



Computers used in coaching

Computers show us the most effective way to put the shot is to use a short glide, across the ring and a long arm stroke

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This 1984 article by Earl Gustkey of the Los Angeles Times discusses the work of Gideon Ariel, a former Israeli Olympic discus thrower and two-time Ph.D. holder in computer science and exercise science. Ariel uses high-speed cameras and computers to analyze athletes' performances and suggest improvements. Despite the potential benefits of this technology, Ariel notes that many American coaches are resistant to change and prefer traditional training methods. Ariel's work has led to insights in various sports, including shot put, high jump, cycling, and kayaking. He also offers services such as helping golfers improve their tee shots and directing young athletes towards sports that suit their natural abilities.

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Below find a reprint of the 2 relevant pages of the article "Computers used in coaching" in "Detroit News":

Many prefer Stone Age methods in sports

Computers used in coaching

By EARL GUSTKEY
of the Los Angeles Times

It is 1984. A high school coach arrives at the Coto Sport Research Center in Southern California with a promising-looking athlete, a 14-year-old freshman.

Purpose of the visit: To learn which sport the youngster should spend his high school and college years mastering.

He spends 10 days at the center. Gideon Ariel measures the boy's bones, tests his reflexes, photographs him running, jumping and throwing with 10,000-frame-per-second movie cameras, examines his parents for genetic characteristics, tests his muscle strength on electronic machines, measures his jumping ability on force plates and checks his cardiovascular capacity and flexibility.

TESTS COMPLETED. Ariel condenses a stack of computer printouts into a brief analysis that suggests the boy's best chance of sports success would be as a cyclist. Or a swimmer. Or a football player. Or a tennis player. Or a discus thrower.

It would be rushing things to say Ariel has lifted American coaches out of the Stone Age and set them down in the 21st Century. Or forced them to turn in their whistles for computerized video display terminals.

For one thing, he says, many of them prefer the Stone Age.

"IT'S INCREDIBLE to me that the nation that put men on the moon is so slow to change its athletic training concepts," he said.

"But there are many experienced coaches who just don't like to be told they've been doing something wrong for years.

"Take the shot put, for example. We used to have three men on the Olympic victory stand. Now, none. Why? The East Europeans outcoached us, that's why.

COMPUTERS SHOW us the most effective way to put the shot is to use a short glide across the ring and a long arm stroke. That's how the East Europeans do it. American coaches, generally speaking, coach a long glide and a short arm stroke.

"I compiled a complete report on the subject, containing indisputable evidence of this. It wasn't complicated or revolutionary. It was simply high school-level, Newtonian physics.

"You know what happened? A U.S. Olympic Committee coach took it from me, locked it up in his drawer and told me to my face he wasn't going to show it to anybody."

THAT'S GIDEON ARIEL, the acerbic, 40-year-old former Israeli Olympic team (he's a U.S. citizen now) discus thrower who started tinkering with computers and high-speed cameras 10 years ago. He's a two-time Ph.D. — in computer science and exercise science.

Today, he's director of computer science-biomechanics for the U.S. Olympic Committee.

Ariel's method involves taking ultra-high-speed movie footage of an athlete performing. The frames are turned into stick drawings, showing body bones and joints. Eventually, a sequential "cartoon" of the action is created, enabling a viewer to measure acceleration and force of all body parts at any given point in the action.

"How can a coach teach, say, a javelin thrower how to release the javelin when he's never seen a release?" Ariel asks. "The human eye can't see it — it occurs in a fraction of a second."

too much rotary action on her strokes, increasing the error margin."

Crew — "In an eight-man shell, the shell will go faster if the coxswain row in a two-two-two sequence, instead of all at once. There will be a higher average velocity. The problem is, it's a difficult stroke pattern to coordinate."

WEIGHT TRAINING — "The next breakthrough will be electronic weight training, where resistance is programmed. It will enable an athlete to lift 'around' an injury. Let's say he has a chest muscle injury and wants to bench press. At the point of peak pain, the resistance drops way down, then goes up again.

"Generally, weight training has been over-emphasized by U.S. coaches. And technique hasn't been emphasized enough. Vasily Alexeyev may be the strongest man in the world, but he couldn't put the shot 50 feet. What does that tell you?"

"I should take part of that back. Bruce Wilhelm (U.S. weight lifter) is as strong as Alexeyev, he exerts the same force. But Alexeyev's technique is much better."

Ann Meyers, woman basketball standout — "She has the potential to break the women's world record in the high jump. She can raise her center

of gravity 60 centimeters in a vertical
IN HIS COTO de Caza condominium
beefy man, was leaping nimbly across
room, demonstrating to a visitor the
European shot put and hammer throw
imitated a weight lifter, snatching a
he was stroking a kayak.

Then he sat down, swallowed a tall
in three gulps, and talked about the
Olympics, past, present and future.

"The last Olympics where athletes
gold medals on sheer talent was 1952.
"Those days are gone forever. But if
puter technology to athletic training
limit to what we can achieve. We
dominate the Olympics, with our tech

"LOOK AT EAST GERMANY. How many
million? Yet they won more medals
Olympics than some continents. (Of
the top three countries at the '76 O
125, U.S. 94, East Germany 50).

"I know some claim the East E
using drugs. And they may be. But
technology, too. With the technology
to training, the potential for impro
greater than it is with drugs."

er to measure acceleration and force of all body parts at any given point in the action.

"How can a coach teach, say, a javelin thrower how to release the javelin when he's never seen a release?" Ariel asks. "The human eye can't see it — it occurs in a fraction of a second."

FEW PEOPLE ON earth can see track and field like Ariel can. To the spectator in a stadium, few sights can rival the majesty of a javelin soaring 300 feet through the air.

But to Ariel, the true beauty of the moment lies in that unseen fraction of a second when the javelin leaves the human hand, when the athlete brings eternal truths of physics to bear on the spear.

Ariel worked seven years at his Computerized Biomechanical Analysis, Inc., lab in Amherst, Mass. But he's moved West. Ground will break soon at Coto de Caza, a private club in the foothills of Orange County, south of Los Angeles, for the multimillion-dollar Coto Sport Research Center.

Ariel says Olympic athletes from throughout the world will be tested there. Some other projected services:

- A golfer will be shown how to get 20 more yards off the tee (for \$1,500).
- NFL placekickers will be filmed and computerized. "I will guarantee them 10 more yards," Ariel says.
- Young athletes will be directed into sports most suitable for their natural ability and potential.
- Tennis players will be shown how to deliver a faster serve.

Ariel has personally tested a lot of noted athletes and fed data into his computers. But he also can gather data from ordinary movie films and videotapes. Here are some random Ariel observations, based on his studies of athletes in different sports:

RENALDO NEHEMIAH, high hurdler, pending world record holder — "He could win the gold medal in the 100-meter dash. His hurdle technique really isn't that good. It's not as good as Hayes Jones' or Lee Calhoun's. But he's a tremendous, natural sprinter."

Women's volleyball — "Some of America's best female athletes are volleyball players, on the U.S. national team. Two of them I've tested could be world-class javelin throwers or high-jumpers. As for volleyball, we showed them that as soon as they stop telegraphing their hits at the net, they'll start winning more international matches."

FRANKLIN JACOBS, 7-7 U.S. high jumper — "Look at Jacobs on the screen and what's interesting about him is not his height (5-foot-8), but his knees. He only has 90-degree flexibility in his knees, which means he doesn't have to lock his knee on takeoff. He's driving off a structure, in effect. It's a great advantage to him.

"By the way, the computer shows that the most efficient way of high jumping is to approach the bar straight-on, instead of the side, take off on one foot and go over belly down. Why no jumpers have tried it, I don't know."

U.S. cyclists — “American cyclists we tested were pulling up on the handlebars while driving the pedals down. The Europeans are pushing down on both. That’s why they win and we lose.”

U.S. kayakers — “On the paddle stroke, the maximum force is created on the second half of the stroke. Americans apply too much force at the beginning of the stroke.”

MARTINA NAVRATILOVA — “She has more talent