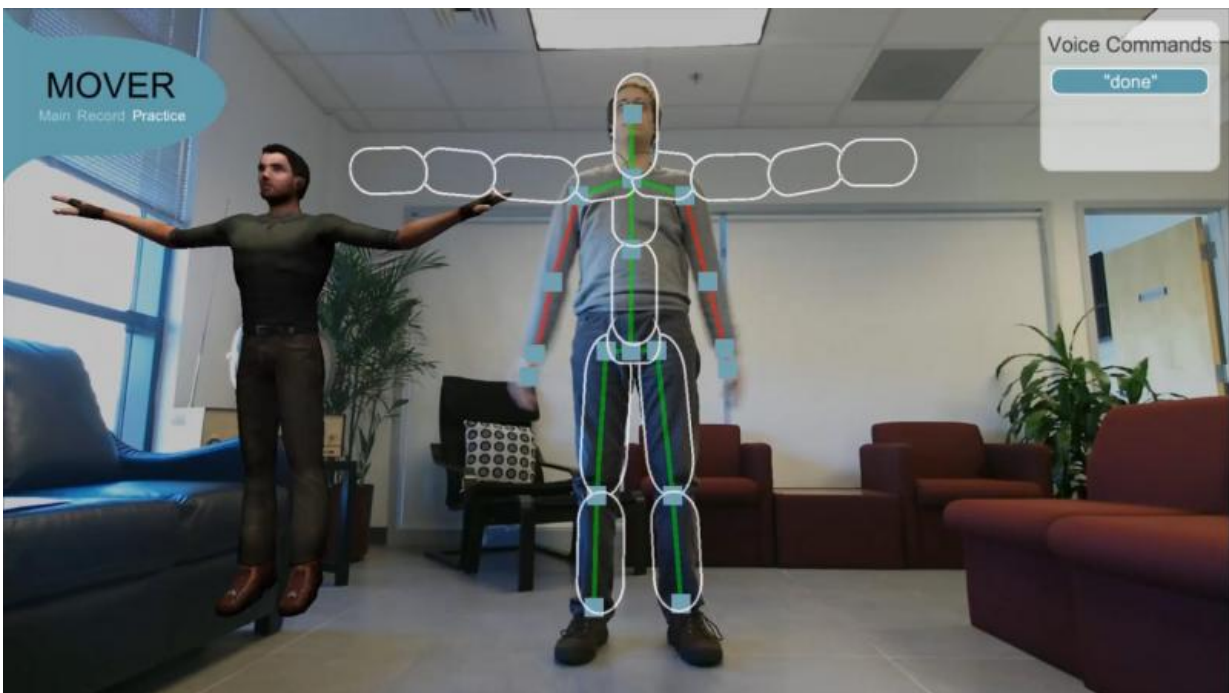


# MOVER technology: Improving therapy for brain injury patients

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An ONR-supported researcher (right) tests the Mobile, Virtual Enhancements for Rehabilitation (MOVER) software system. MOVER provides traumatic brain injury patients with a way to engage in virtual physical therapy regimens at home. Credit: Charles River Analytics Inc.

For warfighters recovering from traumatic brain injuries (TBI), the benefits of home-based, outpatient physical rehabilitation programs are numerous—they can exercise at home on their own schedules, be among

family and friends and spend less time in treatment facilities. Regular physical therapy can keep tendons and joints flexible, maintain bodily strength and improve balance and walking ability.

Unfortunately, because of confusion about exercises, forgetfulness or feelings of helplessness, many TBI patients don't perform their independent therapy—or they do it improperly. Consequently, they don't make steady progress toward a full recovery, and even risk further injury.

To provide patients with a safe, engaging and easy way to maintain their therapy regimens, the Office of Naval Research (ONR) is supporting efforts to develop the Mobile, Virtual Enhancements for Rehabilitation (MOVER).

"This type of technology is crucial to ensuring our warfighters are well taken care of in the defense of our freedoms," said Chief of Naval Research Rear Adm. Mat Winter. "Our advanced research efforts in health, fitness, resilience and medical recovery of our Sailors and Marines are among the most important aspects of ONR's mission."

MOVER is a software system that can be installed on any laptop or PC equipped with a camera function. When operating MOVER, a user just turns on the computer and camera, stands still and the software maps out a virtual "skeleton" on screen. This skeleton consists of brightly colored lines and shapes—mirroring the person's movements through each therapy exercise. To increase screen visibility, users can connect MOVER to a television with a Microsoft Kinect sensor.

During workout sessions, users receive coaching in the form of pop-up text boxes or color shading in a certain area of the virtual skeleton. For example, if someone is leaning too far right, a colored shape will appear on the left side of the screen, highlighting where and how to correct.

"Eventually, we want to improve the virtual coaching so it provides commands and encouragement to users vocally and they in turn can respond back," said Dr. James Niehaus, a scientist at Charles River Analytics Inc., the lead company working with ONR to develop the MOVER software. He also hopes to one day create a mobile app that would enable smartphones to alert users about workout times without the need to set an alarm manually.

"There are times when you don't feel motivated to work out," said Lt. Cmdr. Brent Olde, a program officer in the Human and Bio-Engineered Systems division of ONR's Warfighter Performance Department. "You also risk hurting yourself by exercising incorrectly. That applies to everyone, healthy or not. Now imagine how much harder it is for someone with a brain injury. They may need help, which is where MOVER comes in."

Potential MOVER users would be approved by their physical therapists according to individual capability and mobility, tech savviness and even video game experience. The exercises featured in the software are standard for TBI therapy, including lunges, knee raises and squats. Patients would meet with their therapists at the beginning of a week to design a customized weekly exercise schedule and review their progress, which is tracked by MOVER.

MOVER so far has been successfully tested by researchers. Later this year, Niehaus will launch a six-month, on-site pilot study of the software among nearly 40 TBI patients and therapists at Boston-based Spaulding Rehabilitation Hospital. If that goes well, he might initiate a home-based outpatient test study among other participants.

The MOVER work aligns with the Naval S&T Strategy, which emphasizes health and resilience as key components of warfighter performance. Last year, ONR hosted a Focus Area Forum to discuss

how science and technology can improve warfighter performance and resilience.

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