing

III. Results and discussion

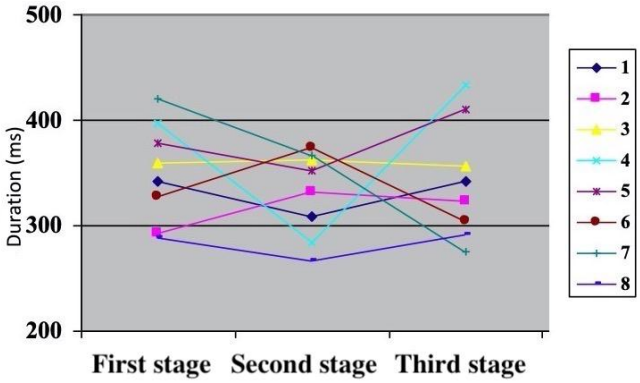

Fig. 2 Dynamics of the minimum response time to a light stimulus in women

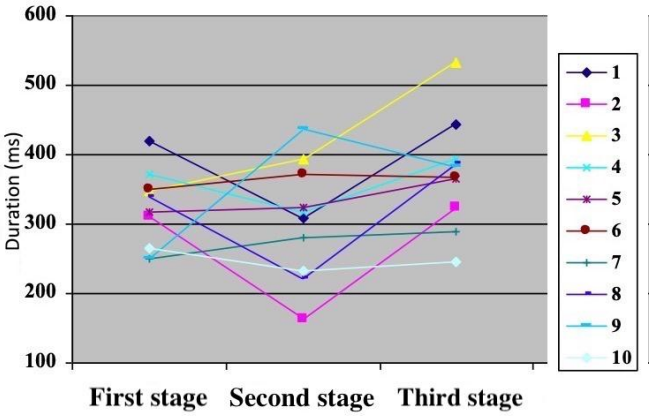

Fig. 3 Dynamics of the minimum response time to a light stimulus in men

Figures 2 and 3 show that most athletes demonstrated better results in the second stage, while in the first and third stages the results of the minimum time of a complex visual-motor response to a light stimulus were worse.

These results can be explained by the fact that at the first stage, the athletes were not fully prepared to deal with training load, but at the third stage the very thought of the World Games was a stress factor, moreover, 4 out of 5 competitive programs were new.

Analysis of the mobility of nervous processes allows identifying the speed of transition from one nervous process to another (from passive to active and vice versa).

The FMNP diagrams show that most of the athletes demonstrated a stable result of 10 points (very high mobility of nervous processes).

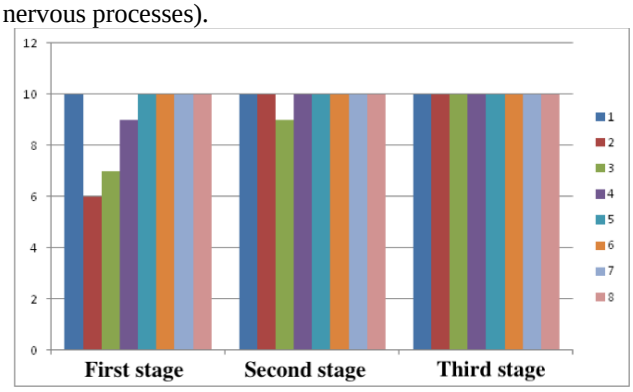

Fig. 4 FMNP dynamics in women

Women 2 and 3 at the beginning of training showed an average and high mobility of nervous processes. However, by the middle of the training event all the athletes showed a very high mobility of nervous processes.

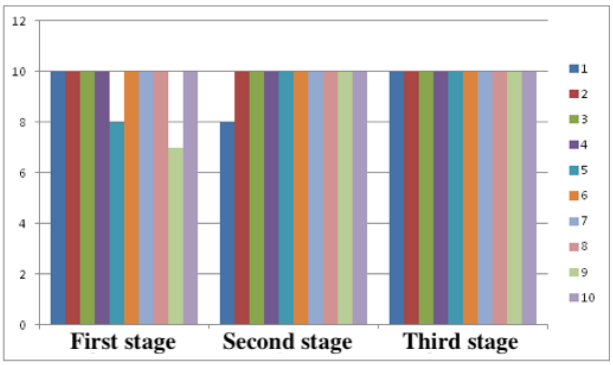

Fig. 5 FMNP dynamics in men

In men 5 and 9, at the beginning of preparation, a high mobility of nervous processes was revealed. However, by the middle of the training event, only man 1 demonstrated high mobility, while all the others had a very high mobility of nervous processes.

Dynamic tremometry allows evaluating the spatial characteristics of movements, coordination and accuracy of actions for the diagnosis of fatigue and emotional stress (the higher the speed of test performance, the lower the mobility of inhibition, the greater the number of touches, the higher the mobility of excitation).

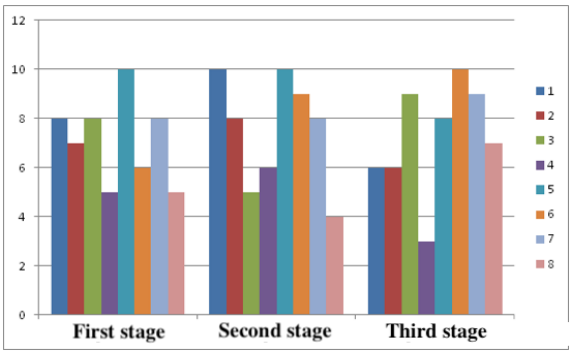

Fig. 6 Dynamics of dynamic tremometry in women

The dynamics of the results of the women national team of Russia demonstrated that the average travel time of the entire path along a special slot with the dominant hand gradually decreased (the first stage - 21174 ms, the second stage - 20755 ms, the third stage - 18093 ms), the number of mistakes (touching the walls) during the test also decreased (the first stage - 7.9, the second stage - 7.1, the third stage - 6.4). However, only athlete 1 increased both the test time and the number of mistakes made (the first stage - 19106 ms, 4 touches, the second stage - 21485 ms, 2 touches, the third satage - 23703 ms, 10 touches).

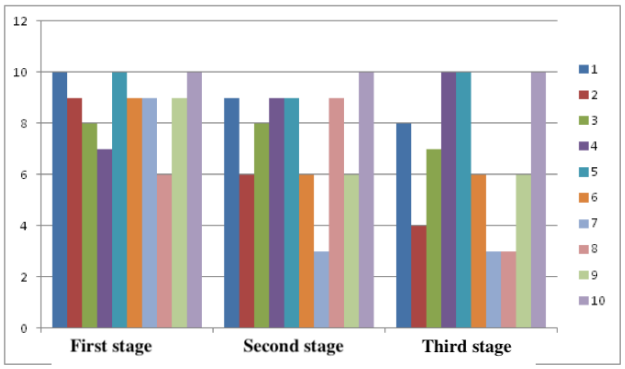

Fig. 7 Dynamics of dynamic tremometry in men

According to the results of dynamic tremometry with the dominant hand, we can say that the average time for covering the distance gradually decreased (the first stage - 35726 ms, the second stage - 23516 ms, the third stage - 20759 ms). However, the number of touches increased (the first stage - 6.2, the second stage - 6.3, the third stage - 7.1).

As a result of the response to a moving object test, it was revealed that by the second stage the number of athletes with a shift in the nervous processes to inhibition increased by 13%.

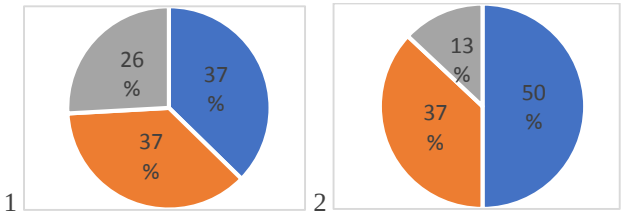

Fig. 8 Results of the response to a moving object test in women at the first (1) and second (2) stage

We also found that at the beginning of training, 100% of the females demonstrated an average response distribution time (total delay time from 251 ms to 456 ms, total advance time from 263 ms to 598 ms), and by the second stage, only 13% demonstrated a similar result (total delay time from 257 ms to 2420 ms, total advance time from 294 ms to 1996 ms).

As a result, we can note a decrease in the accuracy of the response to a moving object, which led to both delayed and advanced responses.

As a result of analysis of the response to a moving object test in men, it was revealed that by the second stage, the number of athletes with a shift in nervous processes towards inhibition increased by 40%.

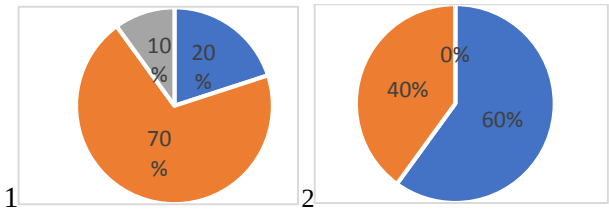

Fig. 9 Results of the response to a moving object test in men at the first (1) and second (2) stage

We also determined that at the first stage, the results of 50% of the men corresponded to a high response distribution time, 30% to high and 20% to low (total delay

time from 0 ms to 801 ms, total advance time from 0 ms to 1603 ms), and by the second stage, the number of men having an average response distribution time increased by 20% (total delay time from 67 ms to 1232 ms, total advance time from 0 ms to 2666 ms).

According to the results of SVMR-MO, it was revealed that the group of both men and women showed the same ratio in terms of central nervous system activation: 50% corresponded to a high level, 10% to a medium level and 40% to a low level.

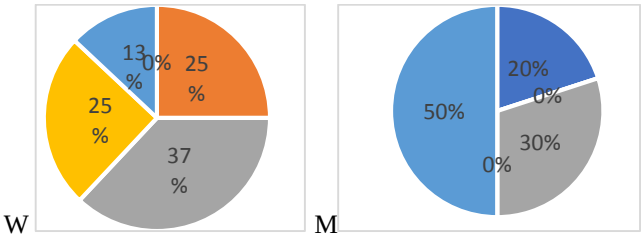

Fig. 10 Faultlessness of SVMR-MO in women (W) and men (M) at the first stage

However, as the results of the same test show, the faultlessness values are different in men and women. So the best results, corresponding to the high level of faultlessness, were registered in 25% of athletes, the results of 37% of women corresponded to the average level, 25% - below the average and 13% - low. At the same time, the results of 20% of men correspond to a high level, 30% to average and 50% to low.

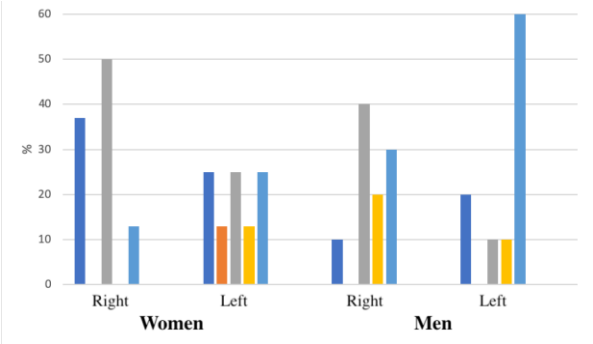

Fig. 11 Static tremometry (3 mm) in the first stage of the study

The results of static tremometry (3 mm) with the right hand showed that 37% of women had a high level of movement coordination, 50% - average and 13% low; 10% of men had a high level, 40% - average, 20% - below average and 30% - low. The results of static tremometry (3 mm) with the left hand showed that 25% of women had a high level of movement coordination, 13% - above average, 25% - average, 13% - below average and 25% - low; 20% of men had a high level, 10% - average, 10% - below average and 60% - low.

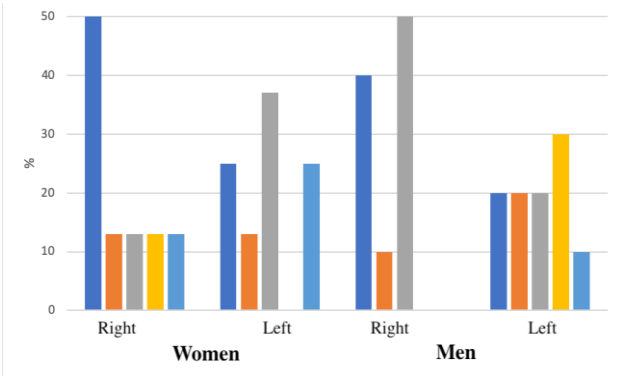

Fig. 12 Static tremometry (5 mm)

The results of static tremometry (5 mm) with the right hand showed that 50% of women had a high level of movement coordination, 13% of women had a higher than average, average, lower than average and low level; 40% of men had a high level of movement coordination, 10% above average and 50% average. The results of static tremometry (5 mm) of the left hand showed that 25% of women had a high level of movement coordination, 13% above average, 37% average and 25% low; 20% of men had a high, above average and average level, 30% below average and 10% low.

The next tests were the Zung self-rating depression scale (Table I, II) and a self-assessment questionnaire consisting of 20 questions.

TABLE I. DYNAMICS OF THE ZUNG DEPRESSION SCALE SCORES IN WOMEN

W	1	2	3	4	5	6	7	8
First stage	49	35	32	38	41	43	29	38
Third stage	49	32	38	35	45	41	36	44

TABLE II. DYNAMICS OF THE ZUNG DEPRESSION SCALE SCORES IN MEN

M	1	2	3	4	5	6	7	8	9	10
First stage	27	32	30	36	36	35	49	29	33	49
Third stage	44	39	26	36	41	35	46	35	30	46

According to the Zung depression scale, it was revealed that men 7, 10 and woman 1 from the Russian national team were on the border between normal values and mild depression at the beginning of training. Moreover, at the third stage, men showed results characterizing a normal functional status, which means increasing confidence in their abilities, and the woman remained in the borderline state.

The results of the self-assessment showed that athlete 1, who was characterized by mild depression, assessed her condition at the beginning of preparations for the World Games as satisfactory, while all the other women at the same stage of preparation assessed their condition as “good”.

In men, the same two athletes 7 and 10 considered their health to be satisfactory, both in the first and in the third stage of the study.

According to the rules of the World Games, only finalists (8 performances) of the previous World Championship in the categories of mixed pairs (MP), trio (TR), groups (GR), dance gymnastics (DG), gymnastic platform (GP) are allowed to participate. The judges evaluate athletes by the following

components: performance (P), artistry (A), complexity (C), the head of the judging panel additionally evaluates the pyramid in MP, TR and GR (max - 1 point). The winner will be the athlete who received the highest number of points (TP) in the sum of these components, if the same number of points is obtained, then the attention should be paid to the "performance" component (whoever has the highest score, becomes the winner.)

TABLE III. RESULTS OF THE RUSSIAN NATIONAL TEAM AT THE WORLD GAMES IN 2017

Components Nomination		P	A	C	P	TP	Place
MP	Semifinal	8.3	9.05	2.9	0.8	21.05	5
TR	Semifinal	8.2	8.95	3.611	0.8	21.561	3
	Final	7.7	8.6	2.777	0.8	19.877	4
GR	Semifinal	8.05	8.95	2.333	1.0	20.333	4
	Final	8.1	9.0	3.222	1.0	21.322	4
DG	Semifinal	9.15	9.2	-	-	18.35	2
	Final	9.35	9.2	-	-	18.55	2
GP	Semifinal	9.1	9.35	-	-	18.45	2
	Final	9.4	9.2	-	-	18.6	1

In the semifinal performance of our team in the "group" nomination, the total "complexity" was not taken into account due to unsatisfactory performance of the element by athlete 1. The coaching staff decided to replace the athlete and change the composition of the group. However, our athletes were not able to climb the podium in this nomination after the final performance.

Men 7 and 10 did not make gross mistakes when performing a competitive exercise, which is explained by their normal functional state at the third stage of preparation.

As a result, the performance of the Russian national team in sports aerobics at the 2017 World Games can be considered successful due to the victory in the nomination "gymnastic platform" and the silver medal in "dance gymnastics".

IV. CONCLUSION

Thus, monitoring the psychophysiological status of athletes from aerobic sports is one of the leading components of sports training management, which allows making reasonable adjustments to the training and competitive activities of athletes.

During the study, the parameters and control points for the psychophysiological status of highly skilled athletes were determined, and the athletes who needed psychological support were identified. Moreover, the results of competitions confirmed the problem areas identified during psychophysiological diagnostics.

Based on the results of a psychophysiological study, a database of highly skilled athletes was created, which was used to determine the model characteristics of athletes.

REFERENCES

[1] 2017-2020. Competition rules: aerobic gymnastics / Federation Internationale de Gymnastique. 2017.

[2] Bernstein H. A. On dexterity and its development. - M.: Physical Culture, 1991. 288 p.

[3] Gorbunov G. O. Psychopedagogy of sport. L., 1986.

[4] I. V. Manzheley, D. V. ChayunPsychological follow-up of athletes' training in aerobic gymnastics. Tomsk state university journal, 2018. Vol. 434. pp. 155 – 161.

[5] Rodionov A.V., Nepopalov V. N., Sopov V. F. Subject organization of psychophysiological training of athletes. Psychology of physical culture and sport. 2015. Pp. 5-10.

[6] Ivko, I., Pozdeeva, E. The comparison of the growth rate of the morphofunctional status and physical fitness in women of young and mature age at the initial stage of health-improving aerobics classes. Human. Sport. Medicine, 2016. Vol. 16(4),pp. 5-17.

[7] Sopov V. Prevention of intrapersonal conflict:"the syndrome of a champion" . Science in Olympic sports, 2008. vol. 1. Pp. 121-126.

[8] Filippova Yu.S., Rubanovich V.B., Aizman R.I. Morphological and functional characteristics of 9- to 22-year-old female athletes involved in sports aerobics. Human Physiology, 2006. vol. 32(2). pp. 209-214..

[9] Yu.S. Filippova, L.K. Matveyeva, S.M. Lukina – Competition success forecasts in sport aerobics. Teoriya i praktika fizicheskoy kultury, 2019. Vol. 10. pp. 83-84.

[10] Cooper K. H. The History of Aerobics (50 Years and Still Counting). Research quarterly for exercise and sport, 2018. Vol.. 89 (2). pp. 129-134.

[11] D'Anna C. et al. Comparison of two pre-jump techniques for equal feet take off jump in aerobic gymnastics: a pilot study, Journal of Physical Education and Sport, 2019. vol. 19 (2). pp. 1268-1275.

[12] Lukina S. M. et al. Aerobic gymnastics element "Flair": technique of execution and training method. Teoriya i praktika fizicheskoy kultury, 2017. vol. 10. pp. 24-24.