# Study of the dynamics of preparedness indicators for highly skilled kayakers during the training process

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**Abstract**

**Objective of the study** is to identify the dynamics of technical and physical fitness indicators of highly skilled kayakers when performing various training loads during the preparatory period.

**Methods and structure of the study.** The work utilised methods of modelling, testing, analysis of planning documents, and mathematical statistics. The following indicators were measured: time taken to cover a distance of 2000 m (time, average rowing speed) and a distance of 2×250 m (average time, speed, stroke length and technical coefficient), bench press and deadlift with a 40 kg barbell in 2 minutes. Two groups (7 people in each) of highly qualified kayakers (Honoured Master of Sports of Russia, Master of Sports of Russia of international class, Master of Sports of Russia) were monitored as they trained according to 2 different plans during the preparatory period (October-December). Testing was conducted monthly.

**Results and conclusions.** The content of training loads and the dynamics of technical and physical fitness indicators of highly skilled kayakers training according to different plans are shown. The assessment of the average group indicators of technical and physical fitness of rowers does not allow us to identify the nature of the influence of various training loads. The improvement in the time taken to complete the test distance by all rowers in both groups is the result of the implementation of the training loads under consideration, which initiate different changes in fitness indicators, which even within each group show individual characteristics of adaptive adjustments. For rowers of high skill level, it is advisable to consider the individual dynamics of fitness indicators in relation to training load.

***Keywords:*** *training process, highly skilled kayakers, preparedness, performance dynamics.*

**Introduction.** One of the main components of coaches' activities is the selection of training loads that cause the changes in athletes' fitness levels necessary to achieve the set goals [2]. In rowing, this primarily refers to indicators of technical and physical fitness [3, 4]. An important aspect of the training process is the correct combination of group and individual work with athletes [1]. Therefore, a promising way to improve the effectiveness of rowers' sports training is to determine scientifically based training effects that take into account individually adapted responses in terms of urgency, intensity and direction. It is known that training loads that are identical in terms of their parameters, when refracted through the individual status of the athlete, cause different adaptive responses, often deviating from those planned. In turn, the same sporting result can be achieved using different training plans.

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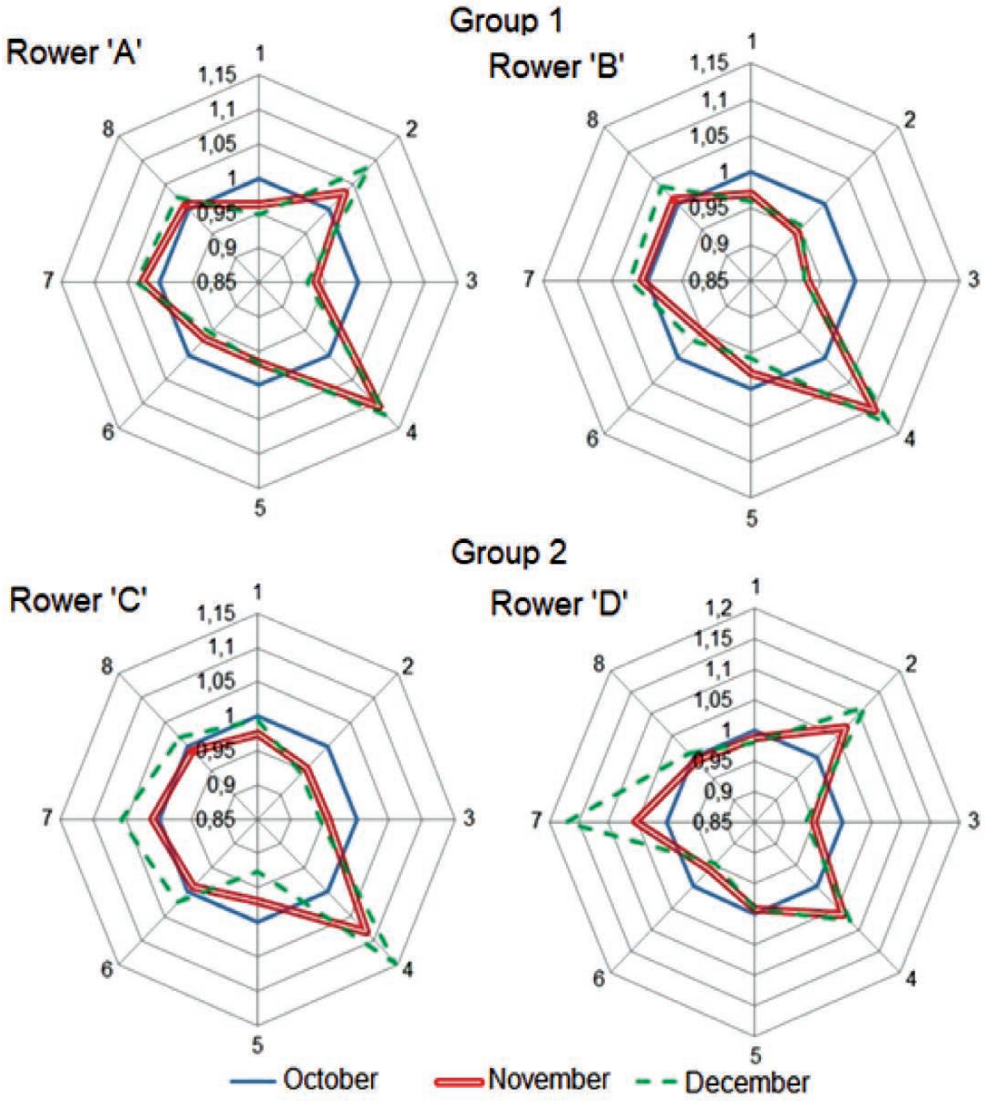


*1 – time for 2000 m; 2 – pace for 2000 m; 3 – time for 250 m; 4 – pace for 250 m; 5 – length of stroke for 250 m; 6 – technical coefficient for 250 m; 7 – barbell press in 2 min; 8 – barbell pull in 2 min.*

*Figure 1. Individual dynamics of indicators (c.u.) of rowers from both groups in the preparatory period*

*Table 1. Monthly training loads for highly skilled kayakers*

| Month | Rowing (km) | | | | | | Gym training (min) | Run-ning (min) | Sports games (min) | GDE (min) | AT (MS) (tonnes) | AT (MV) (tonnes) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Power zones | | | | | Total | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | | | | | | | |
| Group 1 | | | | | | | | | | | | |
| October | 30,5 | 189 | 0 | 0 | 0 | 219,8 | 60 | 1015 | 140 | 590 | 124 | 40 |
| November | 127 | 240 | 47,2 | 2 | 3 | 419,2 | 390 | 770 | 150 | 330 | 125 | 160 |
| December | 133 | 234 | 53,5 | 3 | 5,5 | 428,5 | 280 | 1480 | 160 | 695 | 150 | 310 |
| Group 2 | | | | | | | | | | | | |
| October | 105 | 145 | 25 | 1 | 0 | 276 | 0 | 510 | 80 | 570 | 110 | 150 |
| November | 110 | 171 | 37 | 5 | 1 | 323 | 0 | 540 | 90 | 610 | 110 | 190 |
| December | 97 | 167 | 54 | 2 | 3 | 320 | 65 | 445 | 110 | 610 | 210 | 200 |

*Notes: GDE – general development exercises; AT MS – athletic training (maximum strength); AT MV – athletic training (maximum volume).*

period (October-December). Testing was conducted monthly.

**Results of the study and discussion.** An analysis of both training plan options showed that the number of training sessions was the same, but their content was different (Table 1).

For rowers in the first group, the emphasis was on rowing volume on the water, special training (training and rowing), running and game training, while for rowers in the second group, the emphasis was on rowing in the first, third and fourth power zones and athletic training. The training loads in both groups changed in content from month to month. Common to these changes for both groups was a gradual increase in the total rowing mileage and rowing in the second, third and fifth power zones, an increase in the time allocated to sports games, and an increase in the tonnage of loads in athletic training.

At the same time, in the monthly blocks (accumulative, transformative, implementation), there were peculiarities in the content of the loads: for rowers in the first group – a sharp increase in the proportion of rowing in zone 1, simulator training and athletic exercises performed in anaerobic conditions, and a sharp decrease in running load in November; for rowers in the second group, gym training only began in December and the volume of athletic training increased towards December, while the volume of running and game training decreased. At the end of each month, the technical and physical fitness of the rowers was tested (Table 2).

*Table 2. Dynamics of rowers' test results during the preparatory period*

| Month | Indicators | 2000 m | | 250 m | | | | Barbell press for 2 min, number | Barbell pull for 2 min, number |
|---|---|---|---|---|---|---|---|---|---|
| | | Time, s | Pace 2000 м, str/min | Time, s | Pace, str/min | Length of run, m | Technical coefficient | | |
| Group 1 (n=7) | | | | | | | | | |
| October | M ± m | 485,33±2,53 | 88,57±1,82 | 49,21±0,20 | 119,43±2,48 | 2,56±0,05 | 19,27±0,37 | 116,71±1,49 | 123,00±2,52 |
| | Min | 479,30 | 84,00 | 48,70 | 107,12 | 2,40 | 17,75 | 111,00 | 112,00 |
| | Max | 495,40 | 94,00 | 49,95 | 127,22 | 2,81 | 20,41 | 120,00 | 130,00 |
| November | M ± m | 471,91±3,35 | 89,00±1,94 | 46,51±0,39 | 129,59±2,87 | 2,50±0,05 | 18,69±0,44 | 118,43±1,73 | 122,86±1,98 |
| | Min | 462,50 | 85,00 | 45,25 | 117,67 | 2,33 | 16,89 | 112,00 | 114,00 |
| | Max | 481,20 | 96,00 | 48,10 | 139,48 | 2,75 | 19,89 | 125,00 | 129,00 |
| December | M ± m | 467,07±5,78 | 91,86±2,22 | 45,76±0,19 | 133,66±2,59 | 2,46±0,05 | 18,66±0,33 | 119,00±1,80 | 124,29±1,20 |
| | Min | 456,50 | 86,00 | 45,05 | 120,91 | 2,33 | 17,17 | 113,00 | 119,00 |
| | Max | 495,80 | 101,00 | 46,15 | 140,52 | 2,69 | 19,74 | 126,00 | 128,00 |
| t (October-November) | | 3,19* | 0,16 | 6,13*** | 2,68* | 0,83 | 1,02 | 0,75 | 0,04 |
| t (October-December) | | 2,89* | 1,14 | 12,44*** | 3,97** | 1,45 | 1,24 | 0,98 | 0,46 |
| t (November-December) | | 0,72 | 0,97 | 1,73 | 1,05 | 0,53 | 0,05 | 0,23 | 0,62 |
| Group 2 (n=7) | | | | | | | | | |
| October | M ± m | 501,67±3,26 | 88,00±0,82 | 49,04±0,27 | 119,79±2,91 | 2,56±0,06 | 19,19±0,37 | 108,43±1,93 | 113,71±1,79 |
| | Min | 491,60 | 85,00 | 47,85 | 109,47 | 2,40 | 17,69 | 102,00 | 108,00 |
| | Max | 511,50 | 91,00 | 50,15 | 127,22 | 2,78 | 20,40 | 116,00 | 119,00 |
| November | M ± m | 491,21±4,75 | 89,57±1,60 | 46,44±0,36 | 130,85±3,35 | 2,48±0,05 | 18,80±0,38 | 109,86±2,37 | 114,43±1,90 |
| | Min | 478,60 | 85,00 | 45,50 | 118,00 | 2,30 | 17,52 | 103,00 | 107,00 |
| | Max | 504,60 | 95,00 | 48,05 | 140,60 | 2,66 | 20,09 | 118,00 | 120,00 |
| December | M ± m | 483,54±5,60 | 93,43±2,15 | 45,84±0,32 | 134,98±3,31 | 2,43±0,05 | 18,89±0,37 | 114,14±3,35 | 117,57±1,87 |
| | Min | 463,60 | 84,00 | 44,80 | 124,19 | 2,26 | 17,63 | 105,00 | 110,00 |
| | Max | 501,20 | 99,00 | 47,35 | 145,88 | 2,62 | 20,09 | 129,00 | 124,00 |
| t (October-November) | | 1,82 | 0,88 | 5,76*** | 2,49* | 1,07 | 0,74 | 0,47 | 0,27 |
| t (October-December) | | 2,80* | 2,36* | 7,59*** | 3,44* | 1,69 | 0,56 | 1,48 | 1,49 |
| t (November-December) | | 1,04 | 1,44 | 1,25 | 0,88 | 0,59 | 0,19 | 1,04 | 1,18 |

*Notes: Min – minimum value; Max – maximum value; * - significant at p < 0,05; ** - significant at p < 0,01; *** - significant at p < 0,001.*

As can be seen from Table 2, the average group results of rowers who trained according to different plans showed a general trend. The improvement in the time taken to cover the distance by rowers in both groups was due to an increase in pace (except for the 2000 m distance for rowers in group 1, where the increase in pace was not significant). The changes in the time taken to cover the distance and the pace at both distances were more pronounced in the first two months. Other indicators characterising the level of technical and physical fitness did not show any significant changes. In other words, the average group analysis of changes in the technical and physical fitness indicators of rowers training according to different training plans does not allow us to determine the full range of parameters that ensure improved athletic performance. However, the data presented in Table 2 draws attention to the fact that, despite the insignificant difference between the maximum and minimum values of the time taken to cover distances of 2000 and 250 metres by rowers from both groups, there is a significant spread of values for other indicators.

For a more in-depth analysis, we examined the individual technical and physical fitness indicators of rowers from both groups during this period. As an example, we present the dynamics of the tested indicators of technical and physical fitness of two rowers from each group (Figure 1). The value of each indicator in October was taken as the baseline and expressed in conventional units (c.u.).

As we can see, for rower 'A', during the implementation of each block of the plan with a predominance of rowing and training equipment training, the improvement in the time taken to complete the 2000 and 250 m test segments was accompanied by an increase in rowing speed, a decrease in the length of the stroke and the technicality coefficient. Rower 'B', who trained according to the same programme as the first rower, also improved his times for the 2000 and 250 m distances, the rowing pace over the 250 m distance increased to a greater extent, the stroke length and technical coefficient decreased, but unlike the first rower, the rowing pace over the 2000 m distance decreased. In other words, the improvement in distance times observed in both rowers during the implementation of identical loads occurred against the backdrop of different changes in fitness indicators.

A similar pattern of individual differences was observed in the rowers of the second group, who trained according to a programme with a monthly increase in the volume of athletic and game training. For rower 'C', with improved results over 250 m, the indicators of rowing pace over 250 m, bench press and deadlift, and technical coefficient increased, but the length of the stroke and rowing pace over 2000 m decreased. Unlike rower 'C', rower 'D' significantly increases rowing pace over 2000 m and 250 m distances and barbell press, with no change in stroke length.

Thus, the improvement in the time taken to complete the test distance by rowers in both groups is the result of the implementation of the training load options under consideration, which initiate different changes in fitness indicators, which even within each group demonstrate the individual nature of the adaptive adjustments of the parameters under study.

Conclusions. Assessment of average group changes in the technical and physical fitness indicators of highly skilled kayakers does not allow us to identify the nature of the influence of various training loads and determine the parameters that contribute to the desired sporting results. For high-level rowers, it is advisable to consider the individual dynamics of fitness indicators in relation to training load.

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