

Methods of Freediver Training

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Recreational freediving gives great opportunity to switch attention from meaningless fuss on the surface to the inward absorption in the serenity of water. Slow swimming harmonizes relationships between highly agitated mind and usually inactive body, producing sensation of muscle joy. Breath holding on comfort mildly shakes up an organism, activating metabolism. The main difficulty in freediving lies in mastering efficient technique of swimming, since freediving assumes absolute minimization of efforts. For those who are just starting practicing freediving, it is better to find an instructor, while this article aims to help advanced freediver in their preparation to competitions in dynamic apnea with and without fins.

Every sport forms in athlete a certain kind of morpho-functional harmony. Freediver training methods must take into account functions and properties of neuromuscular apparatus working under situation of breath holding. While breath holding, energy supply of organism occurs at the background of rapidly increasing oxygen deficiency. At the same time, compensatory activation of anaerobic glycolysis (energy production without oxygen utilization) raises lactic acid concentration in tissues up to the toxic level. The main danger in freediving is loss of consciousness (black-out) as the result of brain compensatory mechanisms failure under conditions of physical activity. Combination of three factors leads to black-out: high degree of brain metabolic activity, low amount of oxygen and low reserve of high-energy phosphates. Muscles contain myoglobin (substance capturing oxygen 6 times faster than hemoglobin) and can also utilize certain organic substances for adenosine triphosphate (ATP) reduction, which releases much-needed energy, while brain doesn't have that ability and just switches off. This means the main purpose of freediver training has to be improvement of hypoxia (oxygen insufficiency) resistance, mainly of the brain, at the expense of organism life support systems reorganization.

In practice it means that while training one should avoid maximum distances, which can provoke a black-out, and prefer series of short distances, gradually postponing the threshold of brain functioning inhibition. So, if your limit is 75 meters, it is more effectively to swim series of 25 and 50 meters, rather than trying to shock spectators by your iron will and dive 70 meters.

Exercising consumes organism energy resources, which in turn speeds up restoration processes. Provided with sufficient rest it can lead to super-restoration, characterized by super-compensation of structural and energetic resources of organism. If you have swum today 8x25 meters underwater by breaststroke with 40-second rest, tomorrow your organism probably will not completely recover of this shock, but the day after tomorrow it will prepare in advance by increasing energy resources, changing mitochondrial membrane permeability, improving their performance and increasing activity of enzymes.

Organism can adapt to hard work due to the high degree of cell adaptive variability. The magnitude and direction of restoration processes depend on type of exercises and extent of biochemical changes. Thus the outcome is determined not by the training itself but by the reaction of the organism to the training.

Freediver training should increase level of maximum oxygen utilization, and the ability to continue movements in the situation of increasing maximum oxygen debt. The amount of oxygen organism is capable to utilize is determined by: ventilation system, cardio-vascular system, circulatory system, and

utilization of oxygen by tissues. Maximum oxygen debt depends on enzyme system functioning, reserves of organic substances, and the compensatory ability of tissues. To satisfy these requirements, the following training methods are proposed.

1. **Distance swimming** is continuous swimming with rare breathing. The aim is to improve supply, transportation and utilization of oxygen. Swimming of 400, 800 meters by crawl with inhale each 5th, 7th, 9th stroke, or by breaststroke with inhale each 2nd, 3rd, 4th cycle, or swimming with monofin with inhale each 4th, 5th, 6th cycle. Swimming long distances can cause a headache (due to constriction or dilatation of brain vessels), so in the beginning it is preferable to divide the distance: 4x100 m by crawl with inhale each 5th stroke, than 2x200, 200, 2x400 and so on. Light variant can be used for warming-up: 300 m by crawl with alteration every 50 m – inhale each 3rd, 5th, 7th, 7th, 5th, 3rd stroke. The same scheme can be employed while swimming by breaststroke or with monofin: inhale each 2nd, 3rd, 3rd, 2nd cycle with alteration every 50 m.
2. **Alternate swimming** rapidly activates circulatory and respiratory systems. First portion of the distance forms moderate oxygen debt, which is eliminated during free swimming. It is enough time for aerobic processes (energy production with oxygen utilization) to unfold, and second portion takes place under conditions of intensive aerobiosis. The distance is: 400 m by breaststroke (25 m under water + 75 m on the surface slowly by crawl) or 600 m with monofin (25 m under water + 25 swimming freely on the surface). The method is irreplaceable in pools with cool water.
3. **Interval swimming** is swimming of short distances underwater with brief rest. Aimed to improve heart functioning, while products of the anaerobic decomposition are great stimulators of respiratory processes. Thus during first 10-30 seconds of the rest oxygen utilization and heart performance increase. If the next portion of the distance is taken while these characteristics are still high, it increases oxygen consumption from repetition to repetition. Oxygen consumption stabilizes after reaching maximum values (usually at the 4th interval) and stays constant until the end of the series. The distance is: 8x25 m by breaststroke or with fins with the rest of 10 slow inhales-exhales. Gradually (but with the caution) the series can be increased to 16x25 m, then again 8 repetitions but this time with 9 inhales-exhales (slow!) and again up to 16 repetitions. And so on. It is highly important to achieve stable comfort condition.
4. **Recurring swimming** of 50 m intervals with breath holding at the fast rate or with diminishing rest. Lactic acid concentration increases during the series, and this in turn heightens the organism resistance to unfavorable changes, increases tissue adaptation to hypoxic and hypercapnic conditions, and improves psychological tolerance. The distance is: 2-3 series of 4x50 m by breaststroke or with fins with the rest of 2-1.30-1 minutes. The rest between series is 15-20 minutes in the form of free swimming to decrease the amount of lactic acid and of oxygen debt. It is a relatively hard work and should be practiced only by advanced freedivers.

The athlete's sport shape improves gradually, and this should be taken into account. Practicing recurring swimming in the beginning of the season can lead to disappointment due to failure of adaptive mechanisms.

Beginners have to remember, that the progress initially is determined chiefly by lung volume and ventilation ability, at the second stage – by cardio-vascular system, and finally by the ability to utilize oxygen. It means that if you are serious in your intentions to become a freediver, your career should begin with distance swimming with rare breathing and alternate swimming with short breath holding and free swimming. Advancing, you can add interval training. And by reaching the peak of your shape, you can begin practicing recurring swimming.

Warming-up is an important part of training process. It activates cardio-vascular system, increases blood flow, dilates vessels, increases amount of blood – as the result oxygen capacity of blood heightens. Metabolism of neuromuscular system intensifies, temperature of muscles rises, they become more flexible. Warming-up includes swimming by crawl, breaststroke, with fins and distance swimming with rare but comfort breathing.

Choosing exercises, one should consider not so much the ultimate goal as the current condition of organism and its dynamic. Repeating exercises over and over again, you will be able to feel the organism reaction finely and to provide it with adequate work. To achieve it, it makes sense to train frequently but not so powerfully rather then rarely and exhaustively.