Mobile Virtual Reality to Enhance Subjective Well-Being

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INTRODUCTION

Focusing on health-care, in the last few decades advanced technologies have become crucial keys in supporting subjective well-being (Botella et al., 2012; Riva et al., 2012). Among them, Virtual Reality (VR) - defined as three-dimensional, stereoscopic, interactive computer graphics — has been proven effective in promoting mental health at different levels. In particular, several research studies showed the efficacy of VR in stress management (Gaggioli et al., 2014; Pallavicini et al., 2013; Rizzo et al., 2012; Serino et al., 2014) and in the treatment of different disorders; these include phobias (Parsons & Rizzo, 2008; Rothbaum et al., 1995), anxiety (Meyerbröker & Emmelkamp, 2010, 2011; Pallavicini et al., 2009) and eating disorders (Ferrer-García et al., 2009; Riva, 2005). This technology is also adopted in neuropsychology, for both the assessment and training of cognitive processes (Cipresso et al., 2014; Fordell et al., 2011; Raspelli et al., 2012).

Although the dramatic development in the field of VR systems, there are still important problems related to the use of this technology (Pallavicini et al., 2015; Proffitt & Lange, 2015). First, from a technological point of view, VR are not so easy to be used, requiring a specific training for the clinician and the patient. Secondly, from a clinical perspective, these technologies are not easy to be moved at patients' home, where the delivery of interactive exercises may be useful, especially when patients are provided with a rehabilitative training (Pallavicini et al., 2015).

Within this perspective, the growing availability, low-cost and easy-to-use of Mobile Virtual Reality (MVR) (i.e., the integration of VR system on mobile devices such as smartphone and tablet) represents a meaningful opportunity to support mental health interventions (Gaggioli et al., 2014; Gorini et al., 2010; Pallavicini et al., 2009). MVR, in particular, can offer to the community an innovative tool for the management, monitoring and delivery of exercises, that can

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also be used in individuals 'favorite environment', their home (Pallavicini et al., 2015; Tong et al., 2015; Schroeder et al., 2013).

The present chapter will first briefly describe MVR, highlighting the specific features that characterize it. Then, a MVR design practice will be presented. In conclusion, the current application of MVR to enhance subjective well-being will be discussed, with the support of concrete examples and research studies-analysis.

BACKGROUND

VR is a high-end user-computer interface that involves real-time simulation and interactions through multiple sensorial channels (Burdea & Coiffet, 2003). Although many authors have defined VR essentially as a technology (Heim, 1998), more recent approaches (Riva et al., 2007) forward a more complex vision, considering VR as a human experience and underlining how "the essence of VR is the inclusive relationship between the participant and the virtual environment" (Fitzgerald & Riva, 2001).

VR can be presented in at least five ways:

- **Fully Immersive VR:** It consists of 3D simulation that allow participants to observe and interact with an environment through an available set of actions. With this type of solution, the user appears to be fully inserted in the computer-generated environment. This illusion is rendered by providing a Head Mounted Display (HMD) with 3D viewing and a system of head tracking, to guarantee the exact correspondence and coordination of user's movements with the feedbacks of the environment;
- **Desktop VR:** It consists of computer-generated environments, which exist in 3D (even if they are shown on a 2D display). It uses a computer monitor as display to provide graphical interface for users. It is cost-effective when compared to the immersive VR as it does not require any expensive hardware and software and is relatively easy to develop. Interaction with the interface can be made via mouse, joystick or typical VR peripherals such as Dataglove;
- **Augmented Reality:** The user's view of the world is supplemented with virtual objects, usually to provide information about the real environment;
- **Mixed Reality:** Sometimes referred to as hybrid reality, refers to the merging of real and virtual worlds to produce new environments and visualizations where physical and digital objects co-exist and interact in real time;
- **CAVE:** The term stands for CAVE Automatic Virtual Environment and takes the form of a small room where a computer-generated world is projected on the walls. The projection is made on both front and sidewalls. This solution is particularly suitable for collective VR experience because it allows different people to share the same experience at the same time;
- **Telepresence:** Users can influence and operate in a world that is real but in a different location. The users can observe the current situation with remote cameras and achieve actions via robotic and electronic arms.

From about 2007, the year in which Apple presented the first model of iPhone and the mobile industry significantly changed - thanks to the new possibilities offered by smartphone and tablet to integrate VR, MVR has been risen.

MVR can be defined as "the integration of VR environments on mobile devices" (Pallavicini et al., 2015), and it can be divided into two subcategories based on its technical features:

- **Screen MVR:** It uses the mobile screen as display to provide 3D virtual environments, even if they are shown on a 2D display;
- **Immersive MVR:** The user is completely immersed in the computer-generated en-