SPITAL OBERENGADIN • OSPIDEL ENGIADIN `OTA

Institut für Sportmedizin

Partners for Athletes in Engadin

www.sportmedizin-samedan.ch

1. Goal

The Institute of Sports Medicine of the Spital Oberengadin offers services that relate to everything that athletes do. Care for athletes in almost all areas is offered here. All examinations are done primarily by the sports physicians of the hospital, Dr. Biasca and Dr. Schneider. It is our declared goal to set up a care center for all problems encountered by athletes. When needed, other specialists from the hospital are called in. The idea of uniform care of athletes means the following:

a) **Determination of capability.** A strength and capacity diagnostic test is available that meets the guidelines of Swiss Olympic.

- For beginners at sports
- For team changes of accomplished athletes
- Before the beginning of the season (pre-season training)
- After the end of the season
- Before important events

b) **Injured** persons The most modern methods of treating sports injuries are available. The orthopedic department is thus characterized as a sports orthopedic center.

c) **Rehabilitation after sports injuries**. Two physiotherapists with special training in sports physiotherapy and an outside consultant provide ambulatory rehabilitation after conservative treatment and after operations.

d) **Mild skull and brain trauma** A reference center exists that uses the ImPACT System for initial diagnosis and further care of patients with mild skull and brain trauma.

e) **Center for special problems of athletes** Two contacts (the head and the assistant head of sports medicine) deal with all problems of athletes and maintain contact with specialists from their sports physician network inside and outside the hospital.

2. Range of Services

- Sports medicine examination to determine fitness for sports according to the guidelines of the Swiss Society of Sports Medicine (SGSM) and the Swiss Olympic Association (SOA).
- Performance diagnosis without ergometry
- Strength, muscle, and joint diagnosis
- Anthropometry
- Recommendations for training
- Advice for prevention of injuries
- Diagnosis, treatment, and rehabilitation of sports injuries

2.1 Sports Medicine Examination According to SGSM Guidelines

At a sports medicine exam, the athlete, or the future athlete, completes what is called a risk check, during which he or she is questioned about known illnesses and about the planned or already completed training program. A short medical examination is performed at this time. An ECG is always necessary before a first-time exam and can be done by the family physician. If anomalies appear, or if a patient has prior risk factors or chronic ailments, specialists from the hospital are also called in, such as the pulmonologist, the cardiologist, or the gastroenterologist. Only patients at risk must complete a stress ECG or an echocardiographic examination. If necessary, these can be done by our cardiologists in the hospital. Laboratory tests are done only for team athletes or for athletes older than age 35. If a suspicion of asthma arises, a special examination with a lung function test is indicated to be done by our hospital pulmonologists. If no internal ailments stand in the way of increased sport activity, the next thing is an orthopedic examination of the motion apparatus of the body. A report on the athlete comes at the end of a sports medicine exam that again summarizes the most important points of all examinations.

2.2 Performance Diagnosis

Performance diagnosis is an important tool for determining the initial performance state and for monitoring the results of the course of training. As a result, training is set at its optimal level on the basis of test results through specific individual training suggestions. Monitoring

over time allows corrections to wrongly performed exercises or to overloads, and thus guarantees management of the training that is adapted to the situation and to the patient or athlete.
For a long time performance diagnosis was reserved principally for top athletes. Today, however, newcomers, hobby athletes, and complete amateur teams enjoy the advantages of a well-supported performance diagnosis.

On the basis of various tests, the patient learns the most important things about

- Current abilities
- The best pulse rates for effective training, either for the optimal fat burning and/or a specific increase in performance
- If necessary, current lactate values, from which the individual aerobic (with oxygen) and anaerobic (without oxygen) thresholds for training management are calculated.

It is still important to choose specific tests for the various needs of the individual athletes. For that, the interplay of several situations and concepts of the individual capacity to perform must first be clarified.

Every muscle needs energy for movement. This energy can be of various types and means, but above all else it be must be prepared with and without the use of oxygen. The supply of energy for the muscles without the use of oxygen is called anaerobic gaining of energy (an = not, aerob = oxygen). This method delivers a lot of energy quickly, which however lasts for only a short time. In particular muscles that must be used for quick, intensive power loads get their energy that way. The resulting lactate (lactic acid) is a decomposition product that is quite important for performance diagnostics. Obtaining energy with oxygen (aerobic), on the other hand, is chosen by muscles when slow and repetitive activities of low to medium intensity are performed. In this way glucose (sugar) and fat are "burned" when using oxygen.

In sum, there are two ways of generating energy for the muscles:

- **Without burning oxygen (anaerobic)**: Intensive loads, lasts for a short time only
- **With burning oxygen (aerobic)**: Less intensive loads of longer duration

Obtaining energy	Starting materials	End product	Load	Duration
anaerobic	Creatinine phosphate	Creatinine and phosphate	Very High	10-20 sec.
anaerobic	Glycogen (sugar)	Lactate	high	4 minutes.
aerobic	Glycogen (sugar) and oxygen	Carbon dioxide and water	Medium	100 min.
aerobic	Fat and oxygen	Carbon dioxide and water	low	Days

The goal of most endurance training therapies is to build up the aerobic generation of energy, that is, to manage ever longer periods with ever more intensive loads by burning glucose and fat with oxygen The reason for this is that glucose and fat exist in a much higher amount in the body, and can be replenished even during the loadbearing, such as by drinking. The point at which the aerobic supply of energy is no longer sufficient and at which the body is turned to anaerobic obtaining of energy is called the anaerobic threshold. When this anaerobic threshold is crossed, lactate can no longer be decomposed and now occurs a waste product. In popular parlance, this is called over-acidification of the muscles. Many endurance tests attempt to determine the anaerobic threshold by measuring the lactate value in the blood. On the basis of experience in sports medicine, the sports physician can use the combination of lactate values and the heart rate measured during the test to give recommendations for training to increase endurance. In the area of competitive sports, we intensively include the sports-specific knowledge of our sports physiotherapists in our recommendations.

For many amateur athletes and even for performance diagnostics of larger groups and teams, lactate diagnosis is too expensive. Tests have been defeveloped that calculate the anaerobic threshold solely from the patient's heart rate under load. This calculation, to be sure, gives only an approximation of the anaerobic threshold and is not as exact as the lactate level measurement, but for the novice and for amateurs this calculation is quite sufficient.

2.3 Performance Tests

2.3.1 Tests Based on Heart Rate

A load test is done by the Section on Sports Orthopedics and Sports Traumatology only in demonstrably healthy patients. Patients with risk factors and patients with demonstrated cardiovascular or pulmonary diseases are first referred to colleagues in the section on internal

medicine for testing or further clarification. In the field tests, we work closely with Mr. Andrea Casura, sports physiotherapist in Pontresina, following the guidelines of the SOA.

Cooper Test (12-Minute Run):
A runner tries to cover the greatest possible distance in 12 minutes on a 400 meter track. The anaerobic threshold can be estimated from the distance covered. This test is not suitable for the beginner, for the run is often begun too fast or too slow.

Conconi Test:
This test can be done on a bicycle ergometer or as an outdoors field test. To be able to perform this test independently of temperature and weather conditions, a special sports medicine treadmill prepared by Dr. Biasca is available in Spital Oberengadin. At first the individual being tested is given a low load so that the body can produce the required energy aerobically, that is, by using oxygen. At set intervals, the performance demanded of the athlete is increased (on the bicycle ergometer, by increasing the pedal resistance). The heart rate is continuously measured. As the load increases further, the heart rate "turns down" at an individual spot. This turn stands for the anaerobic threshold, and from there on the body must get its energy principally anaerobically. As a result, the lactate profile in the body increases, which in turn leads to performance failure. This "turning down" of the heart rate is, however, not visible on every runner, and the determination of the anaerobic threshold is not exact for each person.

4 x 1000 m Run:
This running test is particularly well suited as a field test, that is, for groups or teams, to determine the anaerobic threshold, but also to monitor the training. In this test, too, the body is stressed to the maximum, which means that health risks must be ruled out before the beginning of the test. The basic test consists of the four-time completion of a 1000-m run at various intensities: light, medium, fast, and full speed. Some 50 m before reaching the 1000 m mark, the heart rate is determined by measuring the pulse at the wrist if it is not continuously monitored in the first place. On the basis of a nomogram, the anaerobic threshold can be determined, and on the basis of the measured heart rate, training recommendations can be given.

2.3.1 Tests Based on the Lactate Value

Lactate grade test:

This test is done on the treadmill or on the bicycle ergometer. If necessary, a lactate grade test can even be combined with a 4 x 1000 m run. As in all tests, the load is increased gradually in a specific defined form up to the individual maximum load. During every load stage, a drop of blood is taken from the earlobe or from the finger for the determination of the lactate concentration. It is just this lactate concentration that reflects the anaerobic and aerobic proportions of the body's energy source at that moment. Although the lactate production is low during the mainly aerobic generation of energy at low loads, the lactate value increases rapidly when switching to mainly anaerobic energy generation (anaerobic threshold). Measurement of the heart rate takes place in parallel to the measurement of the lactate, and as a result an individual training recommendation can be made. Like all other tests, this test follows the guidelines of the Swiss Olympic Association. Since all athletes complete the same test, the performance results of an amateur athlete can be compared with those of top athletes.

2.4 Strength, Muscle, and Joint Diagnosis

Muscle function test:

In this test, the flexibility of various muscle groups is reviewed. A flexibility therapy plan can be created to prevent injuries in the muscle fiber area.

Trunk basic strength test:

In the area of strength diagnosis, protection against injuries through sufficiently exercised muscles in the back and hip areas is very important. Besides, sufficient stabilization of the trunk appears to be a pre-condition for safe and efficient strength training with extra weights. Surprisingly, the so-called trunk musculature is often not well developed not only in amateur athletes, but in top athletes as well, a situation that in part means a higher susceptibility to injuries. Testing of the trunk musculature is possible with the "Trunk basic strength test." This test too is done according to the guidelines of the Swiss Olympic Association. A course of 3 stations is completed, in which at each station the front, side, and rear trunk musculature is tested. The results are evaluated separately according to the type of sport, since trunk strength does not have the same significance for each type of sport. The standardization of this test took place at the National Office for Sport in Magglingen, which made possible the comparability of the measured data with other types of sports and athletes.

2.5 Training Recommendations

Training means a systematic repetition of planned exercises, which lead to adaptations. This means that at first training leads to fatigue, then to recovery and simultaneous improvement of the original performance level. The initial level before loading is thus exceeded, and what is called super-compensation occurs. If the next training period is completed in this supercompensation, that is, on an already improved level, a new, even higher, supercompensation occurs. Thus arises a training effect based on planned loading, subsequent recovery, and renewed loading. The task of a training plan is to choose the optimal intensity, duration, and time of the next training point.

The results of the orthopedic and sports medicine exam, as well as that of the performance diagnosis, all together lead to individual and specific training recommendations. Various load intensities are combined to reach the individual training goal. Distinctions are made between regenerative, slow, medium, fast, and very fast (intensive) loads. To define these, in solely heart-rate controlled tests these areas are measured as a percent of the maximum heart rate. The Conconi Test gives training recommendations as a percent of the threshold speed. In lactate controlled tests, the intensities are calculated on the basis of lactate values, but the intensities are given in heart rates. So for any athlete the heart rate can be used as a basis to create an optimized program either for burning fat, increasing the basic endurance capacity, or for specific competitive training. The strong cooperation between physiotherapy and sports medicine assures ongoing contact between physician and therapist, and a mutual exchange regarding the findings and course of events results in the best possible care and treatment of our athletes. In particular, complex problems can be handled efficiently. In competitive sports, we use the sport-specific knowledge of our sports physiotherapists, and work closely with the trainers of the individual athletes.

2.6 Anthropometry (Skin Fold Fat Measurement)

Determination of the percentage of body fat is a disputed area of sports medicine. Body fat is the energy reserve of our body that we mobilize and need in extreme situations. An overabundant proportion of fat can mean a health risk, especially if one does not play any sports. The body mass index, the BMI, serves to distinguish between normal-weight and overweight persons. A value smaller than or equal to 25 is normal weight; a value greater than or equal to 30 means overweight. A slight increase in the BMI is normal as one grows older; the BMI increases about 1 point every 10 years. The body fat proportion of individual body parts can be recorded with a skin fold measurement method. Great differences exist from

athlete to athlete in proportions of body fat. So for example endurance athletes and climbers have lower body fat proportions than do participants in strength sports, even though both types can be thoroughly fit. In addition, a certain proportion of body fat is normal, even life-sustaining. Body fat measurements can still make sense for the observation of the course of training.

2.7 Advice on Prevention of Injuries

Advising athletes on injury prevention currently makes up only a small part of sports medicine activity, since the athlete is often not conscious of the importance of injury prevention and even its possibilities. Nonetheless, this point should be included in the grand design since it is of great potential significance. Advising sessions on prevention of injuries can include both instructions on basic strength exercises and special exercises for strength, endurance, and technique.

2.8 Rehabilitation After Sports Injuries

Patients and athletes can be led back to their original capabilities after injuries, operations, or longer illnesses. Since patients at the hospital, following operations or conservative treatment for injuries to the motion apparatus, can undergo comprehensive treatment, trust in the physician and the hospital increases because the case is closed only after the patient has regained full functionality of the injured limb.

3. Infrastructure of the Institute for Sports Medicine

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