Ariel Dynamics Inc. Media Library - Video

History of Biomechanics


DAILY HAMPSHIRE GAZETTE

Computer helps design shoe that walks on air

Code	**adi-vid-01176**
Title	History of Biomechanics
Subtitle	Part 5 - The Coto Sports Research Center
Subject	APAS;Biomechanics;History;Performance Analysis;Science;Sports
Duration	00:09:22
URL	https://arielweb.com/videos/play/adi-vid-01176
Date	2009-05-14 00:00:00
Label	Approved
Privacy	Public

Synopsis

The video discusses the journey of a company, Computerized Biomechanical Analysis System, from its inception at the University of Massachusetts to the establishment of the Carter Research Center in California. The company developed several patents, including the Air Shoes, which generated significant royalties. The Carter Research Center, built with a budget of around five million dollars, was equipped with the most advanced sports research equipment of its time.

The center conducted extensive research in biomechanics, the science of motion in relation to biological systems. This involved calculating kinetic parameters or forces acting on the body, using high-speed film photography and digitizers to trace joint centers of athletes. The data was then processed by a computer to calculate forces and understand movement patterns.

The center also developed sophisticated exercise equipment and worked on projects such as testing visual systems, working with archery on force platforms, and analyzing muscle involvement in different racket types. The center had a multi-million dollar contract with Wilson's Sporting Goods and provided training for top athletes.

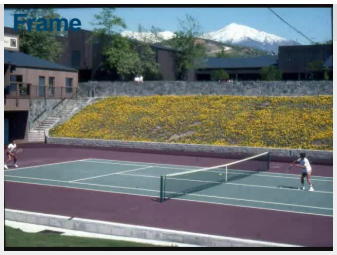
The center was led by psychologist Nick Brayton and computer biomechanics pioneer, Dr. Gideon Ariel. The center's research was instrumental in improving sports performance and equipment design, such as designing better shoes for athletes. The results of their calculations were as factual as gravitational laws, providing valuable insights into the physics of sports.

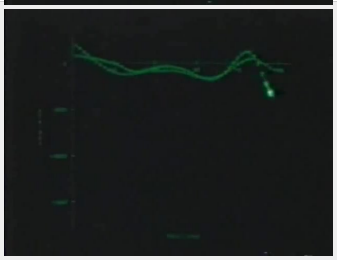
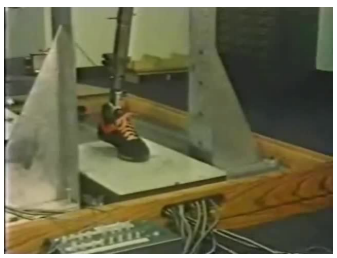
The center also had a significant social impact, fostering interaction between athletes and contributing to the success of teams like the women's volleyball team, which won the silver medal in the 1984 games. The Carter Research Center was a significant milestone in the field of sports science and biomechanics.

Model Id: gpt-4-0613
Created on: 2023-09-19 03:17:36
Processing time: 00:00:24.7870000
Total tokens: 2012

Audio transcription

Frame	#	Time	Spoken text
	0.	00:00:00	*Starting in the University of Massachusetts and creating my company, Computerized Biomechanical Analysis System,*
	1.	00:00:07	*we developed a few patents. One of them was the Air Shoes, which brought us a tremendous amount of royalties,*
	2.	00:00:15	*which enabled us to go to California and start our Green Research Center, which was called the Carter Research Center.*
	3.	00:00:21	*Here it is in construction, and we built it for about one year. We thought it would be two million,*
	4.	00:00:27	*but it came up to about five million dollars of expenses, and here you see the finished product,*
	5.	00:00:32	*the most advanced sport research center in the world with the most modern equipment.*

Frame	#	Time	Spoken text
	6.	00:00:40	*At that time there was no PC at its prior to 1980, and you see it here also we built a big swimming pool for Olympic swimming.*
	7.	00:00:51	*Dr. Anne Penning, myself, planned all the required equipment and the fields.*
	8.	00:00:57	*As you see here, the grid on the tennis courts and the volume calibrations for the Biomechanical Analysis are almost done.*
	9.	00:01:05	*We were taking also firm from the top and from the sides.*
	10.	00:01:10	*Here you say installing the force platforms in front of the center, and you see the multi-million dollar computer that we bought with our royalty money.*
	11.	00:01:20	*In the megatec graphic system, a 3D graphic system, that enabled us and wonderful staff to program it*
	12.	00:01:27	*and create probably the most sophisticated sport science center in the world.*
	13.	00:01:32	*Here are our sophisticated exercise equipment we developed.*
	14.	00:01:35	*Here is a visual system that we tested, and here we are working with the archery on the force platform, including EMG.*
	15.	00:01:45	*Here you see we are working on tennis racket, and you can see the EMG electrodes to see which muscle involved in different racket type.*
	16.	00:01:52	*We have a multi-million dollar contract with Wilson's Sporting Goods.*
	17.	00:01:55	*And the outlets said the benefit out of it, they didn't have to pay, they come here and train against the top.*
	18.	00:02:00	*Here is Ben Plak net world record holder, and they discussed the time exercise.*
	19.	00:02:05	*The women volleyball team, we basically adopted them and they stayed with us for eight years.*
	20.	00:02:10	*We had the cardio vascular equipment, measuring oxygen consumption, and many of them.*
	21.	00:02:16	*Coto de Caza, a coastal valley in ours drive south of Los Angeles, California,*
	22.	00:02:23	*is the home of a unique sports research center, which is headed by psychologist Nick Brayton,*
	23.	00:02:29	*and computer biomechanics pioneer, Dr. Gideon Ariel.*
	24.	00:02:34	*Dr. Ariel, what is biomechanics?*
	25.	00:02:38	*Well, literary, basically it's what the world say. Biomeans life, mechanics mean, the science of motions, the science of stresses.*
	26.	00:02:48	*So what we try to do is actually we combining life with the physical laws that affect in life,*
	27.	00:02:56	*and that's where the world comes biomechanics, the science of motions as related to biological system.*
	28.	00:03:04	*Whatever happened in athletics, how far the shot go, how far the discus go, how far the high jump will go,*
	29.	00:03:11	*it all depends on how much forces were produced to be able the object to move,*
	30.	00:03:16	*and the object could be the human body, or could be a shot, could be a javelin, could be a discus, could be a hammer, could be a frisbee.*
	31.	00:03:23	*We cannot see the forces, but we can calculate the forces.*
	32.	00:03:27	*When we're talking about biomechanics, we're talking about calculations of kinetic parameters or the forces that are acting upon the body.*
	33.	00:03:37	*We're utilizing a high-speed film using photography.*
	34.	00:03:44	*Now, after we develop the film, we can utilize an instrument which is called a digitizer.*
	35.	00:03:50	*You actually see the picture projected on the digitizers.*
	36.	00:03:54	*What we are doing, we're using a sonic pen to trace the joint center of the athlete,*
	37.	00:04:01	*and these joint center locations going right to the computer.*
	38.	00:04:05	*Now, at the past, people did it by hand. It took months and months to do one analysis.*
	39.	00:04:11	*What the computer does, it takes the X and Y coordinates from the digitizers and put it into a memory.*
	40.	00:04:19	*After we did the digitizing process, which takes some time hour, hour and a half, to trace about 100 frames each frame separately,*

Frame	#	Time	Spoken text
	41.	00:04:28	*we can reconstruct the pictures on the screen or the megatec graphic system.*
	42.	00:04:37	*The data of this process by the computer, and it gives us the following in the displacement, how much the joint center moves,*
	43.	00:04:44	*from that we can derive the velocities, or how fast, or the speed of the segments,*
	44.	00:04:50	*from that we can derive the acceleration, and acceleration is very important*
	45.	00:04:54	*because the second Newton law said that force equal to mass times acceleration.*
	46.	00:05:05	*If we know the mass of the different body parts, and if we know the acceleration from this technique, we can calculate the forces.*
	47.	00:05:11	*And what make an athlete move is actually rely on forces, the pattern of the movement, or the acceleration pattern,*
	48.	00:05:19	*in each sequence is critical in understanding of the proper move.*
	49.	00:05:30	*After we interpret the results of the athlete, we might make some changes,*
	50.	00:05:34	*and then two weeks later we retest him again and see if he correct this technique.*
	51.	00:05:44	*This is the non-direct measurement.*
	52.	00:05:47	*The uniqueness in this technique is that it's non-invasive.*
	53.	00:05:51	*We don't touch the athlete while we're taking the film.*
	54.	00:05:53	*That's why the athlete can perform in the Olympic Games or in our Cotto Sport Research Center, and he even doesn't know when we're taking the film,*
	55.	00:06:02	*and then we analyze it.*
	56.	00:06:14	*The direct method consists of a force measurement device that records the forces directly.*
	57.	00:06:19	*It gives us the three orthogonal forces.*
	58.	00:06:22	*This is a direct measurement. It's very important, for example, for a runner.*
	59.	00:06:25	*How much shock it transferring to his body?*
	60.	00:06:28	*For example, comparison between shoes can reveal to us immediately the data if there is any difference in force transmission to the body.*
	61.	00:06:36	*Also, how can we construct better shoes?*
	62.	00:06:39	*Or how can we design shoes for particular athlete so you can perform in the Olympic Games better?*
	63.	00:06:46	*Dr. Ariel, how factual are the results of your calculations?*
	64.	00:06:51	*Well, it's as factual as gravitational laws.*
	65.	00:06:55	*It's like when somebody said that I left the shot put and it fell down.*
	66.	00:07:01	*Very seldom am I here. Somebody said I left the shot put and it fell up.*
	67.	00:07:05	*It's a physical loss. It cannot fall up unless you are in the moon.*
	68.	00:07:10	*So if we're finding out that there is some kind of linkage here that translates momentum from one segment to the other,*
	69.	00:07:17	*it couldn't be. It will be any different.*
	70.	00:07:20	*Also, I used to tell the shot put a shot put a shot put a shot put a shot put a shot.*
	71.	00:07:22	*But what about the psychology? I said, well, I don't know yet the shot put it through the shot.*
	72.	00:07:27	*The shot just left the hand and then it concentrate and sun is zoomed when five feet farther.*
	73.	00:07:33	*I never saw it. If it ever happened, it always happened when it was still in contact with the fingers*

Frame	#	Time	Spoken text
	74.	00:07:39	*and when the forces were transmitted through the dynamic link into the shot from the hand.*
	75.	00:07:45	*All this concentration and all this shouting and all this jumping after the shot left the hand.*
	76.	00:07:50	*This is just in person on the audience.*
	77.	00:07:53	*The shot is going to land where it's supposed to land.*
	78.	00:08:00	*So in order to summarize the whole system, utilizing the mega deck graphic system, the data general computer, the talus digitizing system,*
	79.	00:08:09	*we can bring outlets to our call to sport research center, running analysis on them the first two days,*
	80.	00:08:15	*run for two more weeks of training, retest them, see the changes, recorrect them again and later in two weeks again*
	81.	00:08:23	*we follow up with another analysis and I am assure you we will have progress.*
	82.	00:08:39	*The women volleyball team got the silver medal in 84 games.*
	83.	00:08:43	*We had the drawers here and other events here as Brian Oldfield.*
	84.	00:08:47	*We had a fantastic social interaction between all the athletes and you see here Danny Sauer with the computerized access machine*
	85.	00:08:55	*with Ben Plaknet on the bench here as a Mike Powell, former world record holder and Brian Oldfield.*
	86.	00:09:01	*They would be here all the time.*
	87.	00:09:03	*Brian Oldfield tried to overcome the particular force and we had a fantastic social interaction, fantastic dinners*
	88.	00:09:12	*and the Koto research center was the light bright of my life to be continuing the next episode.*

This PDF-document has been auto-generated from a video file by arielweb-ai-bot v1.2.2023.0926 on 2023-09-28 03:44:51 without human intervention. In case of errors or omissions please contact our aibot directly at ai@macrosport.com.

Video filename: **adi-vid-01176-history-of-biomechanics-1024kbps.mp4**