High class athletes' psychophysical state study during adaptation to the conditions of competitions in terms of Russian Far East

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Abstract: Sports working capacity and a high functional readiness support, at the peak of sports fitness during the flight through several time zones, is an important objective for trainers and doctors of national teams. Specialists mention steady biological rhythms disorder during the flight more than 3 time zones, which is demonstrated in motor, physiological and psycho-emotional reactions violation. In terms of training national teams for the future Games of the Olympiad in Tokyo and Beijing it is interesting to study the processes of athletes' adaptation during the flight from the west to the east and also preliminary acclimatization in terms of Asian-Pacific region (APR). **Materials.** The regularities and peculiarities of adaptation among highly-qualified athletes to the conditions of Russian Far East. **Methods.** Information sources analysis and summarizing; video, pedagogical observation, methods of psychophysical state study, express-method "VibraMed", expert analysis of competitive activity, methods of mathematical statistics. **Results.** Analyzing the results dynamics of boxers' psychophysical state right during the competitive period, we can follow the main individual and group tendencies. Athletes of "A" group are more experienced boxers, who have already taken part in big competitions. Their distinctive feature is a quick CNS functional state adaptation. A new daily rhythm formation was quicker, which can be conditioned by the experience of adaptation during many flights and by more stable state of psycho-emotional sphere in competitive conditions. The athletes' indices of this group in general during the whole time of adaptation changed gradually, in some indices there was the increase at the beginning of the competitions, in comparison with the initial results. All athletes of this group won in the final combats. The studied indices of the athletes from the second group changed quickly, with rough increases, at the same time, the indices didn't achieve the initial level. The athletes from the second group needed longer period for adaptation, as they didn't have time to achieve their optimal psychophysical state towards the beginning of the competitions. The results of the competitive activity of the athletes from "B" group were worse. **Conclusion.** The results of the held research showed that there are general regularities of adaptation, however, individual peculiarities of adaptation are more important during training for the most important competitions.

Keywords: adaptation, athlete, training process, psychophysical state.

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Sports working capacity and a high functional readiness support, at the peak of sports fitness during the flight through several time zones, is an important objective for trainers and doctors of national teams. The urgent questions of the athletes' time-related adaptation were studied by native and foreign specialists [2, 3, 4, 5, 6]. Specialists mention steady biological rhythms disorder during the flight more than 3 time zones, which is demonstrated in motor, physiological and psycho-emotional reactions violation.

The objectives of the research:

- to define the differences of psychophysical state indices during the process of adaptation to the conditions of the Far East among high-class boxers;
- to define the peculiarities of group and individual changes in psychophysical state indices among highly-qualified boxers during adaptation.

Research Methods

The following complex of research methods was used in the research:

- information sources analysis and summarizing;
- video taking for competitive activity analysis (the number of accurate blows, combat density and etc.);

- pedagogical observation over the training and competitive process;
- methods of psychophysical state study: hardware and software complex (HSC) "NS-Psikhotest" for orientative-visual-searching reaction analysis according to Shulte-Platonov tables (OVSR), simple visual-motor reaction (SVMR), choice reaction (CR), reactions to a moving object (RMO), attention focusing (AF), voluminal attention (VA). Apart from mentioned above reactions, the indices of coordination and power were registered [12]:

- express-method "VibraMed" [1] for more than 12 psycho-emotional parameters of a person control and diagnostics (aggression, stress, anxiety, tranquility, energy, self-regulation, inhibition and others) [7, 8, 9, 10, 11]. The methodology of vibroimage analysis helps to study psycho-emotional state of an athlete without interference into the training process, using information-statistical analysis concerning three-dimensional head micro motion and vestibular-emotional reflex;

- competitive activity expert analysis;

- methods of mathematical statistics.

12 highly-qualified boxers took part in the research (1 Merited Master of Sports, 2 World-class athletes and 9 masters of sport). The research was held at the beginning and during the Xth International Boxing tournament in memoriam of K. Korotkov. The athletes were examined in the morning.

Results and Discussion

In order to solve the first objective of the research more than 50 indices (among them we defined the most important ones), which reflect athletes' psychophysical and psycho-emotional state during adaptation were studied (Pictures 1, 2).

The dynamics of psychophysical characteristics analysis showed that the most considerable changes were on the third, sixth and tenth days of adaptation. The most significant changes were in the following indices: simple visual motor reaction on the third day decreased till 9%, on the 6th day increased the initial index till 4%, on the 8th day decreased till 6% from the initial and at the end of the competitions increased by 2% from the initial level. The accuracy of orientative-visual-searching reaction was the following: -6,8% on the second day; +12,3% on the 7th day; +8% on the 9th day. Reaction to a moving object became worse on the 3rd day of adaptation by 3,7%, on the 5th day it improved by 3,2% in comparison with the initial level and on the 10th day it improved by 6,5%. Choice reaction decreased on the 3rd day by 4%, then it improved on the 5th and the 7th day by 3,8 and 6,9%. Dynamometry decreased by 5% on the 3rd day; on the 6th day it increased +3,5%.

In psycho-emotional indices there was a wave-like dynamics. Most of all changes were during the 1st, 5th, 7th, 10th days of adaptation.

Aggression decreased by 8%, then increased till 3%, then the index achieved the initial level, after that it started to increase from +29% and till +40% on the 11th day. Energy increased: 5%; +4,5%; +17,2%; +12% during the mentioned days. Self-regulation indices changed during the mentioned days by -8%; -2,4%; +12%; +7,2%; anxiety indices: +3%; +8%; +4%; +10%.

Thus, during the 1st and the 3rd days of adaptation there were negative changes of the studied indices, on the 5th-7th day their values renewed till the initial level and in some cases increased this level.

Individual changes analysis of psychophysical indices revealed considerable differences in the character and the volume of changes. That is why the athletes were divided into two groups –A and B, according to mentioned above peculiarities of adaptation.

Picture 1 – Indices dynamics of highly-qualified athletes' psychomotor system and power during adaptation

ПЗМР-SVMR
ПРВ- choice reaction index CRI
Пвним-Index of attention
Помех- noise stability
Точреак- accuracy of reaction
ОЗПР-OVSR
Сила-power

Comparative analysis of the studied indices revealed group characteristics of adaptation (table 1). During the test the athletes from "A" group had the following simple visual-motor reaction index: 207 ms, which corresponds with the average speed of sensomotor reaction. During the 1st day of adaptation the index was 209 ms (the average speed of sensomotor reaction). The peak of this index increase till 199 ms (high speed of sensomotor reaction) was during the 3rd day of adaptation. On the 10th and the 12th day of adaptation the index was 199 and 197 ms (high speed of sensomotor reaction).

The index of choice reaction (ms), stated during the test, in the average was 318 ms (high speed of sensomotor reaction). During the 1st day of adaptation the index was 341 ms (the average speed of sensomotor reaction). The peak of increase till 304 ms (high speed of sensomotor reaction) was during the 2nd day of adaptation, the peak of decrease was on the 9th day of adaptation and was 371 ms, on the 12th day of adaptation – 369 ms (the average speed of sensomotor reaction).

The index of attention estimation (ms), registered during the test, in the average was 294 ms (transitional type between the inert and non-stationary type of higher nervous activity). During the first day of adaptation the index was 316 ms (inert type of higher nervous activity). There was no quick decrease of this index during the test. The peak of increase was during the 9th day – 273 ms, during the 12th day

of adaptation – 276 ms (transitional type between the inert and non-stationary type of higher nervous activity).

Noise stability index (ms), registered during the test, in the average was 363 ms (inert type of higher nervous activity). During the 1st day of adaptation the index was 353 ms, which corresponds with the inert type of higher nervous activity. The peak of decrease was during the 4th day of adaptation – 386 ms, and during the 5th day – 394 ms. This index improvement was during the 6th day of adaptation – till 342 ms, and during the 9th day – 346 ms (transitional type between the inert and non-stationary type of higher nervous activity). On the 12th day of adaptation this index was 360 ms (inert type of higher nervous activity).

Picture 2 – Indices dynamics of highly-qualified athletes' psycho-emotional state during adaptation

Агрессия-aggression
саморег-self-regulation
энергичность-energy
невротизм- neuroticism
тревожность-anxiety
пси-energetics

The index of accuracy of reactions (quantity) in the reaction to a moving object, registered in the test, in the average was 14 (70%) (the average level of accuracy of reactions). During the 1st day this index was 13 (65%) (the average level of reactions accuracy). There was no quick decrease of this index during the test, but maximum values were registered during the 2nd and the 3rd days of adaptation – till 16 (80%) (above the average level of reactions accuracy). During the 12th day of adaptation this index was 12 (60%) (the average level of reactions accuracy).

Table 1 – High-class boxers' psychophysical indices dynamics during the period of adaptation

№	Indices	Group A				Group B				Difference M2-M4	
		Result (before)	To competitions (after)	%	P	Result	To competitions (after)	%	P	%	P
1	SVMR (ms)	234±3,6	248±5,7	5,7	P<0,05	234±3,6	229±5,7	2,1	P>0,05	7,7	P<0,05
2	CRI (ms)	318±8,3	331±10,9	4,4	P>0,05	348±7,2	316±9,7	9,2	P<0,05	4,5	P<0,05
3	IAttent(ms)	294±4,4	316±6,1	7,1	P<0,05	305,5±5,7	283±6,2	7,2	P<0,05	21,2	P<0,05
4	Noise stability (ms)	353±6,4	394±5,9	5,8	P<0,05	380±6,2	354±6,6	6,8	P<0,05	10	P<0,05
5	Acc.of react (times)	14±0,5	16±0,6	14,3	P<0,05	13±0,7	16±0,6	23	P<0,05	0	P>0,05
6	OVSР (s)	33±1,8	28,5±1,9	22,3	P<0,05	33,5±1,8	27±1,6	19,4	P<0,05	5,3	P<0,05
7	Power	72±2,5	76±2,9	6	P<0,05	72±2,4	68±2,6	3	P>0,05	15,8	P<0,05
8	Aggression	34,7±1,5	49,5±1,8	49,9	P<0,05	42,2±2	50,5±1,9	19,7	P<0,05	20	P<0,05
9	Self-regulation	79,9±4,2	58,5±3,9	31,3	P<0,05	70,7±4,6	68,9±5,2	2,5	P>0,05	17,9	P<0,05
10	Energy	15,3±0,7	22±1,4	38,9	P<0,05	16,2±0,6	18,6±0,9	13,6	P<0,05	18,9	P<0,05
11	Anxiety	10,8±1,3	45,7±1,7	30,1	P<0,05	9,4±1,5	48,9±1,4	19,8	P<0,05	32	P<0,05
12	energetics (psi)	21,8±4,4	45,1±3,9	33,8	P<0,05	22,6±3,8	27,3±3,6	20,8	P<0,05	39,5	P<0,05

Simple visual reaction index (s.), registered during the test, in the average was 33 seconds (above the average index). During the 1st day of adaptation it was 44,5 seconds, which corresponds with the average value. There was this index decrease during the whole test, but the highest values were registered on the 5th day of adaptation - 26,5 seconds, on the 9th day of adaptation – 29 seconds (high index); on the 12th day of adaptation the index of simple visual reaction P was 28,5 seconds (high index).

Taking into consideration the dynamics of psycho-emotional indices of A group athletes we come to the following conclusion. The main indices changes had a stable character. Since the 1st till the 3rd day “aggression”, “danger”, “tranquility” (everything within 8% from the initial level) decreased. Since the 3rd till the 5th day there was “aggression” increase -18%, “self-regulation” – till 19%, “tranquility” – till 10%, “energy” –till 20%, “anxiety”, “inhibition”, “neuroticism” indices decreased by 8, 5 and 12 %. The main “negative peak” of these boxers’ adaptation after coming to Far East was relatively stable, not causing big leaps in psycho-emotional indices. Then there was the tendency of “aggression” increase till 19,2% on the 6th day, “charisma”-till 29,6%, “self-regulation” till 16,7%, which can be explained by the orientation of an athlete to the coming competitions. “Stress” level decreased within 17,3%, “integral positive index” increased till 10%, “energy” increased till 12,3%, which could be caused by the main processes of competitive combats, there was general tendency to the following indices increase: “tranquility”(till 22,8%), “energy”(till 81%), “self-regulation”(till 24%), “integral positive indices”(till 72%), “energy consumption”(till 15%). The following indices stably decreased: “stress” (till 17,3%), “anxiety” (till 21%), “inhibition” (till 22%), “energy”(till 19%). The sleep of athletes wasn’t almost disturbed after the flight. The first three days athletes got up very early, then their sleep stabilized. Taking into consideration high qualification of the athletes, it can be said that they felt psychological comfort quickly enough after the flight, psychophysiological functions of an organism stabilized on the 4th day, time-related adaptations were quick enough.

The athletes from “B” group had the following index of simple visual-motor reaction (ms), during the whole time of test: in the average 211,5 ms (the average speed of reaction). During the 1st day of adaptation the index was 210 ms (the average speed of sensomotor reaction). The peak of increase till 190 ms - a high speed of sensomotor reaction – was during the 6th day of adaptation and on the 12th day - 196 ms (high speed of reaction). The peak of decrease was during the 2nd day of adaptation – till 230 ms (a low speed of reaction). On the 13th day of adaptation this index was almost equal to the initial value – 211 ms (the average speed of sensomotor reaction).

Choice reaction index (ms), registered during the test, in the average was 348 ms (the average speed of sensomotor reaction). During the 1st day of adaptation the index was 364 ms (the average speed of sensomotor reaction). The peak of improvement till 316 ms was during the 2nd day of adaptation and during the 13th day – 322 ms (high speed of reaction). The peak of decrease was during the 9th day of adaptation and was 381 ms (the average speed of reaction).

Attention estimation index (ms), registered during the test, in the average was 305,5 ms (inert type of higher nervous activity). During the 1st day of adaptation the index was 313 ms, which corresponds with inert type of higher nervous activity. The peak of worsening was during the 2nd day of adaptation – 323 ms. The peak of this index improvement till 283 ms was during the 6th day of adaptation, on the 8th day of adaptation – 287; during the 13th day of adaptation the index was 298 ms (transitional type between the inert and non-stationary type of higher nervous activity).

The index of noise stability (ms), registered during the test, since May, 7 till May, 19, in the average was 380 ms (inert type of higher nervous activity). During the 1st day of adaptation this index was 461 ms, which corresponds with the inert type of higher nervous activity. In general there was this index decrease during the test. The peak of decrease was on the 6th day of adaptation – 354 ms and on the 8th day – 330 ms (transitional type between the inert and non-stationary type of higher nervous activity). During the 13th day of adaptation the index of noise stability decreased in comparison with the initial value (461ms) till 362 ms (till 99ms) (inert type of higher nervous activity).

The accuracy of reactions index (times) in the reaction to a moving object, registered during the test, in the average was 13 (65%) (the average level of reactions accuracy). During the 1st day of adaptation this index was 13 (65%) (the average level of reactions accuracy). During the 3rd and the 4th day of adaptation (May, 9-10) the index was 16-17 (80-85%) (above the average – high level of reactions accuracy); during the 10th day of adaptation the index was 16 (80%) (above the average the level of reactions accuracy). During the 12th and the 13th days of adaptation there was accuracy of reactions decrease till 13 times (the average level of reactions accuracy coinciding).

The index of simple visual-motor reaction (s), registered during the test, in the average was 33,5 s (above the average index). During the 1st day of adaptation this index was 44 s, which corresponds with the average value. In general, there was this index gradual decrease. The peak of index improvement till 27 s was during the 6th and the 10th days of adaptation and during the 12th day – 26 s (high index). During the 13th day of adaptation there was this index worsening till 38,5 s.

In B group there was the following indices decrease: “aggression”, “danger”, “tranquility” since the 1st till the 3rd day (within 15, 5 and 10%). Also there was a quick decrease of the following indices on the 3rd day of adaptation among B group athletes: “energy” - more than 16%, “self-regulation” – till 24,3%, “charisma” till 29,6%, “integral positive” and “physiological” indices till 18%. Stable enough were the following indices: “inhibition”, “energy consumption”, “integral negative” with the spread of no more than 8%. The athletes felt worse during the 3rd day on arriving in Far East. There were sleep disorders (they started to fall asleep later and woke up earlier). Subjective feelings of the athletes also become worse: they were tired, had the symptoms of cold, had dull mood. The athletes complained of bad sleep, the duration of sleep decrease, the absence of a good night's sleep. Drowsiness and weakness was in the morning. During late evening hours psycho-emotional and motor activities distinctly increased. Since the 3rd till the 5th day there was “aggression” increase till 38,6%, “tranquility” increase till 10,3%, “energy” increase till 8%, “anxiety”, “inhibition”, “neuroticism” indices also increased till 10, 5 and 5%. Then since the 6th till the 12th day, including the days of competitive combats, the dynamics was the following: the tendency of the following indices decrease “tranquility” (till 12%), “energy” (till 31%), “self-regulation” (till 10 %), “integral positive indices” (till 10%), “energy consumption” (till 15,7%). The following indices had a stable increase: “stress” (till 10%), “anxiety” (till 20%), “inhibition” (till 5%), “energy” (till 20%). The following indices decreased: “anxiety”, “neuroticism”, “physiological and integral negative” (till 10 points), “energy” decreased till 30%. Stable enough were the following indices: “energy consumption”, “aggression”, “charisma”, “self-regulation”. The following indices increased: “stress” till 15%, “danger” till 5%, “energy” till 20%. Also the following indices distinctly increased: “danger” till 35 points, “inhibition” till 10 points, “neuroticism” till 25 points. The tendency decrease was in the following indices: “energy consumption” (till 30 points), “tranquility” (till 20 points), “self-regulation” (till 20 points), “integral positive indices” – till 15 points, “physiological” – till 20 points. The most variative indices in this group are the following: “aggression” – the spread from the beginning till the end of the competitions was 40 points, “energy” - the spread was till 30 points, “charisma” and “energy” – till 25 points.

The changes of the other indices of psycho-emotional state were minimal. The points spread was only till 10 points, which is insignificant, in the opinion of the methodology authors.

Any irregularity in “aura” color and size characterizes the object’s movement and psychophysiological state. A normal state of a person is characterized by more equal outer vibroimage (vibro-aura), blue, green, violet prevail [12, 13, 14]. The athletes from “A” group demonstrated more stable “aura” silhouette, blue-green colors prevail.

For a tense state of a person great space and color vibro-aura irregularity is typical, which was among the athletes from “B” group.

During the indices comparison among the athletes from two groups it was revealed that the athletes from “A” group turned out to be more stable in adaptation to negative factors (acclimatization, fatigue,

trauma, cutting weight and etc.), which is presented in table 1. The most significant differences to the end of the adaptation period (competitive) were in the following indices: among “B” group athletes, in comparison with “A” group athletes, high indices turned out to be the following: attention estimation index – by 21,2% ($P<0,05$); SVMR – by 7,7% ($P<0,05$); noise stability index – by 10% ($P<0,05$); which proves less activity of nerve processes, high level of visual-motor centers fatigue. In dynamometry indices “A” group athletes had the increase by 15,8% ($P<0,05$). Low lability of nerve processes had a negative influence on coordination and power abilities of “B” group athletes.

In psycho-emotional sphere demonstration “A” group boxers turned out to be more adaptive. “Self-regulation” index among the athletes from this group turned out to be 17,9% ($P<0,05$) higher, than among “B” group athletes, “energy” index turned out to be 18,9% ($P<0,05$) higher; a complex index of energy turned out to be 39,5% ($P<0,05$) higher; “aggression” of “A” group athletes increased by 20% ($P<0,05$).

Other psychophysical indices changed statistically not significantly.

All mentioned above influenced sports result of the definite boxers, most indices of competitive activity among “A” group athletes were considerably higher than the indices of “B” group athletes. The following group tendencies were demonstrated: the number of accurate strikes increased by 10% among “A” group athletes; the coefficient of attack efficiency increased by 12%; the index of “tactical objectives solution during the combat” improved by 15%. The final combats among “A” group boxers were held in a quick tempo, strictly attacking manner, mainly at mid and close distances. Among “B” group athletes the following indices decreased: power, energy, energy consumption and it influenced competitive activity.

Analyzing the results dynamics of boxers’ psycho-emotional state directly during the competitions, we can see the main individual and group tendencies.

Conclusion

Thus, it should be noted that “A” group athletes are more experienced boxers, who took part in big competitions and who won at the present competitions. Their distinctive feature is a quick adaptation of CNS functional state. A new daily rhythm formation was quicker, which can be conditioned by the experience of adaptation in terms of great number of flights and by more stable psycho-emotional sphere state in terms of competitive conditions. The athletes’ indices from this group changed gradually and equally during the whole period of adaptation, in some indices there was some increase at the beginning of competitions in comparison with the initial results. All athletes of this group won the final combats.

The studied indices of the second group athletes changed quickly, with rough increases, at the same time, the indices didn’t achieve the initial level. The second group athletes needed longer period for adaptation, as they didn’t have time to achieve their optimal psychophysical state towards the beginning of the competitions. The results of the “B” group athletes competitive activity were worse.

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