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Relationship between psychological state and performance of rowers aged 14-16

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Abstract

Introduction. Kayaking and canoeing requires a significant level of psychological resilience and physical fitness from athletes, in the face of everincreasing levels of competition and the number of events throughout the season.

The aim of the study was to determine the relationship between the rowing performance dynamics and the psychological state dynamics in rowers aged 14-16 years after a year of training using a block approach with double periodization.

Materials and Methods. 22 rowers aged 14-16 took part in the study.

Results. The study found an improvement in rowing time at a distance of 500 m by 9.32% (p<0.001) and 1000 m - by 7.75% (p<0.001) after a year of training with a block approach and double periodization. According to the results of the Sport Orientation Questionnaire: the competitiveness indicator improved by 14.29%, the desire to win indicator improved by 17.01%, and the purposefulness indicator improved by 16.69% (p<0.001). In addition, a significant correlation was found between the improvement of the result at the distance of 500 m and the improvement of competitiveness (r = 0.559, p<0.01), desire to win (r = 0.624, p<0.05) and purposefulness (r = 0.548, p<0.01) and between the improvement of the rowing time at the distance of 1000 m with the improvement of desire to win (r = 0.517, p< 0.05) and purposefulness (r = 0.616, p< 0.01), with the improvement of competitiveness indicator the correlation was moderate (r = 0.473, p < 0.05).

Conclusions. Therefore, the block approach with double periodization is effective and well-thought-out regarding the alternation of periods of intense loads and rest, thanks to which the exhaustion of athletes' bodies is prevented and their psychological state improves too.

Key words: rowing, psychological state, double periodization, preparation, block approach.

Introduction.

Kayaking and canoeing require a significant level of psychological resilience and physical fitness from athletes in the face of ever-increasing levels of competition and the number of events throughout the season.

In order to achieve high sports results at competitions, athletes need to have a high psychological preparation (Duda, 1992), which prompts coaches to increase the volume of the training load. That is why a lot of rowers' training is devoted to high-volume training and functional training.

Some authors (Bompa & Buzzichelli, 2018; Frank, 2015; Frank, 2007, Stam, et al., 2020) note that this approach to training is less productive. In their opinion, an important factor in the training of athletes is the correct distribution of the training load, psychological preparation and especially effective periodization of training time. However, studies (Bohuslavska, et al., 2017; Michael, et al., 2008) have shown that large volumes of training at the age of 14-16 years that do not correspond to the functional capabilities of the body, which can negatively affect the psychological state, reduce the dynamics of the increase in results and cause health disorders in young athletes.

This focuses the attention of coaches on the need to find options for improving the entire training structure of athletes to ensure quality training and create prerequisites for the transition to professional sports. And an important element of increasing the effectiveness of the training process is the athlete's psychological state. (Yang, 2024)

The training year can be divided using single and double periodization. (Frank, 2015). The specificity of training in rowing on kayaks and canoes allows dividing the year into two stages (macrocycles): winter and summer. Double periodization has three types of blocks: preparatory - for the development of rowing technique and aerobic capabilities, transitional - for the development of specific physical qualities from the sport, primarily anaerobic capabilities and special technical skills, and competitive - for the development of specific rowing tactics and recovery before the start. These three mesocycle blocks form the training phase.

Advantages of the block training model:

- reduced total load volume;

- the division of training into blocks allows you to prepare for a large number of starts in the year;

- more time for recovery after each mesocycle;

- better preparation for the main competitions of the year.

It is worth noting that there are different models of periodization of the training process, for example three-cycle and five-cycle theories of periodization (Hopkins, et al., 1999, Platonov, 2021), which provide a fairly high level of preparation for competitions in certain parts of the year. As some authors note, when building the structure of the training process, it is worth taking into account the specifics of the sport, the number of competitions in a year, the psychological state (Park, 2023) and the athlete's ability to achieve the maximum effect.

The wrong approach to the training process and the long duration of the preparation stages lead to physical and psychological fatigue of athletes (Klockare, 2025), which creates prerequisites for a decrease in results and lower readiness for the main competitions of the year. There are other periodization options, which are more appropriate for training adult athletes, and have less impact on the results of intermediate level athletes (Bompa & Buzzichelli, 2018; Frank, 2015).

The relevance of this study is determined by the fact that the issue of the relationship between the psychological state and the performance of middle-level rowers is not sufficiently discussed in the literature.

The aim of the study was to determine the relationship between the rowing performance dynamics and the psychological state dynamics in rowers aged 14-16 years after a year of training using a block approach with double periodization.

Materials and Methods.

22 athletes took part in the study. Measurements of rowing at distances of 500 m and 1000 m were carried out before the beginning of the study - September 2023 and at the end of the experiment - September 2024. It is accepted to observe the proportions in the preparation periods in the annual cycle, which are: 60% (preparatory), 35% (competitive), 5% (transitional). Rowers in this study were trained using a block approach to training with double periodization (Frank, 2015). The peculiarities and seasonality of rowing on kayaks and canoes created conditions for dividing the training year into two stages (macrocycles): winter, which consisted of 3 mesocycles and lasted from October to March, and summer - from 6 mesocycles, which lasted from April to September. Each macrocycle at both stages consisted of three blocks: preparatory, transitional, competitive. These three mesocycle blocks form the training phase.

A questionnaire was also conducted using the Gill method SOQ (Sport Orientation Questionnaire) (Gill, 1988), which is a multidimensional, sport-specific measure of individual differences in orientation (psychological state) to sports achievements. The questionnaire contains 25 questions that relate to one of three subscales: competitiveness, desire to win, and purposefulness. Out of a total of 25 questions, the "competitiveness" subscale includes 13 questions, while the "desire to win" and "purposefulness" contain 6 questions each. When answering the question, the respondent chose from the following options: no (one point), more no than yes (two points), neither (three points), more yes than no (four points), yes (five points). Testing of the psychological state of athletes according to Gill was carried out before the beginning of the study - September 2023 and at the end of the experiment - September 2024. All study participants were familiarized with the study design and gave their informed consent for the tests.

Statistical analysis

The average value (Mx), standard error of the average (Smx) was calculated. The Shapiro-Wilk Test (Shapiro-Wilk Test) was performed to check the correspondence of the distribution of variables to the law of normal distribution. When testing hypotheses, the level of statistical significance (p) less than 0.05 was used. To determine the reliability of dynamic changes in the group with a normal distribution, the Student's t-test was determined for dependent groups, and with a different from the normal distribution, the Wilcoxon test was used.

To check the presence and determine the depth of the correlation relationship, the Pearson correlation coefficient (r) was determined when the distribution was normal, and the Spearman rank correlation coefficient (R) when it was different from the normal distribution. To assess the reliability of the correlation coefficients, the calculated coefficients were compared with the critical values taking into account the degrees of freedom. The depth of correlation was evaluated according to the scale Chaddock: at r=0 - there is no correlation, at 0 < r < 0.30 - weak, at $0.30 \le r \le 0.49$ - moderate, at $0.50 \le r \le 0.69$ - significant, at $0.70 \le r \le 0.89$ - strong, at r ≥ 0.90 - very strong, close to a functional relationship.

Results.

Table 1. Dynamics of fowing indicators at distances of 500 m and 1000 m						
	Research stage					
Indicator	to	after	Increase,	t	р	
	Mx±Smx	Mx±Smx	%			
Powing 500 m	$122,61\pm$	$111,18\pm$	0.32	0.80	n < 0.001	
Kowing 500 III	1,78	0,86	-9.32	-9.69	p<0.001	
Bowing 1000 m	259,79±	239,65±	7 75	0.29	m <0.001	
Kowing 1000 m	2,93	0,96	-7.75	-9.38	p<0.001	

Note: Mx is the average value; Smx - standard error of the mean; t - Student's t-test; p - statistical reliability of the change in the indicator in the group at the beginning and after the end of the study.

As a result of the study, it was found that after training using a block approach with double periodization, rowers showed a significant improvement in time at a distance of 500 m by 9.32% (p<0.001), and at a distance of 1000 m - by 7.75% (p<0.001). (table 1)

When analyzing the results of the Gill SOQ test for the entire period of the study, an increase in the competitiveness index by 14.29% (p<0.001), desire to win - by 17.01% (p<0.001) and purposefulness - by 16.69% (p<0.001) was found in athletes. (table 2)

Indicator	Research stage		Inonago		
	to	to	increase,	t	р
	Mx±Smx	Mx±Smx	70		
Competitiveness	50,23±	57,41±	14.29	7.86	p<0,001
	1,94	1,27			
The desire to win	$24,05\pm$	28,14±	17.01	6.28	p<0,001
	0,85	0,33			
Purposefulness	24,50±	28,59±	16.69	15.12	m < 0.001
	0,41	0,25			p<0,001

Table 2. Dynamics of the Gill test SOQ (Sport Orientation Questionnaire)

Note: Mx is the average value; Smx - standard error of the mean; t - Student's t-test; p - statistical reliability of the change in the indicator in the group at the beginning and after the end of the study.

Data analysis was also conducted on the possible interrelationships between the dynamics of psychological state according to three parameters of the psychological state: competitiveness, the desire to win and purposefulness with the dynamics of rowing time at distances of 500 m and 1000 m. The results are given in table. 3

performance at distances of 500 m and 1000 m.						
Correlation pair	Improvement of	Improvement of	Improvement of			
	competitiveness	the desire to will	purposerumess			
Improvement of rowing time at a distance of 500 m	r = 0,559 p<0,01	r = 0,624 p< 0,05	r =0,548 p<0,01			
Improvement of rowing time at a distance of 1000 m	r = 0,473 p < 0,05	r = 0,517 p < 0,05	r =0,616 p <0,01			

Table 3. Correlations between psychological state dynamics and rowing performance at distances of 500 m and 1000 m.

Note: r is the degree of correlation between parameters; p- the reliability of the correlation between the parameters.

Among rowers a significant positive correlation was established between the improvement of the time at the distance of 500 m and improvement of competitiveness indicator (p<0.01), Fig. 1.1,



Figure 1.1. The relationship between improvement in 500 m rowing time and improvement of competitiveness.

It was also found a reliable significant correlation between the improvement of rowing time at a distance of 500 m and the improvement of the indicator of the desire to win (p < 0.05), Fig. 1.2.



Figure 1.2. The relationship between improvement in 500 m rowing time and

improvement of indicator desire to win.

A significant positive correlation (p<0.01) was also found between the improvement of rowing time at a distance of 500 m and improvement of purposefulness indicator, which is shown in Fig. 1.3.



Figure 1.3. The relationship between improvement in 500 m rowing time and purposefulness

At the distance of 1000 m, a moderate positive correlation was established between the improvement of time and improvement of competitiveness indicator among rowers, (p < 0.05) Fig. 1.4.



Figure 1.4. The relationship between improvement in 1000 m rowing time performance and improvement of competitiveness indicator

A reliable significant correlation was found in athletes between the improvement of rowing time at the distance of 1000 m and the desire to win indicators improvement (p < 0.05). Fig. 1.5, as well as between the improvement of rowing time at a distance of 1000 m and purposefulness indicators improvement (p < 0.01), Fig. 1.6.



Figure 1.5. The relationship between improvement in 1000 m rowing time and the improvement of desire to win indicators.



Figure 1.6. The relationship between improvement in 1000m rowing time and the improvement of purposefulness indicators

Discussion

As a result of the study, it was found that the block approach to training with double periodization is effective, as evidenced by a significant improvement in the results of rowers at a distance of 500 m by 9.32% (p<0.001), and at 1000 m by 7.75% (p<0.001).

An improvement in the psychological state of athletes was established according to the results of the Gill test (Sport Orientation Questionnaire): the competitiveness indicator improved by 14.29%, the desire to win indicator improved by 17.01%, and the purposefulness indicator improved by 16.69% (p<0.001). In addition, a significant correlation was found between the improvement of the result at the distance of 500 m with the psychological state dynamics according to three parameters: competitiveness, the desire to win and purposefulness, and between the improvement of the result at the distance of 1000 m with the indicator of the desire to win and purposefulness, and the correlation with the indicator of competitiveness was moderate.

In other sports, there has been research (Bafirman, et al., 2024; Bell, et al.,

2020, Gill, 1996, Hu, et al., 2017) on the importance of sports psychology in improving athletic performance.

It is obvious that in the established relationship between the improvement of the time at both distances and the improvement of the psychological state, it is difficult to determine what exactly is primary and has a greater influence on the result in the training process: the improvement in the result improves the psychological state, or a better psychological state allows to achieve a better result on the water, and this still needs to be investigated in more detail.

Previous research (Gill, 1993) has found gender differences, with men's competitiveness and desire to win higher than women's, but not purposefulness. The results of our study could be influenced by the small number of rowers and the absence of girls in the group, in which the impact of physical exertion on the psychological component of training is different (Murata, et al., 2025, Fajar, et al., 2024). Perhaps it is worth increasing the duration of training with a block approach than we investigated. Therefore, relationship between the rowing performance dynamics and the psychological state dynamics in rowers using a block approach with double periodization requires further research.

Conclusions.

So, the block approach to training with double periodization is balanced in relation to periods of intense loads and rest, thanks to which the exhaustion of the athletes' body is prevented and their psychological state is improved.

The results of this study can be used in the practical activities of coaches and athletes for more effective training of young rowers, and a gradual transition from children's to professional sports without significant psychological and physical overload of the body.

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