



ICTE 2016, December 2016, Riga, Latvia

## A review of Telerehabilitation Solutions for Balance Disorders

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### Abstract

In the last few years, there has been an increase in telerehabilitation research that shows a large variability in terms of technical solutions, methodological approaches, intervention protocols, and outcome measures. This paper provides an overview of the current literature on telerehabilitation solutions for balance disorders.

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Peer-review under responsibility of organizing committee of the scientific committee of the international conference; ICTE 2016

*Keywords:* Telerehabilitation; Telerehabilitation literature review; Balance disorders; Balance disorder treatments

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### 1. Introduction

Information and Communication Technology (ICT) is changing people's daily lives, the way they work, buy, sell, and learn, and also the way in which services are run in the healthcare sector.

The aim of telerehabilitation is to provide rehabilitation services at a distance to help people to regain their psycho-physical functions through the use of new technologies<sup>1,2</sup>. The scope of telerehabilitation is vast, since it faces challenges related to both medical and community care settings<sup>3</sup>. In the last few years, research has demonstrated the potential for improving telerehabilitation processes based not only on mobile technologies and the Internet in general, but also on virtual reality.

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### 1.1. Different forms of telerehabilitation

Generally, two different forms of rehabilitation can be distinguished: *medical* and *social*, or, in the latter case, also referred to as *vocational*. Both these forms are aimed at developing the functional and psychological abilities of the individual and, if necessary, his/her compensatory mechanisms, in order to enable him/her to attain self-dependence and lead an active life. The main difference between medical and social telerehabilitation lies in the fact that medical telerehabilitation is more focused on curative medicine, and involves intensively trained clinicians and different health professionals, particularly physiotherapists, whilst social telerehabilitation focuses more on the individuals' social sphere, and includes services such as rehabilitative nursing, occupational therapy, speech and language therapy, audiology, dietetics, prosthetics and orthotics, podiatry, art therapy, music therapy, and social work.

However, due to the diffusion of community-based telerehabilitation practices, it is not always possible to trace a line of demarcation between medical and social telerehabilitation, and sometimes there is an overlapping relation between them. An interesting case of overlapping concerns balance disorders.

## 2. Balance disorder

A balance disorder is a disturbance that causes a feeling of unsteadiness, or a sensation of movement, spinning, or floating when an individual is standing or walking<sup>4</sup>. When balance is impaired, an individual has difficulty maintaining orientation, and experiences:

- A sensation of dizziness or vertigo
- Falling or a feeling of falling
- Light-headedness or feeling woozy
- Visual blurring
- Disorientation

The main causes of a balance disorder are:

- Infections (viral or bacterial)
- Head injury
- Disorders of blood circulation affecting the inner ear or brain
- Stroke and multiple sclerosis
- Eye muscle imbalance
- Arthritis

Individual treatments can vary, and are based upon symptoms, medical history, general health, examination by a physician, and the results of medical tests.

Treatments often include balance-retraining exercises (vestibular rehabilitation) that entail specific movements of the head and body. Telerehabilitation can be useful for early diagnosis of balance disturbance, patient monitoring, and controlling training exercises.

Balance exercises are specifically prescribed for patients who have had a stroke. It should be noted that stroke rehabilitation includes integrating treatments performed by physiotherapists, occupational therapists, speech therapists, dieticians, psychologists, specialist nurses, and doctors.

Accordingly, balance exercises are to be integrated into an articulated medical and social telerehabilitation program, in which social support is claimed to be important in emotional, instrumental, and informational spheres<sup>5</sup>.

## 3. Research method

The aim of our research, which forms part of the VPP INOSCTEREHI scientific program, was to collect ICT-based solutions and best practices experimented in the wide-ranging and varied area of balance disorder treatments.

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