

Evaluation of the Vestibular Sense and Psychological Characteristics of Highly Skilled Athletes Who Specialize in Sailing during the Competition Period



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Abstract: During the competition period highly skilled athletes who specialize in sailing experience fatigue, which manifests itself in the form of coordination disorders in maintaining balance. Therefore, it is important to determine the level and dynamics of the vestibular sense development, provide forecasts and perform the professional selection of athletes into the team.

The research on the biomechanical process of maintaining the vertical posture by athletes in this kind of sport and the relevant psychological characteristics is reduced to establishing a qualitative and quantitative relationship between the coordinating properties of an athlete and their main psychological characteristics.

Index Terms: personal anxiety, psychological diagnostics, Romberg's test, situational anxiety.

I. INTRODUCTION

The practice of high-performance sport shows that the study of the peculiarities of the emotional state of the athletes and methods to overcome situational and personal anxiety is an important component of training athletes who specialize in sailing. The content and focus of psychophysiological training of highly qualified athletes, as well as the ratio of its components (general and special physical training) in the annual training macrocycle, remains one of the urgent problems of the modern theory of sport. The structure of training macrocycles identified by us during the theoretical analysis and generalization is aimed at solving the problems related to the physical, psychological, technical and tactical training of athletes. The intensity of static and dynamic work during the execution of technical sports exercises by sailors requires special psychological and physiological qualities [1]. Physical training solves the problem of relieving

neuro-psychological stress after intense competitive activity with the help of outdoor activities [2], improving overall performance and functional fitness [3].

II. PROPOSED METHODOLOGY

A. Block Diagram

We carried out the study of the static and dynamic stability of sailors' posture and the assessment of the vestibular sense development using the Stabilan platform. High mastery of movement control as a basic condition implies a subtle differentiation of the spatial, temporal and power characteristics of the movement, which is the essence of the improvement of techniques. The Romberg's test involves a comparison of statokinesiographic parameters for equal time (usually 51 seconds) with open and closed eyes under conditions of different "modes" of the vestibular system [4].

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Table 1. Statistics of the main characteristics of the stabilometric testing in sailors (juniors and adults)

	Junior sailors (11 participants)		Adult sailors (12 participants)		t-criterion for paired samples	Value (double-sided)
	Average	Mean square deviation	Average	Mean square deviation		
Romberg's test with the eyes open (Center of pressure (CoP) area)	168.25	260.42	66.9	47.96	1.327	0.199
Romberg's test with the eyes open (CoP movement speed)	10.49	4.11	7.04	3.03	2.303	0.032
Romberg's test with the eyes open (dispersion along the frontal line X)	2.44	1.31	1.91	0.96	1.126	0.273
Romberg's test with the eyes open (dispersion along the sagittal line Y)	3.83	2.54	2.3	1.05	1.911	0.070
Romberg's test with the eyes open (vestibular sense development)	77.63	13.61	79.72	25.99	-0.238	0.814
Romberg's test with the eyes closed (CoP area)	280.44	246.77	202.58	161.65	0.903	0.377
Romberg's test with the eyes closed (CoP movement speed)	16.42	6.27	13.64	4.24	1.259	0.222
Romberg's test with the eyes closed (dispersion along the frontal line X)	3.81	1.94	3.02	1.42	1.125	0.273
Romberg's test with the eyes closed (dispersion along the sagittal line Y)	4.57	1.99	4.32	1.88	0.307	0.762
Romberg's test with the eyes closed (vestibular sense development)	57.48	20.41	65.34	15.9	-1.035	0.312
Romberg ratio	207.63	107.68	242.17	140.49	-0.657	0.518
Test with the total error involute — the frontal line	6.24	1.14	5.8	1.38	0.824	0.419
Test with the total error involute — the sagittal line	6	1.44	5.97	2.5	0.039	0.969

B. Algorithm

At the stage of physical training during the competition period, we determined the levels of psychological state, the severity of situational and personal anxiety, as well as the emotional stability of sailors. We used the "Integrative anxiety test" (IAT) and "Express assessment of athletes' emotional state before the competition".

To determine the dynamics of psychological state and emotional stability of athletes in the competition period, we

used IAT, an express diagnostic methodological and psychological tool to identify the level of anxiety as a state (reactive) variable and anxiety as a trait-typological characteristic, and "Express assessment of athletes' emotional state before the competition".

C. Flow Chart

Table 2. Statistics of the main characteristics of the psychological testing of sailors (juniors and adults)

	Junior sailors (11 participants)		Adult sailors (12 participants)		t-criterion for paired samples	Value (double-sided)
	Average	Mean square deviation	Average	Mean square deviation		
State anxiety (IAT)	3.27	2.10	1.50	1	2.620	0.016
Emotional discomfort of state anxiety (IAT)	4	2.49	2.08	1.68	2.183	0.041

Asthenic component of state anxiety (IAT)	4	2.89	3.67	2.06	0.320	0.752
Phobic component of state anxiety (IAT)	3.82	2.36	2.08	2.02	1.899	0.071
Anxiety assessment of the state anxiety perspective (IAT)	3.63	2.20	2.83	2.04	0.908	0.374
Social protection of state anxiety (IAT)	4.64	2.29	2.75	1.96	2.127	0.045
Trait anxiety (IAT)	6.36	1.63	5.25	1.71	1.594	0.126
Emotional discomfort of trait anxiety (IAT)	6.73	1.68	5.92	1.78	1.120	0.275
Asthenic component of trait anxiety (IAT)	5.63	2.11	5.08	1.62	0.708	0.487
Phobic component of trait anxiety (IAT)	5.18	1.99	4.33	2.35	0.930	0.363
Anxiety assessment of the trait anxiety perspective (IAT)	5.91	1.58	5.50	1.51	0.636	0.532
Social protection of trait anxiety (IAT)	4.73	2.33	3.58	2.23	1.202	0.243
Well-being (Express assessment of emotional state before the competition)	6.36	1.21	7.08	1.31	-1.366	0.186
Mood (Express assessment of emotional state before the competition)	7.54	2.21	7.92	1.72	-0.451	0.657
Desire to train (Express assessment of emotional state before the competition)	7	1.89	7.83	2.48	-0.899	0.379
Satisfaction with the training process (Express assessment of the emotional state before the competition)	6.91	2.30	6.67	2.60	0.236	0.816
Sports prospects (Express assessment of emotional state before the competition)	8.27	1.85	8.33	2.61	-0.064	0.950
Readiness for the competition (Express assessment of the emotional state before the competition)	7	2.09	7.83	2.03	-0.966	0.345
Relationship with the team (Express assessment of the emotional state before the competition)	8.45	1.03	8.75	1.14	-0.649	0.523
Relationship with the coach (Express assessment of the emotional state before the competition)	7.45	2.16	7.67	2.77	-0.203	0.841
Emotional state (express assessment of emotional state before the competition)	59	9.77	62.08	13.22	-0.631	0.535

Statistical processing was carried out using standard methods of variation statistics with Student's t-test and correlation analysis.

III. ANALYSIS OF RESULTS

According to the results obtained in the course of the study, most of the stabilometric and psychological parameters of the surveyed groups of sailors (adults and juniors) coincide. The only item that reliably statistically differs between the two studied groups is the psychological test indicator "Situational anxiety" (IAT) (Table 2). It is low in both groups and differs only in the level of anxiety in the pre-competition period, with the value of 3.27 points in juniors and 1.50 points in adults. This shows that junior sailors experience greater emotional discomfort (4 points) than adult athletes (2.08 points) and indicates the stability of the perception of a stressful situation by adult sailors who are used to competing. For juniors, the situation of competition is more alarming and stressful. After analyzing the difference between the Romberg's test values in two groups, namely the difference between the results of the tests with open and closed eyes (Table 1), such as the speed (10.49 in juniors, 7.04 in adults) and the CoP movement area (168.25 in juniors, 66.9 in adults) with the eyes open and speed (16.42 in juniors, 13.64 in adults) and the CoP movement area (280.44 in juniors, 202.58 in adults) with the eyes closed, the Romberg ratio (207.63 in juniors, 242.17 in adults) — we can conclude that the visual system of both juniors and adult sailors makes a greater contribution to their ability to control their posture. Nevertheless, the speed of CoP

movement with the eyes open (the Romberg's test) shows significant differences between the two groups: the value equals 10.49 in juniors and 7.04 in adults, which points out a greater development of proprioceptive sensitivity in adult sailors as compared to the juniors. An analysis of the correlation relationships (Table 3) of the coordination abilities and personality characteristics of the junior sailors showed that the vestibular sense development with the eyes open was positively related at a reliable level to the readiness for the competition (0.647*) and emotional state (0.623*). Junior sailors with a developed vestibular sense are distinguished by high readiness for competitions and emotional stability. While for adult sailors, the vestibular sense development with the eyes closed directly depends on the mood (0.871**). A negative relationship has been discovered between the indicator of relationship with the coach and such Romberg's test values (with the eyes open) as the CoP area (-0.683 *), dispersion along the frontal line X (-0.680*) and dispersion along the sagittal line Y (-0.731*). Fatigue of an adult sailor manifests itself in the form of coordination disorders in maintaining balance. However, the positive correlation between the asthenic component of state anxiety and the Romberg ratio (0.717**) in adults suggests the opposite.

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Thus, we have discovered an important functional connection between the constructive personality traits of the individual and the psychophysiological (psychomotor) organization of an athlete, which creates prerequisites for a detailed study of this phenomenon in sailing sports.

Table 3. Correlations

Psychological test indicators	Stabilometric indicators	r
Junior sailors		
Readiness for the competition (Express assessment of the emotional state before the competition)	Romberg's test value of vestibular sense development (with the eyes open)	0.647*
Emotional state (Express assessment of the emotional state before the competition).		0.623*
Relationship with the coach (Express assessment of the emotional state before the competition)	Romberg's test CoP area (with the eyes open)	-0.683*
	Romberg's test dispersion along the frontal line X (with the eyes open)	-0.680*
	Romberg's test dispersion along the sagittal line Y (with the eyes open)	-0.731*
Adult sailors		
Asthenic component of situational anxiety (IAT)	Romberg ratio	0.717**
Well-being (Express assessment of the emotional state before the competition)	Romberg's test CoP area (with the eyes closed)	-0.676*
Mood (Express assessment of the emotional state before the competition)		-0.869**
	Romberg's test CoP movement speed (with the eyes closed)	-0.869**
	Romberg's test dispersion along the frontal line Y	-0.651*
	Romberg's test value of vestibular sense development (with the eyes closed)	0.871**
Desire to train (Express assessment of the emotional state before the competition)	Romberg's test dispersion along the frontal line X (with the eyes closed)	-0.837**

IV. CONCLUSION

According to the results of stabilographic and psychological surveys, the level and dynamics of static-dynamic stability and basic psychological qualities in the structure of the functional and psychological training of athletes, we can conclude that sailors' fatigue manifests itself in the form of coordination disorders in retaining balance.

The criterion of the effectiveness of exercises performed by sailors, along with the targeted improvement of endurance and speed-strength abilities, is the level of their emotional discomfort and their mood. Junior sailors experience more emotional discomfort than adult athletes.

This indicates the stability of the perception of a stressful situation by adult sailors who are used to competing. For juniors, the situation of competition is more alarming and stressful. The visual system makes a greater contribution to posture control, both in junior and adult sailors. Nevertheless, the proprioceptive sensitivity in adult sailors is more developed compared to juniors. Junior sailors with a developed vestibular sense are distinguished by high readiness for competitions and emotional stability. While for adult sailors, the quality of vestibular sense development with the eyes closed directly depends on the mood. Fatigue of an adult sailor manifests itself in the form of coordination disorders in maintaining balance.

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