

Virtual reality for motor rehabilitation of the shoulder

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Researchers at Universidad Carlos III de Madrid (UC3M) have developed a virtual reality system for motor rehabilitation of the shoulder. The prototype, which includes a built-in movement sensor, allows the user to do controlled exercises as part of a football game.

The system is made up of software developed in the motor of a multiplatform videogame (Unity) combined with two novel technologies: Intel RealSense, a movement sensor that was recently launched for developers, and Oculus Rift DK2 virtual reality goggles, through which users can see the program and check which movements they are performing.

"The objective is to rehabilitate the shoulder using [virtual reality](#)," explains one of the researchers, Alejandro Baldominos, of UC3M's Computer Science department. He presented this advance in the journal *Procedia Computer Science* and, more recently, at an International scientific congress on the application of new technologies in the area of healthcare, the HCist, which was held in Portugal in October 2015.

This first prototype focuses on two movements: the adduction and abduction of the shoulder (raise and lower the arms forming a "T" with the body). "The patients act as goalkeepers in a football match and they have to stop the balls that are kicked, so they have to make exact movements," explains Alejandro Baldominos. "To help maintain the correct position in each save, the patients see the reflection of their hand (with the rest of the arm hidden), which improves the effect of the

proprioception, which is the sense that tells the body what position the muscles are in," he adds.

This first version of the prototype was developed for use in rehabilitation centers, so that a physical therapist can supervise the results of the exercises that the patients have done, point out the researchers. In addition, they estimate that, with this system, they will be able to reduce rehabilitation time by 20 minutes per day.

"An evaluation was done working with physical therapists and the feedback was very positive. Everyone felt that their patients improved the mobility of the [shoulder joint](#), increased their muscle mass and recovered strength," claim the researchers, although they clarify that this is still only a prototype which will require more work before a commercial product can be produced. The future challenges of this line of research, started through an undergraduate degree final project by Carlos Aguado in the Grupo de Computación Evolutiva y Redes Neuronales (EVANNAI- Evolutionary Computation and Neural Networks Group) at UC3M, include carrying out clinical trials using this technology, in addition to developing programs that help rehabilitate the other four movement of the shoulder: flexing, extension, internal rotation and external rotation. "And perhaps even create more games to rehabilitate other parts of the body," concludes Baldominos.

More information: Alejandro Baldominos et al. An Approach to Physical Rehabilitation Using State-of-the-art Virtual Reality and Motion Tracking Technologies, *Procedia Computer Science* (2015). [DOI: 10.1016/j.procs.2015.08.457](https://doi.org/10.1016/j.procs.2015.08.457)

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