

Chapter 32

Effective Game use in Neurorehabilitation: User-Centered Perspectives

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ABSTRACT

Games possess highly favourable attributes to bring to the field of neurorehabilitation by means of providing motivation and goal-directed exercise tasks. For the use of games to be effectively integrated in the commercial and clinical rehabilitation marketplace, it is necessary that a unified and comprehensive rehabilitation gaming platform be developed following principles of user-centered design. The needed platform must contain compatible modules for the planning and execution of treatment as well as progress assessment, and its development must take into consideration the needs and viewpoints of the involved stakeholders and the required supporting factors, including: patient, prescriber, therapist, care-provider, family, clinic, as well as supporting scientific evidence, technology, and policy. A proposed platform and needed components are explained and an example prototype rehabilitation platform is provided for discussion.

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INTRODUCTION

The use of computer games in rehabilitation has increased substantially over the past decade. In particular, games applied in the field of neurorehabilitation are helping to improve the process of motor learning and recovery from incidents of stroke, traumatic brain injury, and other neuromuscular impairment by increasing user motivation during training. Now that a number of devices for upper limb rehabilitation have been introduced, offering the ability to train specific arm movements at high intensities and longer durations, it becomes apparent that maintaining patient interest and preventing abandonment over such durations can be challenging.

Through the combination of engaging games coupled with functionally-oriented training tasks, neurorehabilitation training programs offer a potential for increasing patient motivation as well as increased accessibility and duration of therapy sessions. Games used for this purpose are typically referred to as “serious games”. Unlike traditional computer games, whose main purpose is entertainment, serious games are designed with the intent of being used for education or training. However, while serious games are often thought of as less “entertaining” than games designed for pure recreational play, it is important to note that this is not a prerequisite, and in fact serious games should be designed in such a way as to maximize user motivation for play. In the use of serious games, particularly for neurorehabilitation, the motivational aspect of the game is as important as the learning aspect of the game since without motivation, participation diminishes rapidly.

In the diversely growing field of neurorehabilitation, it is recognized that serious games represent a powerful tool to increase participation and adherence to a multitude of training programs. Although the learning improvement thought to be achieved through educational games is still a matter of debate, gaming has become of steadily increasing interest for health care systems worldwide and is

on its way to becoming a fundamental component of standard neurorehabilitation practice. Despite this trend, it is clear that for better integration of gaming in the field of neurorehabilitation, an in-depth user-centered design approach is necessary.

In the current practice of neurorehabilitation, progressive clinics use a multidisciplinary approach where a team of specialists collaborate in assessing and treating the patient in a holistic way, taking into account physical, psychological, emotional, and cognitive dysfunction. It is a complex process involving coordination between medical doctors, physical therapists, occupational therapists, psychologists, patients, and patient family members. As a result, for a given therapy to be successfully prescribed, executed, and followed, it must satisfy the needs of all users involved in the process. In this case, users include all relevant stakeholders from insurance and medical institutions to therapeutic and patient users. In deploying a technology inside such an integrated system, it would be a grave mistake to consider the patient as the only end user, and would likely compromise the success of the technology.

The potential impact of a user-centered approach is especially valid for the area of motor rehabilitation, where there is a growing need for methods to treat increasingly larger patient populations, in part as a result of an increased aging population, and therefore increased absolute incidence of stroke. At the same time, therapists have expressed a need for improved means of quantitative assessment. Both of these aspects are currently being addressed through advances in rehabilitation robotics, where robotic systems assist the therapist in guiding and correcting patient movements. However, while the devices themselves provide increased treatment availability, intensity of therapy, repeatability, and quantitative measures, they have yet to be integrated with a comprehensive platform for planning, executing, and assessing therapy session. This lack represents a current and significant gap in rehabilitation technology. It is believed that

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