tive self-massage is used which employs slow, soft techniques. Training-type auto-massage is executed 2 hours or more after the final workout of the day. It is usually longer-lasting and employs many different techniques in order to increase the body's functional capabilities.

Vibrational massage has been used for many years with Soviet lifters and is finding increased use in many different sports. According to Kopysov (2), "Low-frequency vibromassage has been found to be one of the most effective means of enhancing accelerated recovery following training sessions, and of preventing injuries." This conclusion was based on studies conducted on rowers, skiers and runners. With weightlifters, in addition to the restorative effect, vibrational massage had a high tonic effect (getting the body ready for the ensuing work).

Turin (6), in his study of vibromassage with gymnasts and runners had very interesting results. He determined that "... after vibromassage, irrespective of when it was used in training, there was an increased functional state of the nervous-muscular systems, increased muscle tonus and excitation," all very positive. For example, the percent of runners having a quickened pulse after training was significantly less when massage was done in the warm-up. Also, the pulse was "recovered" on the following morning if the athlete massaged after training.

Vibrational massage was also found to have a positive effect in specialized training of athletes. For example, gymnasts were able to execute identical routines when working on the apparatus (judged by a panel of experts) only after massage. Runners showed stable results when executing 6x100m reps with a rest period of 2-3 min only when massage was used with warm-up.

In recent years the Soviets have shown how variability in strength training is very important for gains in strength and other physical qualities (9). There is now increasing evidence that variability in recovery means (even the same technique) is also very necessary and for the same reason. By using the same recovery means the body adapts quickly, after which their effectiveness is reduced significantly.

At the present time, much use is being given to underwater hydro- and pneumo-massage which, in the opinion of experts, have a deeper and more all-around effect on the body. See Figure 1 for an example of a hydromassage bath in use.

Various water procedures are also important for recovery. These include different kinds of showers (circular, needle-shaped, etc.), total baths (fresh water, salt water, pine, soda water, etc.) and also partial baths which are distinguished by their solutions and by the temperature variations. In addition, steam and sauna baths and heat chambers are being used to promote faster removal of wastes and harmful metabolic products. They also furnish a general circulatory and toughening effect.

In recent years, physiotherapeutic measures have been increasingly used for recovery. One of the means is electrostimulation of muscles which improves local blood circulation and metabolic processes in muscles, removes fatigue and increases muscle strength. Ultra-sound is being applied, which makes it possible to decrease or eliminate pain in tendons and ligaments or at their sites of attachment. Ultra-sound has an anti-inflammatory effect on microtraumas, which are unavoidable in virtually any severe workout. These methods are also used in rehabilitation and for a combination of recovery and rehabilitation.

Other methods include the use of electrosonics, which relaxes muscles, lowers blood pressure, normalizes the excitatory and inhibitory processes and improves sleep. Reflexology is now taking root as a new, highly promising recovery method for fast healing. It involves auriculo- and corporal electro-acupuncture and can also be used for diagnosis. See Figure 2 for an example of reflexology therapy in action.

Still other physiotherapeutic methods are in use such as ultra-violet irradiation, air ionization and electro-phoresis. Pressure chambers are also being used with great success. See Figure 3 for an example. Each of these methods is effective under special conditions when prescribed and carried out by medical personnel.

In recent years, different methods of psycho-regulatory training which can be done by physician-specialists and by the athlete himself are gaining increasing significance in sports. This includes using specially selected music, colors, color-music, and so on.

For an excellent example of variability in restorative means see the article by Kopysov, Pologujev, Prilepin (3). These were the methods used by the junior national weightlifting team which has shown outstanding (if not phenomenal) results in international competition.

Last but not least, it is necessary to look at the role of nutrition, as it too plays an important part in restoration. Caloric (Continued, page 40)
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intake; percentages between protein, fat, and carbohydrates; and the use of vitamins and minerals are important to restoration as well as to increasing levels of performance. Minerals also, have been found to be especially important to restoration. They are necessary for the normal flow of most biochemical reactions and influence excitability of nervous and muscle tissue, muscle contractility and other body processes.

Heavy physical loads lead to significant disturbance of the water and salt balance and because of this, have great significance for the restorative processes and maintenance of workability. Various preparations, such as sports drinks, juices, albumen and albumen-carbohydrate products, which supplement the diet and help in faster and fuller restoration are now being used. (For more information in this area see the article by Kalinsky (1).)

Pharmacological preparations are also used in recovery processes. This includes: vitamin preparations (aerovite, ascotin, decamevite) as well as individual vitamins. The use of such preparations is determined by the training conditions and the athlete's condition. For example, more B3 and B5 are recommended for high altitude adaptation and vitamin E for speed work. Glutamic acid, which promotes protein, carbohydrate and fat metabolism is recommended after severe training. Lipotropic substances (choline and methionine), which affect fat metabolism, are also recommended, but should be prescribed by a doctor.

It should now be evident that there is a strong relationship between training loads and recovery means. In the case of high-intensity training (especially during the pre-competitive period) all means of recovery should be used. In training many months prior to competition, it is often advisable to conduct intense workouts with only minimal use of recovery means. This is necessary so that the body responds with greater mobilization of internal resources, as in supercompensation, which enables the athlete's range of functional capabilities to be expanded.

Rest can also be considered a means of restoration. However, the Soviets usually consider different states of rest as a prerequisite to the application of restorative means as well as a means of restoration (usually called active rest). What occurs during these rest periods is many times very critical. Yakovlev (8) for example, who has done much research in...

the area of training and fatigue, stated that: "The structuring of rest is very important for recovery following fatiguing work-loads." He found that in the rest period following rapidly developing fatigue, there is residual excitation which slows down recovery processes. Thus, all methods that reduce residual excitation, such as light exercises that are different from the sports event and non-sports measures, will promote faster recovery. In the case of slowly developing fatigue—especially high levels—the athlete needs calm rest and a sound sleep, during which a significant part of the restorative processes take place.

All the answers are still not in regarding when and how restorative measures should be applied. However, Talyshov (5) has come up with several generalizations that can be useful for many coaches. He determined that for the greatest work capacity recovery after a short span of time, as for example between AM and PM workouts, it is best to use recovery methods immediately after workouts. However, if it is necessary to have a high work capacity on the following day it is better to use recovery means 6-9 hours after the workout or competi...
tion. If the workout (or competition) is ending in the evening, it is best to start recovery procedures in the morning shortly after arising.

In conclusion, we can see that for today's athlete to achieve the highest levels of performance, it is necessary to employ restorative measures. The athletes are training longer and harder than ever before and taxing their bodies to the utmost. To assist athletes, Soviet Science is examining very closely what happens to the body during very voluminous and intense workouts. This is done in order to determine what measures can be taken to recuperate the athlete more rapidly and effectively. Restorative means are done so that the athlete will be capable of doing even more work, which seems to be the trend in achieving higher levels of performance. Only in this way will the athlete be able to develop his full potential and achieve his highest results. There are no shortcuts that can be taken to eliminate part of the actual workout process. Proper recovery however, will speed up the process by which the athlete can attain his maximum level of performance.

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**Bibliography**


Physiotherapeutic methods useful in athletic recovery include air ionization, electrophoresis and, pictured here, ultra-violet irradiation.