

# Improving the special motor qualities of experienced female volleyball players living on the territory of martial law

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## Abstract

**Background and Study Aim** The training of athletes in conditions of limited freedoms (COVID-19 pandemic and martial law in the territory of residence) does not allow for the full training of athletes in team sports. The purpose of the study is to determine the organizational forms and means of training sessions aimed at improving special physical qualities under martial law.

**Material and Methods** The study involved experienced volleyball players of one team (n=12). Volleyball players live in the territory of martial law (Kharkiv, Ukraine) and the restrictive measures of the COVID-19 pandemic. The experiment was carried out for 6 months in 2022 during martial law in Ukraine. The organization of the training was carried out with an emphasis on independent individual work. Pedagogical testing was carried out. 5 test exercises were used: each volleyball player performed independently. Volleyball players are offered an individual training plan that takes into account: safe living conditions (presence of special shelters – underground metro stations near the place of residence, special shelters, basements of houses, etc.); availability of electricity and means of communication (mobile, Internet); availability of means of life support (drinking water, food).

**Results** It was determined that the team is homogeneous only in the test exercise “long jump from a place”. The indicators of the other four tests indicate the heterogeneity of the group of volleyball players. The use of the ZOOM videoconference to monitor the performance of tests by volleyball players under martial law has been substantiated.

**Conclusions** Exercises for the development of certain physical qualities of volleyball players are proposed. Also, schemes of remote self-training are proposed to level the heterogeneity of the group.

**Keywords:** Ukraine, martial law, volleyball, training, special exercises, self-study.

## Introduction

The restriction of various freedoms of athletes can be due to a number of factors. The most significant influences on the level of training and competitive activity of athletes are exerted by the COVID-19 pandemic and living in martial law, which can last from several months or years. This period is characterized by the presence of certain restrictions related to the safety for the life and health of athletes: periodic or constant threats of air attacks with missiles on the city of residence; partially ongoing restrictions of the COVID-19 pandemic. Such a long period of restrictions forces team sports athletes and coaches to find non-standard solutions to training problems and possible competitive activities.

During the COVID-19 pandemic, a fairly large number of studies have been conducted. These studies were conducted under protective restrictions (isolation, quarantine, social and physical

distancing) stemming from the global COVID-19 pandemic. In many ways, such restrictions are also typical for the territories where athletes live, where martial law has been introduced.

The study by Vitali et al. [1], Hardiman et al. [2] and Leisterer et al. [3] highlighted the understanding of the psychological implications of the COVID-19 pandemic, emphasizing the role of the perceived safety of the training environment on the well-being and athletic readiness of athletes. Aghababa et al. [4] also took into account the complex psychosocial situation associated with COVID-19 incarceration. The authors note that physical activity patterns alone can balance possible mood and behavioral disturbances. Some of the studies are devoted to the analysis of the opinions of athletes on conducting remote forms of training, which under normal conditions is carried out in the gym [5]. These are the most typical training opportunities for athletes during the COVID-19 pandemic and martial law. To this should be added the restrictions associated with the announcement of air alerts. This forces athletes to interrupt their activities and move to a safer place

to stay.

Milovancev et al. [6] analyzed the effects of COVID-19-induced detraining on cardiorespiratory endurance. The authors report that the participants experienced typical effects of detraining. This was confirmed in the study by Orscelik et al. [7]. The authors showed the impact of COVID-19 infection on the results of volleyball players. There is an improvement in the performance of vertical jumps of volleyball players. It has been found that inactivity can be more detrimental than contracting COVID-19 to athletic performance. Acar [8] notes the increasing impact of the COVID-19 pandemic on the propensity for depression and eating habits of elite female volleyball players.

Another approach is shown in the study by Nishino et al. [9]. Several teams were gathered in one place. For more than a month, large-scale international volleyball competitions were held without spectators. Takamatsu [10] provides recommendations on what sports organizations need to know when hosting matches and games during a pandemic. Similar recommendations are made in studies on the impact of the COVID-19 pandemic on volleyball players and clubs in Greece [11] and Italy [12]. It should be noted that this approach is quite applicable in a state of martial law. In this case, it is necessary to choose the safest place for the deployment of teams.

Dasheva et al. [13] analyzes the possibilities of using online platforms or communication tools for effective learning. This paper provides an overview of the extent to which blended education has been highlighted by the pandemic. The authors argue that it is necessary to rethink the content of sports and sports education.

Celik et al. [14] argues that the weakening of the respiratory muscles can affect the performance of volleyball players. The authors propose approaches to increase the strength of the respiratory muscles and prevent deterioration in performance. Hadi et al. [15] recommends the use of hypoxic exercises to improve the performance of volleyball players. The authors note that hypoxic exercises contributed to an increase in the level of physical and technical capabilities of young volleyball players.

An analysis of studies on the impact of the COVID-19 pandemic on the training of volleyball players made it possible to identify the most characteristic opportunities for organizing training. At the same time, the martial law in the territories where athletes live impose other restrictions on the organization of training. The ability to continue functioning during military conflicts is shown in the study by Kennedy [16]. The author provides analogies to how the Football League responded to a number of key issues during the critical period between 1942 and 1944. It is noted that the football league has received a lot of criticism for continuing the

competition. The League supported the prevailing view that the public needed a distraction to relax a bit from the pressures of the war.

Another study [17] examined the historical features of women's football in Western Australia during the Great Wars. The author argues that such studies provide evidence of the complex relationship between sport and gender during the First World War. Such research opens up opportunities for a deeper understanding of the widely studied military conflict. The author also points the way forward for those who doubt the need to continue playing football.

A feature of this study is an attempt to solve the problem of organizing training sessions under martial law and quarantine measures of the COVID-19 pandemic. This was supposed to be carried out through the selection of complexes of special exercises to improve the physical qualities of volleyball players. This takes into account the lack of time and the specific conditions in which the team's volleyball players found themselves. It is also expected that ZOOM videoconferencing can be used to monitor the performance of volleyball players under martial law.

*The purpose of the study* is to determine the organizational forms and means of training sessions aimed at improving special physical qualities under martial law.

## Material and Methods

### *Participants*

The study involved experienced volleyball players of one team (n=12). Volleyball players live in the territory of martial law (Kharkiv, Ukraine) and the restrictive measures of the COVID-19 pandemic. The organization of the training was carried out with an emphasis on independent individual work. Pedagogical testing was carried out. 5 test exercises were used: each volleyball player performed independently. Volleyball players are offered an individual training plan that takes into account the following: safe living conditions (presence of special shelters – underground metro stations near the place of residence, special shelters, basements of houses, etc.); availability of electricity and means of communication (mobile, Internet); availability of means of life support (drinking water, food).

All volleyball players gave written consent to participate in the experiment. Characteristics of participants: age -  $19.75 \pm 0.77$  years; weight -  $61.58 \pm 7.51$  kg; height -  $177.67 \pm 4.88$  cm; BMI -  $19.58 \pm 2.35$  kg/m<sup>2</sup>

### *Research design*

The experiment was carried out for 6 months in 2022 during the declaration of martial law in Ukraine. The organization of the training was carried out with an emphasis on independent individual work.

Pedagogical testing was carried out. The testing program included tests and test exercises specific to volleyball. The peculiarity of these tests is that they can be performed independently without additional equipment:

Test 1: Standing Long Jump Test (Broad Jump), cm (Fig. 1).

Test 2: Eurofit Sit Up Test (for 20 sec.), number of times (Fig. 2).

Test 3: Squats Test (two legs), number of times (for 20 sec.) (Fig. 3).

Test 4: Plank Fitness Test, min. (Fig. 4).

Test 5: Cadence Push-Up Test (for 20 sec.), number of times (Fig. 5).

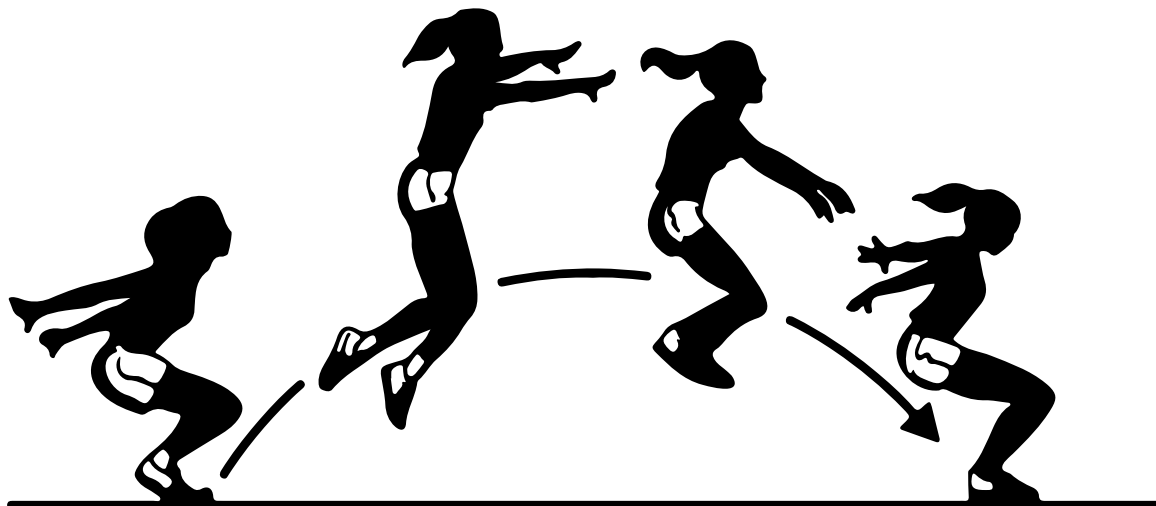


Figure 1. Test 1: Standing Long Jump Test (Broad Jump), cm

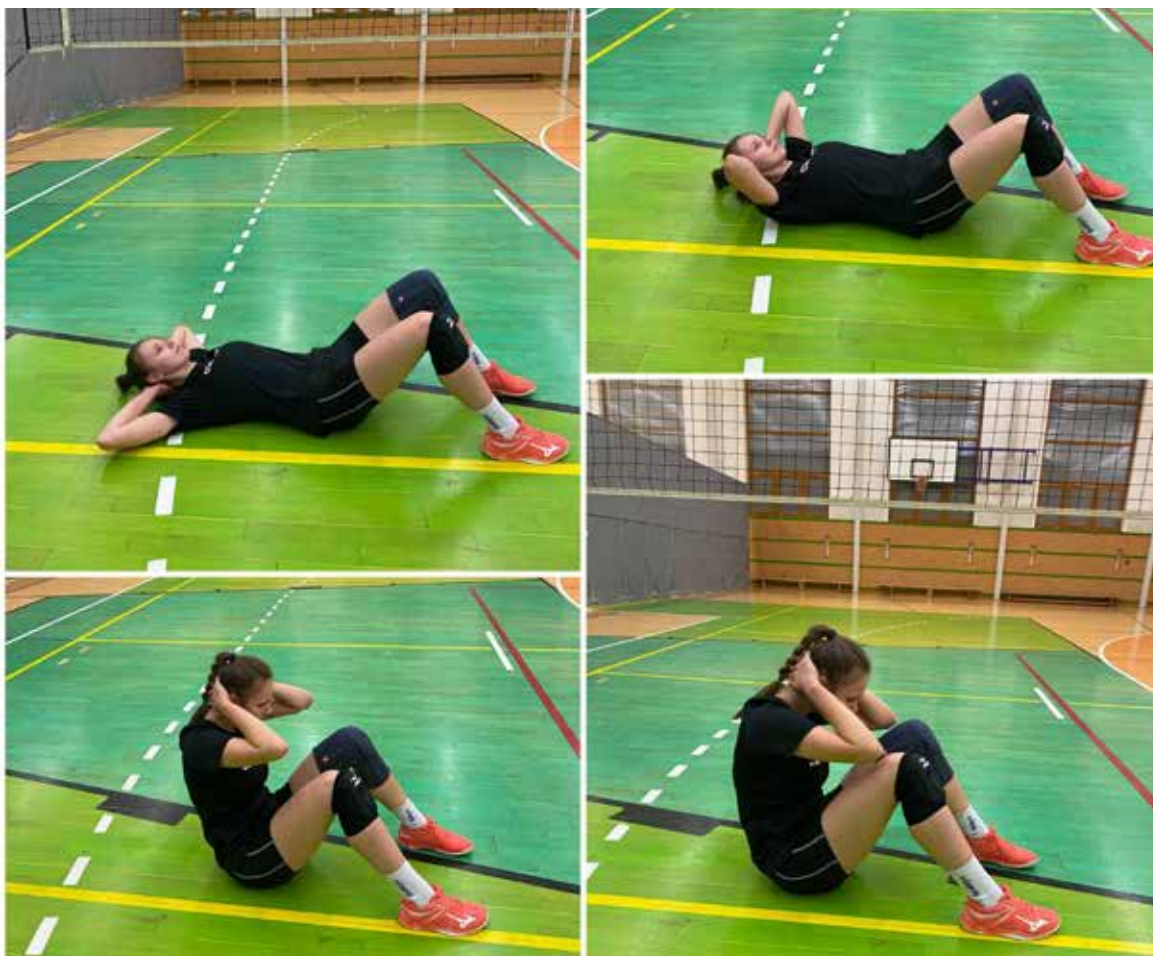


Figure 2. Test 2: Eurofit Sit Up Test (for 20 sec.), quantity of times



**Figure 3.** Test 3: Squats Test (two legs), quantity of times (for 20 sec.)



**Figure 4.** Test 4: The Plank Fitness Test, min.



**Figure 5.** Test 5: Cadence Push-Up Test (for 10 sec.), quantity of times



Test 6: "Ten Eights". Equipment: tennis ball, stopwatch. The starting position of the athlete is to tilt the body forward, holding the ball in one hand. On the "Start" command, he/she performs an imaginary eight with the ball as quickly as possible between the legs at the level of the knees. The ball is passed from hand to hand.

Test 7: Ability to coordinate movements. The starting position of the athlete is to hold the stick in straight hands. At the signal of the coach, step over the stick: 5 times with the right foot and 5 times with the left foot. Task execution time, in sec.

Test 8: Stand on one leg with closed eyes. Athlete's starting position - stand on one leg, the other leg is bent at the knee and maximally turned outward. The heel touches the knee joint of the supporting leg. Hands on the belt, head straight. At the command "Start", the athlete closes his/her eyes, and the experimenter starts the stopwatch. The stopwatch stops in case of losing a balance. Result: the best result is determined in two attempts with

an accuracy of 0.01 sec.

Test 9: Assessment of the athlete's ability to kinesthetic differentiation. Test - "Throwing the ball at the target (the athlete stands with his/her back to the target)". Equipment for the test: measuring tape, 6 tennis balls, a drawn circle with a diameter of 80 cm, 1 volleyball, a drawn square 2x1 m. The athlete stands behind the throw line (back to the target). The task is to throw the ball over the head or over the shoulder and hit the target 2 m away. The target was a square. In the middle of the square was a circle with a ball in it. The athlete performs 1 trial attempt and 5 valid attempts. Hitting the square – 1 point. Getting into the bracket of the circle – 2 points. Hit between the circle and the ball – 3 points. Hitting the ball – 4 points.

Test 10: Standing Forward Bend, cm.

Test 11: Determining the level of mobility in the shoulder joints (Fig. 6). The level of mobility is the distance between the thumbs of the left and right hands. The smaller the distance between the grip of



**Figure 6.** Test 11: Determining the level of mobility in the shoulder joints

the hands during the exercise, the higher the level of flexibility in the shoulder joints and vice versa.

Test 12-13: Accuracy of assessment and measurement of muscle effort. Measured with a hand dynamometer. The starting position of the athlete is in a standing position and arms extended to the side (dynamometer in hand). The athlete performs maximum effort. The athlete performs an effort equal to 0.5 of the maximum (3 attempts). The result is evaluated by the magnitude of the deviation from the maximum effort.

Testing was carried out by volleyball players on their own at a conference with a coach on the virtual conference platform ZOOM.

At the first stage of the experiment, primary testing was carried out and sets of exercises were prepared, the implementation of which is specific for volleyball. These complexes are adapted to individual work. The essence of the pedagogical experiment will be the use of specially selected exercises individually for each player, taking into account the role of the game. It should be recognized that some complexes were already performed by volleyball players earlier during the full-scale COVID-19 pandemic. In addition, these sets of special exercises were used in preparing the team for competitions in different periods and mesocycles.

Volleyball players are offered an individual training plan that takes into account: safe living conditions (presence of special shelters – underground metro stations near the place of residence, special shelters, basements of houses, etc.); availability of electricity and means of communication (mobile, Internet); availability of means of life support (drinking water, food).

Table 1 shows an example of a complex of special exercises for the development of special physical qualities.

#### *Statistical analysis*

Statistical processing of data was carried out with the help of programs from processing the results of scientific research Microsoft Excel “Data Analysis” and SPSS. The arithmetic mean ( $\bar{X}$ ), standard deviation ( $S$ ), confidence interval ( $\Delta x$ ), assessment of the validity of the opinions according to the Student’s t-test from the average level of significance ( $p$ ) were assigned. Differences were considered significant with equal value  $p < 0.05$ . For the evaluation of the parameters in the distribution of the scores, the Kolmogorov-Smirnov test was used.

#### **Results**

Analysis of the publication of the results obtained by various authors, allowing the selection of a number of indications in the special physical preparation, which evoke the effectiveness of the great activity of volleyball players. It has been shown that use of victorious complex increases in the special abilities of volleyball players. Significant improvement ( $p < 0.05$ ) was detected in 13 indications (Table 2).

The use of a complex of special exercises for 6 months contributed to the improvement of speed and strength qualities by 3-18.7% ( $p > 0.05$ ). The indicator of maintaining the position of “lying down” (characterized the condition of the muscles of the abdominal press, gluteal muscles, muscles of the back surface of the thigh and shoulder muscles) improved by 7% ( $p > 0.05$ ). Indicators of volleyball players’ ability to quickly adjust and coordinate motor activity improved by 7.8-13.9% ( $p > 0.05$ ). Along with this, the mobility indicators of the shoulder joints and the flexibility of the spinal column improved by 2.1-12.6%, respectively. Indicators of hand dynamometry and the ability to assess muscle effort also underwent positive changes (1.7-

**Table 1.** An example of a complex of special exercises to improve the special qualities of volleyball players

Nº	Exercises	Dosing
1	Running in Place alternately high knees and butt kicks	3 series for 20 sec.
2	Lunge alternately forward Backward Lunge and side lunge	3 series for 20 sec.
3	Barbell squat	3 series for 20 sec.
4	Jumping rope from different high with different speed	3 series for 20 sec.
5	Barrier jumps	3 series for 20 sec.
	A Vertical Jump with a 360° turn;	
6	A Vertical Jump with a 180° turn;	3 series for 20 sec.
	A Vertical Jump with a 90° turn;	
7	Opposite heel tap jump;	3 series for 20 sec.
	Jumping jacks with toe touch	
	Kettlebell Sumo Squats;	
8	Kettlebell Sumo Jumps;	3 series for 20 sec.
	Kettlebell Deadlift Jumps	
9	Jumping over obstacles	3 series for 20 sec.
	Jumping Oblique Twists	
10	Weight training:	3 series for 20 sec.
	Imitation exercises with a large range of motion in attack	
	The exercise sequence:	
	Squatting down;	
11	Lying Down;	3 series for 20 sec.
	Squatting down;	
	Jumping Raised Hands	
12	Stretching Exercises	2-3 minutes

11.1%,  $p>0.05$ ). The index of accuracy of throwing a tennis ball at the target (characterized the ability of volleyball players to kinesthetic differentiation) improved by 13.2% ( $p>0.05$ ). In the course of the research, a significant increase in the Romberg Test indicator was found, which characterized the condition of the vestibular apparatus of volleyball players. The increase was recorded at the level of 85% ( $p>0.05$ ).

### Discussion

The purpose of this study was to better understand the possibilities of conducting sports training for female volleyball players in a state of war and some of the restrictions of the COVID-19 pandemic. The results of this study confirm the hypothesis of the possibility of testing using the ZOOM videoconference. Our results represent the first direct demonstration of the possibilities of preparing a volleyball team under martial law. Our results are consistent with the statements of other authors about the possibility of sports training in conditions of limited freedom of athletes [4, 5, 9, 13].

There are at least a few potential limitations to the results of this study. The first limitation concerns

the fact that the experiment was conducted with the participation of only one team. The second potential limitation is that the conditions for doing homework for female volleyball players were different. The third limitation is the small sample size. This is confirmed by the works of other researchers [18, 19, 20]. Despite these limitations, these results suggest several theoretical and practical implications. The main are shown in our study. We state that much remains to be done before a full understanding of the extent of the impact of martial law on the level of training of volleyball players is established.

In addition to those already mentioned, we offer a few more research methods that may be useful. The authors identify the most important elements to be taken into account: the neuromuscular aspect due to consequences [21]; the ability to cope with the situation by doing physical and mental training at home [22]; possibilities of distance structure of theoretical-tactical education and physical training [23]; the impact of social isolation (quarantine) on physical and mental health [24].

These studies support our assumptions and raise various intriguing questions for future research. Thus, the present study contributes to increasing

**Table 2.** Changes in indicators of special fitness among volleyball players (n = 12) under the influence of a complex of special exercises

N	Index	Before experiment		After experiment		$\Delta x$	t	p
		X	s	X	s			
1	Standing Long Jump Test (Broad Jump), cm	211	13.2	217	14.4	7.8	7.3	0.001
2	Eurofit Sit Up Test (for 20 sec.), quantity of times	11.6	1.01	12.3	0.99	0.53	4.37	0.001
3	Squats Test (two legs), quantity of times (for 20 sec.)	18.9	1.68	19.7	1.26	0.88	4.2	0.001
4	The Plank Fitness Test», min.	2.9	0.24	3.1	0.18	0.13	4.1	0.001
5	Cadence Push-Up Test, quantity of times (for 20 sec.)	10.7	1.8	12.7	2.2	1.1	4	0.002
6	“Ten eights”, sec.	9.7	0.87	9.0	0.77	0.65	2.98	0.025
7	“Stepping over a gymnastic stick”, sec.	13.9	2.4	12.2	2.1	1.88	3.7	0.01
8	“Romberg’s test”, sec.	32.8	13.3	60.7	20.5	10.9	3.4	0.015
9	Throwing a tennis ball at a target, score	12.9	1.7	14.6	1.9	1.47	3.6	0.011
10	Leaning the body forward from a sitting position, cm	12.7	4.6	14.3	3.6	2.12	3.8	0.002
11	Mobility in the shoulder joints, cm	53.6	10.4	52.5	9.9	4.9	3.4	0.004
12	Hand dynamometry, kg	29.9	4.6	30.4	4.7	2.13	3.7	0.002
13	Estimation of muscle effort, kg	3	1.7	2.7	1.6	0.79	3.6	0.003

evidence that restricting athletes’ freedoms is not a reason to stop training. The physical activity shown by volleyball players under martial law can contribute to psychological stability, attempts to maintain their physical and technical condition.

Despite the limitations (martial law, COVID-19 pandemics), this study has improved our understanding of the relationship between physical and technical fitness indicators of female volleyball players in individual conditions of sports training. To this should be added the possibility of evaluating the results of individual training with the help

of modern means of video communication. We hope that ongoing research will stimulate further exploration of this important area.

### Conclusions

Exercises for the development of certain physical qualities of volleyball players are proposed. Also, schemes of remote self-training are proposed to level the heterogeneity of the group. It is recommended to use video communication tools to complete test tasks in the virtual presence of the coach and the entire team as a whole.

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