Implementing Medical Checkups to Prevent Sports-Related Injuries and Disorders

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Abstract: Sports related injuries and disorders have increased due to the spread of sports. To prevent such injuries and disorders and to improve activity levels further, medical checkups of individual athletes are conducted before, during, and after their performance, and the results are provided as feedback for athletes, coaches, and physicians. The checkup consists of three examinations: (1) an internal medical evaluation in which ischemic heart diseases and valvular diseases with fatal symptoms that are induced by sports are mainly checked, in addition to basic systemic diseases such as kidney, liver, and metabolic diseases, (2) brain surgery and orthopaedic evaluations in which basic brain disorders and susceptibility to head and limb injuries are checked, and (3) a physical strength evaluation in which basic physical performance and muscular strength of extremities and trunk, body fat rate, height, and body weight are checked during sports activities. It is very important that the data obtained from this examination is promptly converted as feedback for use by athletes, coaches and trainers, and to enable the physician to provide appropriate medical advice.

Key words: Medical checkup; Sports injury; Training

Introduction

Recently, due to the widespread popularity of sports among the general public, the number of people who enjoy participating in a variety of sports activities as a source of recreation has rapidly increased. The age of such persons has been noticeably increasing as well. When people who have few opportunities to engage in sports suddenly participate in these activities without adequate training, many different kinds of injuries and disorders can occur.

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Meanwhile, those who take part in athletic sports have the need to acquire a higher level of skill and ability because the overall level in each sport has significantly increased over the years. This has also been true regarding the athletic levels demanded of growing school children, which is now at a higher plateau. Coinciding with such trends, athletes are more prone to experience sports injuries and disorders, and the types of injuries and disorders they sustain are now changing.

Medical checkups are used to evaluate individual sports performances prior to an athlete’s actual engagement in such activities, and to regularly check their physical performance in sports-related activities in order to prevent injuries and disorders (Table 1). Based on the results of the medical examination, guidance on adequate training methods and exercises can be provided to ensure safe and more advanced sports activities (Fig. 1). When a major disease or illness is found during an examination, it may become necessary to change the activity or to discontinue it completely in some cases. The items that the medical examination covers vary according to the particular sporting event and the overall activity level demanded.

This paper describes several common items that are evaluated during the medical checkup: (1) An internal medical evaluation to check for...
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underlying systemic diseases to ensure safe participation, (2) brain surgery and orthopaedic evaluations to check for underlying diseases and to evaluate the strength of the muscles and the supporting tissues in the head and limbs, which are often susceptible to sports-related injuries, (3) physical strength evaluation to check physical performance, and (4) individual checkup items for each person and the utilization and feedback of the data obtained.

Internal Medical Evaluation

During the internal medical evaluation, the greatest care should be taken to check for various forms of heart disease. The presence of heart disease indicates that participation in a sporting activity may lead to the onset of a severe or acute medical condition. Particularly in the case of valvular disease and ischemic heart disease, involvement in a sports activity can induce a life-threatening condition. Therefore a thorough and detailed examination is necessary.

Firstly, the patient should be asked about their past medical history in full detail, including whether they have or have had arrhythmia and hypertension. It is also important to check for a past history of diseases such as rheumatic fever, Kawasaki disease and Marfan’s syndrome that lead to heart disease. Cardiopulmonary function should be evaluated by performing auscultation to check for heart murmur and to examine lung field, in addition to examinations such as electrocardiograms, chest X-rays and echocardiography, which should be used when necessary. If possible, detailed examinations with stress tests and Holter ECGs, are even more useful.

As a principal rule, the presence of other diseases that are potentially influenced by sports activities, including renal, hepatic and metabolic diseases, should also be examined. Additionally, during the blood examination, it is necessary to check the hepatic and renal functions and for the presence of anemia as well as the CPK (creatine phosphokinase) levels. Alcohol consumption and smoking should be included as check items as well, because they represent medical risk factors.

Brain Surgery and Orthopaedic Evaluations

In the evaluation for brain surgery, it is necessary to ascertain the patient’s past history regarding epilepsy seizures, head injury, cerebral hemorrhage and cerebral infarction. Electroencephalograms, CTs and MRIs should be used when necessary. Patients should be examined thoroughly for the presence of epilepsy and cerebral aneurism, since these conditions can be fatal in certain sporting events such as boxing if left untreated.

In the orthopaedic evaluation, the presence of limb injuries including previous bone fractures should be identified. It is also important to inquire about a past history of lower back and neck pain as well as medical conditions related to overuse such as jumper’s knee and tennis elbow. Care should be taken when a patient has suffered from previous overuse-related conditions, because they may reappear when sports activities are resumed (even though symptoms are not usually manifested in daily life activities).

In the diagnosis, a skeletal check should be conducted at first to evaluate the presence of deformations in the upper and lower body limbs, mobility of the trunk, and pain during exercise. Additionally, an extensive examination of the nervous system including muscle strength and perception and reflex activity in each limb, should also be made. For the joints in the limbs, the range of motion should primarily be checked. However, an examination of joint instability is also important, particularly in the knee and ankle joints. Most ligament injuries in these areas do not interfere with daily life, yet they can often cause subjective instability once sports activities are started.

For the cervical and lumbar vertebrae, where
severe sports disorders may occur, and the knee and ankle joints, which are subject to frequent injuries, the presence of deformations or malalignment should be identified during plain X-ray findings. Particularly, plain X-rays can show changes including bipartite patella (which can potentially result in pain during sports activities), os tibiale externum, and in cases where the sports activity has been continued since childhood, Osgood-Schlatter disease and spondylolysis.

For sports that involve a considerable amount of stress applied on the upper limbs, such as baseball and softball, X-ray images of the shoulder and elbow joints should be taken. MRI scans of the cervical and lumbar vertebrae, if possible, will also provide additional relevant diagnostic information. Additionally, electromyograms and CTs are also useful when necessary.

**Physical Strength Evaluation**

Physical strength evaluation is useful in preventing diseases and enhancing sports performance.\(^3\) Height, body weight, and body fat ratio are the first items to be measured. A training goal should be established by calculating an individual's optimal body fat ratio, taking into consideration the type of sports they are engaged in, their positions and ages. Some people play sports to reduce body weight and body fat, and regular measurements of these items will help boost their passion and enthusiasm for the sports activity they are engaged in.

Muscle strength in the lower and upper limbs should be separately quantified using a measuring device (Fig. 2). Such measurements not only reveal reduced muscle strength caused by different types of diseases and disorders, but also indicate the degree of muscle strength build-up, which is important for enhancing personal motivation.

The balance with antagonist muscles is also an important factor related to muscle strength.

For example, the balance of muscle strength between the quadriceps and antagonist muscles such as the hamstring has a significant effect on exercise performance. Therefore the strength ratio of these muscles should be checked and subsequently used as a guide for training. For athletes, it is necessary to measure their individual performance in aerobic and anaerobic exercise, and subsequently this data can be used as a guide for training purposes.

**Feedback and Data Analysis**

The results obtained from these evaluations and examinations should be promptly fed back to athletes, coaches and trainers. Based on the results, athletes may occasionally be forced to stop further sports activities, to change the sporting event they participate in, or to alter the position they play on the team. In such cases, it is essential that physicians inform the individual of his/her results, and they should also discuss the future course of action with the athlete and the coaches and trainers. Additionally, it is important to provide advice from a physician’s standpoint.

If the medical checkup reveals a disease or physical drawback that can be coped with, the physician should confer with the athlete, coach
and trainer about the treatment and training methods that are available. The results of the internal medical evaluation should be used in the prevention and treatment of diseases and for nutritional guidance. And the results from the brain surgery and orthopaedic evaluations should be used in the prevention and treatment of each disease and disorder that is diagnosed, and to determine appropriate training methods for medical conditions related to overuse. Data from the physical strength evaluation should be used for controlling body weight and determining the best muscle training method. In this case, it is important to obtain data collected over time in order to ascertain the effectiveness of treatment and training, and to also enhance an athlete’s motivation.

Even if a particular treatment or training approach does not yield a 100 percent improvement in the athletes, they can still effectively utilize the results to learn about their shortcomings and weak areas, and thereby master other skills or use alternative methods. In team sports, when a coach or trainer is able to obtain medical and sports performance data for each of their players, it becomes easier to develop plans and team strategy, including the positioning of players.

Additionally, if this prospective data is accumulated and then comprehensively analyzed, it will serve as an information source that can be effectively used to elucidate the causes of sports injuries and disorders as well as how to prevent and treat them.

**Conclusion**

This paper described the ways in which sports-related medical checkups are implemented and utilized. Both sports athletes and the general public are expected to continue to increase their overall level of athletic ability in the future, with this ability becoming more complex. Simultaneously, it is anticipated that the importance and usefulness of sports-related medical checkups will further increase as well.

**REFERENCES**

