

## **MotoVate Rehabilitation System**

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Formerly known as the BioRehab System, Motovate is a package system designed and produced by Enhanced Mobility Technologies of Roseville, MN, in collaboration with the Institute for Interventional Informatics in Syracuse, NY. It is a rehabilitation product that allows the patient to undergo therapeutic muscle stimulation by using muscle activity as a means of controlling a video game. The components of Motovate include one hundred electromyography sensors, a four channel EMG device, a dedicated personal computer, and all necessary software.

Electromyography is used to measure the electrical activity of specified muscles or muscle groups.

The sensors used are skin-mounted surface pads, although intramuscularly placed probes are used for other applications of electromyography requiring greater precision. The process relies on biofeedback, broadly described as any procedure intended to improve a person's ability to control their body's functions and processes. This concept is utilized by the MotoVate system to treat victims of stroke, cerebral palsy, and anyone with an injury to the brain or spinal cord by teaching the patient how to better control their muscles and mobility.

There are several advantages of this system over more traditional rehabilitation methods. First, MotoVate can allow increased performance of patients who had "plateaued" using traditional rehabilitation techniques. The system is also easily customized to the patients' specific needs and abilities. In addition, MotoVate can detect minute muscle movements that are otherwise unnoticed by either the patient or the therapist, and the game can be customized to respond to different magnitudes of movement. The patient and therapist receive immediate feedback, which can increase motivation and confidence. The system requires the patient

to control both agonistic and antagonistic muscles in order to operate the game properly, improving coordination and balance. The patient tends to be more motivated and involved in the therapy process when the treatment is a game, instead of repetitive tasks, and neither the patient nor the therapist need to be skilled in computer use to operate MotoVate. The patients typically see good results from using the system for just an hour to an hour and a half per week, the recommended therapy time by the manufacturer.

MotoVate has been used in the treatment of thousands of patients since it has been released. The overall results have been very positive. Patients have shown greatly increased strength, speed, coordination, endurance and balance. Users have also been able to improve their abilities even after traditional methods have stopped producing increased results.

MotoVate is FDA approved, covered by Medicare and most insurance policies, and was awarded "Best of Show" at the Partnerships for Health in the New Millennium Technology Games in January 2000.

### References:

- [www.biorehab.com](http://www.biorehab.com) MotoVate System Home Page
- [www.aapb.org/public/articles/details.cfm?id=4](http://www.aapb.org/public/articles/details.cfm?id=4) Association for Applied Psychophysiology and Biofeedback
- [www.cdc.gov/niosh/91-100.html](http://www.cdc.gov/niosh/91-100.html) NIOSH: Selected Topics in Surface Electromyography "New form of therapy spurs the brain to rewire itself", Josephine Marcotty, 29 December 1999, Star Tribune, Minneapolis-St. Paul
- "Estimation and Application of EMG Amplitude During Dynamic Contractions: Processing Nonstationary EMG for Applications in Prosthesis Control, Biofeedback, and Joint Torque Estimation", Clancy, Bouchard, and Rancourt, IEEE Engineering in Medicine and Biology, Volume 20 Number 6, November/December 2001