

# *A Closer Look at the* **Opto Jump**

The latest in a great testing and diagnostic tool



It's great to have a positive attitude and to expect that when a child participates in high school sports they will get excellent coaching – and that if an injury occurs, the staff will know exactly how to take care of it. This is one reason we started the “Dark Side of Sports” column, to make the public aware of safety issues that could affect student athletes. It's also why we have

teamed with Microgate USA.

One of Microgate's key products is OptoJump™, which quickly and easily assesses body mechanics while an athlete is in motion. OptoJump presents real-time feedback in three formats: video, graphical and numerical.

To ensure accuracy and reliability, OptoJump has no moving mechanical parts. It can measure flight and contact

times during a series of jumps with an accuracy of 1/10000 of a second. As such, the speed of the video can be reduced to “frame by frame” or still picture – and it's possible to use various graphic tools (lines, arcs, circles, ruler, goniometer, etc.) to draw on the still picture for future analysis.

OptoJump provides precise and objective performance data to make



The OptoJump uses light-weight, portable sensors that are linked to sophisticated data analysis software that presents real-time feedback in three formats: video, graphical and numerical.



certain that the well-rounded athlete is able and agile in all directions and has no favored side. Here are several specific applications of the OptoJump related to athletic fitness:

- to assess an athlete's performance and physical condition
- to rapidly identify any muscular deficiencies and to measure tolerance to various workloads
- to develop customized and diversified training based on the test results
- to periodically check the results of training
- to create a database of athletes in order to compare them with each other or to compare the results of an individual athlete in different

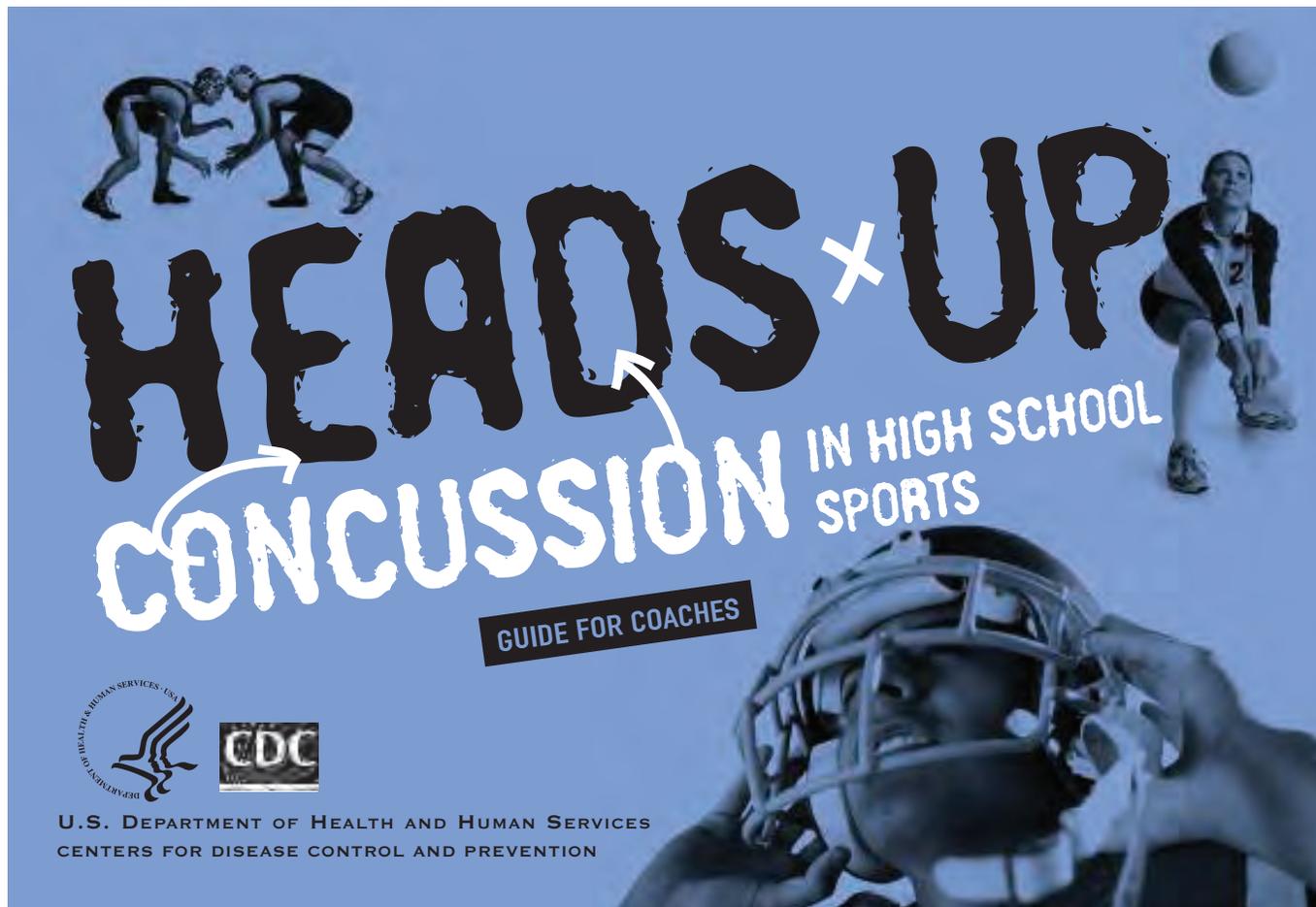
periods of time so as to objectively determine the results of training

- to examine the physical condition of an athlete after an injury for the purpose of developing specific actions for rehabilitation and check its progress
- to motivate athletes by giving them tangible proof of the progress made, thus stimulating fruitful competition inside the group
- to significantly reduce the trainer's workload, at the same time allowing him/her to retrieve at any time the results of tests performed even months before
- to make use of an objective judgment when talent-scouting or choosing athletes

### Getting into the System

With a simple, 30-second march-in-place test, OptoJump can measure the contact time of each foot, the flight time of each foot, and the athlete's ability to hold his or her center of mass constant. An athlete's biomechanical baseline, or "gait print," can then be tracked over time, allowing physical educators, coaches and trainers to objectively measure biomechanical development and ensure effectiveness of training. In addition, the device provides the only dynamic stability test in the world: a simple 5-jump, in-place test that evaluates an athlete's creation, execution and direction of power (stability).

OptoJump allows immediate and



The Centers for Disease Control offers many educational products about concussions that can be useful to coaches, athletes and parents.

exact identification of biomechanical asymmetries by assessing gait, power, acceleration of each leg, etc. One application for gait analysis is with the use of a treadmill, placing the unit on the edges of the machine. The following are the precise gait phases the OptoJump examines:

- **Stance Phase:** The stance phase is the supporting phase of each gait cycle. It begins with the contact of the heel and finishes with the setoff of the tip of the same foot. It is therefore the time between the first and the last contact of two consecutive supports of the same foot. It is also presented as a percentage of the total gait cycle.
- **Swing Phase:** The swing phase begins when the tip of the foot

leaves the ground, and it finishes with the contact of the heel of the opposite foot. It is therefore the time between the last contact of the first support of the foot and the first contact of the following support. It is expressed in seconds (sec) and as a percentage of the gait cycle of the same foot. The swing time of one foot corresponds to the single support time of the other foot

- **Single Support:** This is the time between the last contact of the current support and the first contact of the following support of the same foot, i.e., the time when only one foot touches the ground. The single support corresponds to the swing time of the opposite foot.

It is expressed in seconds and as a percentage of the total gait cycle time

- **Total Double Support:** This is the sum of two partial double supports, which are defined as DS1 and DS2
- **Step Time:** This is the time between the first contact of a foot and the subsequent contact of the opposite foot
- **Initial Double Support:** This is the first Double Support Time
- **Terminal Double Support:** This is the second Double Support Time
- **Step Length:** Distance between the tip (the toe) of one foot and the tip of the opposite foot in the subsequent step, or the distance between the heel of one foot and the heel of

the opposite foot in the subsequent step

- **Gait Cycle:** Time between the first contact of two consecutive steps of the same foot
- **Stride Length:** Distance between the tip of one foot and the tip of the same foot in the subsequent footprint, or the distance between the heel of one foot and the heel of the same foot in the subsequent footprint
- **Speed:** Average speed of a single step
- **Acceleration:** Speed variations between one completed step and the next completed step
- **Cadence:** Rhythm as expressed in steps per second
- **Total Distance:** Progressive distance walked or run by a patient
- **Contact Phase:** The time between the first contact of the heel and the complete support of the foot; the percentage indicates the value with respect to the total contact time
- **Flat Foot:** The time the foot

completely touches the ground; the percentage indicates the value with respect to the total contact time

- **Propulsive Phase:** The time between the lifting of the heel to the complete setoff of the tip of the foot; the percentage indicates the value with respect to the total contact time

In addition to being a valuable tool for enhancing performance, OptoJump offers a precise method of helping to deal with the ever increasing problem of concussions. This method is called “appraisal of movement.”

### Staying Ahead of Concussions

Appraisal of movement means that problem areas can be addressed long before they turn into injuries; this must be a critical, *objective* evaluation of an athlete’s preparedness to return to play after injury. OptoJump allows immediate and exact identification of biomechanical asymmetries that may indicate that an individual has not adequately

recovered from the effects of this type of brain injury.

In one study by the American Academy of Neurology that involved 1,038 high school athletes who suffered a concussion, the researchers estimated that 41 percent of these athletes returned to sports too quickly. Another study found that 16 percent of high school football players who lost consciousness from a concussion returned to practice the same day! As such, having a “gait print” of each athlete will help the medical staff determine when an athlete can resume normal athletic activities.

As a performance and training tool, OptoJump is one of the best possible means of developing bigger, faster and stronger athletes who are efficient and effective in their movement for their sport. It is also a valuable assessment tool to help ensure the safety of young athletes. 

A concussion can alter the athlete’s gait print, and as such a history of OptoJump readings will provide objective data about the athlete’s status and their readiness to return to play. These photos show how the OptoJump can be used on a treadmill to precisely analyze an individual’s gait.

