



## Editorial

# Using Information and Communication Technologies to Enhance Patient Rehabilitation Research Techniques

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## Introduction

Physical rehabilitation is generally perceived as a face-to-face interaction between therapist and patient. However, thanks to technology developments, this picture has been changed. The massive innovation of information and communication technologies (ICTs) has brought a revolution to the view of health, people, and work.<sup>1</sup> Especially, the application of virtual reality (VR) and augmented reality (AR) has given an important contribution to health. Lastly, a growing number of studies have shown important implications of the use of ICTs, VR, and AR for treating several disorders and promotion of healthy lifestyles or well-being. Initially, most of these studies have focused on treating anxiety disorders,<sup>1</sup> phobias (e.g., specific phobias, social phobia, and agoraphobia),<sup>2</sup> posttraumatic stress disorder (PTSD),<sup>3</sup> attention deficit disorder,<sup>4</sup> eating disorder,<sup>5</sup> the reduction in stress,<sup>6</sup> and posttraumatic stress disorders in patients with limbs amputation<sup>7</sup> among others. In all these studies, the use of these ICTs has supported doctors and researchers to reach the best results for patients. Thanks to the technological advances, it is possible to reproduce virtual environment where people can move as they are in the real world or having some mobile applications which can enlarge the world around us and facing specific phobia. But for professionals, it is not always an easy work because the use of ICTs usually implies that psychologists have to open their mind and cowork with engineers and other professionals who have different backgrounds.

## Selected Papers

Five papers were selected, after a double-blind peer review process, presented at the REHAB-Workshop, celebrated in Popayán-Colombia.<sup>8</sup> Next, there is a brief description of the different papers:

### A Systematic Review of the Effectiveness of Telerehabilitation Interventions in the Elderly

Velayati et al<sup>9</sup> have done a review of the effectiveness of telerehabilitation interventions in the elderly. Chronic health conditions of the elderly and mobility limitations usually affect providing them with traditional rehabilitation services, in that way, telerehabilitation can be a good option for delivering healthcare services to this group of patients. The results obtained indicated that a wide range of simple and complex telerehabilitation interventions were used and compared with traditional rehabilitation methods in the elderly. While telerehabilitation interventions were found to be more effective than traditional approaches in improving some outcomes, no significant difference was found between these two methods in improving many other outcomes. Obviously, the effectiveness of telerehabilitation might be related to various factors, such as the type of telerehabilitation system, ease of use, and motivation for using the technology. However, it seems that evidence for the effectiveness of telerehabilitation is quite limited.

### Design of a Low-Cost, Wearable Device for Kinematic Analysis in Physical Therapy Settings

The findings of this article by Hua et al<sup>10</sup> establish the value of providing physical therapy patients with at-home kinematic analysis. Despite the amount of knowledge generally needed to interpret kinematic data, participants were able to understand kinematic data and its potential value as a virtual coach. These findings can be used as a guide toward developing wearable devices in physical therapy settings and facilitating information to users in a simple manner. This manuscript is a part of a larger study that also explored the validity of the device and classifying exercises using kinematic data from the device. The device allows researchers to collect new metrics of home

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exercise that was previously difficult to obtain such as quality and quantity of exercise.

### Usability Evaluation of a Distributed User Interface Application for Visuomotor Organization Assessment

The article by Cuerda et al<sup>11</sup> describes the development and evaluation of a smart tool to assist therapists in the assessment of acquired brain injury. The tool is a digitalization of the subtest pegboard construction inside the traditional Loewenstein Occupational Therapy Cognitive Assessment (LOTCA) battery. This application allows therapists to evaluate the acquired brain injury. This application allows the patient to perform the test on a touch screen, while the therapist can observe the results of the test in real time on a separated monitor, instead of using traditional methodologies based on physical elements.

### Health-Enabling Technologies for Telerehabilitation of the Shoulder: A Feasibility and User Acceptance Study

The article by Steiner et al<sup>12</sup> describes the development of a telerehabilitation system “acronym blinded”-P2 in close cooperation with physical therapists. It provides automated real-time feedback, as well as time-delayed feedback, from physical therapists. In contrast to traditional unsupervised home exercise programs, “acronym blinded”-P2 enables patients to continue their rehabilitation exercises with tele therapeutic support. The results of this study have shown that health-enabling technology supported home-based exercise programs are feasible.

### Advantages and Limitations of Leap Motion from a Developers, Physical Therapists, and Patients Perspective

Gamboa et al<sup>13</sup> have identified the advantages and limitations of using leap motion (LM) for physical rehabilitation exergames (PREGs). They have conducted a qualitative study including the perspectives of a group of developers, physical therapy experts, and patients. Their study could be used as guidelines for developers and therapists during the development and use of PREGs targeted at hands and fingers, guiding the decisionmaking during feasibility analysis and design stages.

## Conclusion

ICTs are important issue in the rehabilitation process. However, their implementation is not an easy task; it requires understanding of different scenarios to provide the better technology. Within this focus theme, a set of important papers have been presented, analyzing and discussing the main advantages of ICT and rehabilitation, and depicting how solutions in different environments have been implemented in a successful manner.

### Conflict of Interest

None declared.

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