# Chapter 4.3
# Virtual Reality Simulation in Human Applied Kinetics and Ergo Physiology

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## ABSTRACT

Virtual reality is today an excellent tool for a full simulated experience in a modern environment where any researcher or any individual scientist may work with vital experimental environments or use parameters that sometimes does not really exist. It is already a vital step for the future of science and for the modern experiment. Ergo physiology today has many applications for research. We can find new unknown parameters for the human body searching biokinetics and ergo physiology, and it is time to use modern technologies and applications. The vital issues discussed in this chapter may offer many applications for human kinetics and movement and may also discuss biokinetics research using the physical laws and parameters in various biokinetics and physiology fields.

## INTRODUCTION

Virtual reality is today an important part of modern scientific methodology and research, using modern high-speed computers of lately designed technologies for research and simulation in various scientific fields such as ergo physiology and biokinetics. This is a new field in contemporary science, methodology, and experimentation, and we can recognize that during the past years, it has continued with great success. An important field using this new way of research is the simulation of human movement in ergo physiology and applied biokinetics science. Virtual reality is very useful for researchers in these fields because they can have simulations of the physical human body at any time they want for study or experimentation.

## BACKGROUND

One of the first authors who wrote about virtual reality was Howard Rheingold (1991), who wrote about data visualization and 3-D CAD (computer-aided design) in which someone may use his or her hands and fingers. Many applications can be found from the middle war period by the U.S. Air Force to create flying simulations.

Myron Krueger, during the '60s, worked on the affiliation of human and computer with special research in computer-controlled responsive environments, which were named by him artificial reality (Krueger, 1993). He also designed the video place, a system that contains a projection screen and a video camera that is controlled by a computer. By this method, human movements in each activity are transferred to computer graphics in software (Boudouridis, 1994).

So, there can be a connection between human and technical things in space with computer graphics. This was one of the first methodologies in human-kinetics research and applications.

Tom Furness was another scientist who designed the Super Cockpit for the U.S. Air Force after many years of research. In a small place, a human could use computers and a HMD (head-mounted display) to understand vital secrets of the flight without any danger (Furness, 1991).

But the man who is the father of the terms virtual reality and reality engine is Jaron Lanier, an informatics scientist who, with another young man named Tom Zimmerman, established the Visual Programming Language Research Inc in 1980 (Boudouridis, 1994). This company was the first to make important tools for virtual reality programs and applications, such as data gloves and HMDs.

## ISSUES

In the beginning, many other scientists worked with computer data for virtual reality applications in various fields with very big success.

Today, there are many different fields and applications of virtual reality technology. Table 1 summarizes some of the virtual reality applications similar to those of ergo physiology.

Especially in the fields of ergo physiology and biokinetics, virtual reality is used in many applications. Some of the characteristics of human movement, the human body, and parameters such as space, geometry, color, and sound may help virtual reality programs become more effective in various methodologies of research and virtual applications.

The importance of this is to find a methodology for using virtual reality and a way to recognize the results, such as some of the official physiology results that can give to researchers many new discoveries in existing science and theory, or future science research in finding new signals from the human body during simulations.

Today we have all the modern technology to make better simulations for the human body and to see new fields that had not previously existed. This is, of course, the future of research.

For example, it is not possible for anyone to fly at high speeds without any danger so that scientists can see the behavior of the human body or parameters such as blood pressure, the behavior of the heart, muscle energy, signals or other problems in the eyes, and so forth. But with virtual reality simulations, we can today register

*Table 1. Summary of the virtual reality applications similar to those in ergo physiology fields*

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| • Human behavior in flying simulations |
| • Human behavior in space simulations |
| • Learning and human-movement programs in kinetics |
| • Neurodisease science |
| • Rehabilitation |
| • Physical behavior in space |
| • Step-correction learning and research |
| • Adapted methodologies in kinetics |
| • Special gymnastics programs |
| • Study of the human senses and their characteristics |
| • Pain confrontment |
| • Continuing education |