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We Are Basketball

MOVEMENT ANALYSIS IN SPORTS AND BASKETBALL



by Ilker Yücesir

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WHAT IS MOVEMENT ANALYSIS?

Modern human movement analysis is the interpretation of computerized data that documents an individual's upper and lower extremities, pelvis, and trunk motion during movement. Movement analysis has its roots in ancient times. Philosophers and physicians had been thinking and arguing about human movement. The beginning of dynamic calculations of human movement, however, began with Giovanni Borelli during Renaissance. Before Dr. James Naismith created the magical game called basketball, Muybridge was analyzing human and animal movements with photographs in 1870. Using cinematographic pictures, Braun and Fischer made their own calculations, transforming images to numeric values, like "change of location per second," which actually is the velocity of movement. For decades, taking moving pictures and processing them frame-by-frame, was the primary method for determining movement of athletes and animals. It was also a difficult method. In the past 25 years, however, the development and subsequent improvement of electronic technology and computer science has made it easier to analyze human movement.

The increasing involvement of technology in medicine has made some other methods and tools available for tracking and assessing human motion. Additional equipment, such as dynamic EMG, force plates, pedobarographs, electrogoniometers, and metabolic analyzers have made a more complicated, but also more complete acquisition of human movement available.

Hundreds of laboratories around the world are now working on movement analysis. These laboratories primarily work with patients with neurological, neuromuscular, and orthopedic disorders of locomotion. However, there is also important work being done in analyzing sports-related

movement.

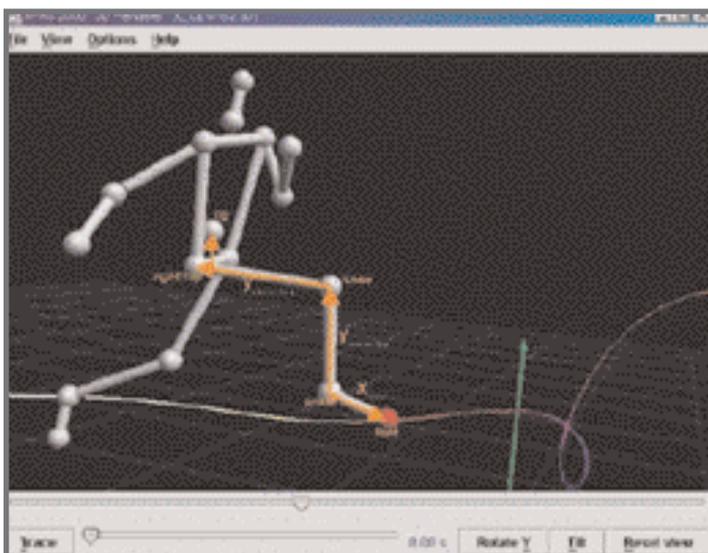
Sports performance is directly linked to human motion and performance. So, movement analysis is automatically a part of human performance assessment and analysis.

Today in many sports, sports scientists use movement analysis as a tool to enhance techniques, correct movement errors, assess metabolic costs related to a variety of movements, and aid in rehabilitation.

BIOMECHANICS AND MOVEMENT ANALYSIS

The study of the motion of living things is known as "biomechanics" which is a fusion of the disciplines of anatomy, physiology, physics, and engineering. Biomechanical research of human motion respects the human body as a mechanical system of moving segments upon which muscular, gravitational, inertial, and reaction forces are applied. Modern computerized systems of movement analysis generally consist of placing special markers on the subject that will transmit informative data from their position in space to receiver device(s) or force platforms that then assess those forces and moments related to gravity. Computer software programs are used to evaluate the collected data and process it.

Processing of data results in numeric values and graphics of different sorts, such as stick figures or other graphs of movement. With these software programs, it is now possible to make sophisticated calculations, statistical evaluations, and comparisons between subjects, cases, and models related with the movement.



Armed with this valuable information, movement researchers can determine abnormal biomechanics, measure deviations from a desired pattern, and assess a variety of biomechanical errors made by an athlete.

HOW CAN MOVEMENT ANALYSIS BE USED IN BASKETBALL

The use of movement analysis for athletic performance focuses on errors made by the athlete while performing a specific movement during the course of a game. Comparison of an athlete's movement stored in a computer with a database consisting of this particular athletic activity makes it possible to determine and correct errors made by the athlete.

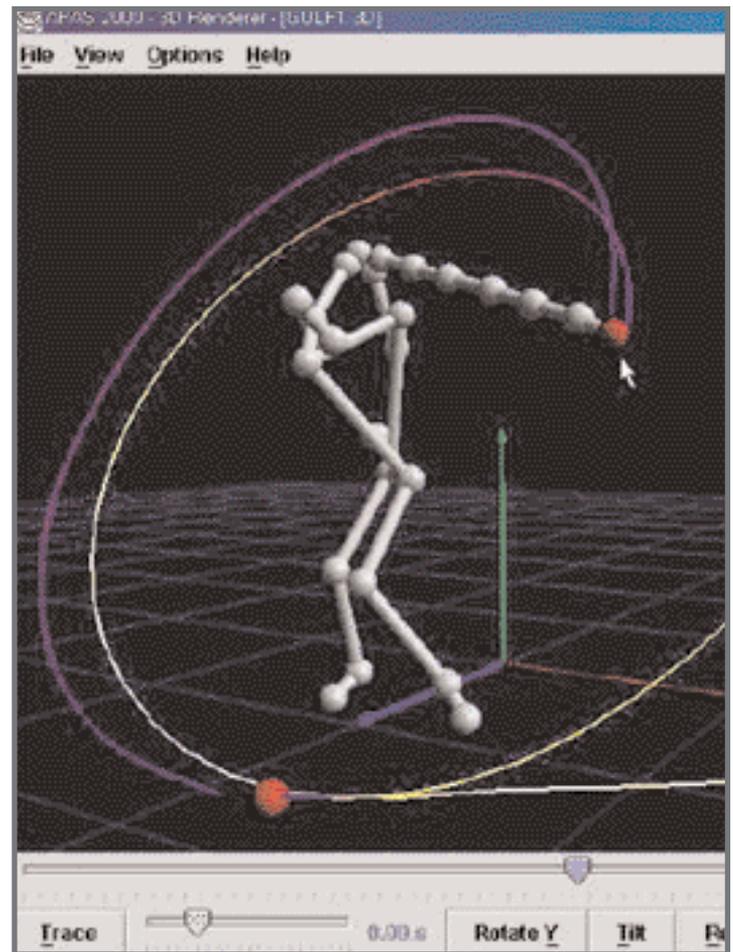
For this purpose, two kinds of databases can be used.

The first database is created from the movement data of elite athletes, while the second is created over time from the movement data of the athlete himself. For example, once you have a database of an elite athlete performing a particular movement—a jump shot, for example—you can then compare it with a particular player's execution of the same movement. Once you record a number of repetitions of a player for a certain skill, you can compare his/her bad performances with the performances desired.

You will then be able to say where he/she is failing and needs to pay closer attention in order to correct his/her technique.

You can compare a player's made free throws with the missed attempts, for example. Simple suggestions, such as telling the player to shoot with the elbow extended more, or with the wrist flexed may be enough to significantly increase free throw percentage. Some may say that an experienced coach is already making this movement analysis during practice sessions and games and therefore he really doesn't need to avail himself of this movement technology. However, while the coach can play a role in fine-tuning shooting technique, keeping track of subtle changes in movement over a period of years needs more than the eyes and memory of the coach.

With the use of modern movement analysis, researchers may help fine-tune everything from running, jumping, and



shooting. Correction of a simple error involved in placement of the feet prior to a jumpshot may lead to better running, jumping, and shooting abilities.

Another important aspect of movement analysis is its use in rehabilitation of injured athletes.

Athletes recovering from surgery or a serious chronic injury often require intensive correction of the motor abilities that were lost over time. Incorrect movement habits developed because of the injury need to be pointed out to the athlete and strategies have to be developed to help the athlete recover proper movement patterns.

Coupling audio-visual biofeedback along with the analysis of the movement during rehabilitation can also be used as an important part of the treatment.

SUMMARY

Analysis of movement is a developing area in sports science. Relying on one's natural athletic talent can take an athlete only so far. Movement analysis, however, can be the difference between the athlete making a team, significantly improving his skills, and returning to action after an injury.

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