mSinaptiks: An eHealth platform for Virtual and Augmented Reality mobile applications

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Abstract. The rapid growth of the Information and Communication Technologies over the past decade changed the ways in which people communicate, relate and live. The health field is not an exception to the 21st century trends, and emerging technologies such as Virtual Reality (VR) and Augmented Reality (AR) have started to play a central role for health professionals. However, most of the current VR and AR applications have prohibitive costs and a variety of interfaces and tools. This has limited the impact and the implementation of these technologies in health settings.

mSinaptiks is the first eHealth platform in integrating, under a common interface, a variety of immersive VR and AR applications for the prevention, evaluation, treatment and tracking of disabling illnesses and psychological disorders. In addition, the platform integrates apps for education and professional training. mSinaptiks allows health practitioners to benefit from affordable and easy-to-use mobile-based apps to improve the quality of life of their patients.

Keywords: eHealth, Virtual Reality, Augmented Reality, Treatment, Assessment, Trainning

1. INTRODUCTION

Over the past decade, rapid and far-reaching technological advances have significantly changed the way people communicate, relate and live. Technological devices and applications that were hardly used some years ago (or even not exist) are already part of our daily life. This is given the way to the Information and Communication Society (Bradley, 2000), characterized by an extensive use of the Internet, computers and mobile phones in almost every human activity.

The health field is not an exception to the 21st century trends, and ICTs have started to become common tools for diagnosis, prevention, therapy, education and training. In particular, emerging technologies such as Virtual Reality (VR), Augmented Reality (AR) and mobile devices are starting to play a central role for health professionals (Botella & Bretón-Lopez, 2014) due its potential to improve the efficacy and efficiency

of traditional healthcare processes.

Recent research provides evidence on the clinical efficacy of VR and AR in the treatment a number of anxiety disorders (Gerardi, Cukor, Difede, Rizzo, & Rothbaum, 2010; Meyerbroker & Emmelkamp, 2010; Opris, Pintea, García-Palacios, Botella, Szamosköki, David, 2012; Parsons & Rizzo, 2008; Powers & Emmelkamp, 2008; Turner & Casey, 2014), eating disorders (Riva, Bacchetta, Baruffi, & Molinari, 2002; Riva, Manzoni, Villani, Gaggioli, & Molinari, 2008), addictions (Hone-Blanchet, Wensing & Fecteau, 2014), sexual dysfunctions (Optale, Marin, Pastore, Nasta & Pianon, 2003) or pain management (García-Palacios et al., 2015). In addition, VR and AR have been used as effective tools for cognitive and motor rehabilitation (Turolla et al., 2013). However, despite these positive results, their implementation in clinical settings is still sparse and limited. This is due, at least in part, to the prohibitive costs associated with using these technologies and to the high amount of existing applications. In fact, each application has a specific interface and uses different tools. As a consequence, the practitioner must acquire a variety of artifacts and needs to be highly familiarized with the specific features of each application. These issues have limited the impact and the implementation of VR, AR and related technologies in health settings.

That is way Sinaptiks has developed mSinaptiks, the first eHealth platform that integrates a variety of medical and health apps in a single interface. The platform allows health practitioners to use affordable and easy-to-use mobile-based apps to improve the quality of life of their patients.

2. SINAPTIKS

Sinaptiks is the developer of mobile-based applications that uses the most emerging technologies to improve traditional healthcare processes. The company designs, creates and validates VR and AR applications for different stakeholders, including institutions, associations, practitioners and patients. The solutions developed by Sinaptiks are mainly directed to clinics, hospitals, practitioners and social and health institutions (table 1).

Field	Objectives
Medical	Improve information management and healthcare decision-making. Create closer links between practitioners and patients.
Health	Improve health-related quality *of* life *and* well *being* of individuals affected by disabling illnesses and conditions. Empower the patients and promote self-health management.
Mental Health	Evaluation, prevention, tracking and treatment of psychological disorders. Enhance treatment adherence and reduce the number of dropouts.
Training	Create collaborative and participative learning scenarios to promote the acquisition of professional skills and competencies. Use of gamification techniques to increase engagement and commitment.

Table 1. Areas of activity and main goals of the company.

Founded in 2015, the company integrates a unique team composed by engineers, designers, physicians and psychologists with more than 10 years of experience in applying VR to mental health and higher education. The company has now created mSinaptiks and the first applications for the platform. Sinaptiks is a company that develops its own apps but also adapts and customizes products from selected partners (other companies and universities).

3. MOBILE SINAPTIKS

mSinaptiks is the first modular platform that integrates in a single interface different health-related apps. The platform includes a suite of mobile applications for the evaluation, prevention, treatment and/or tracking of disabling illnesses and psychological disorders (figure 1).
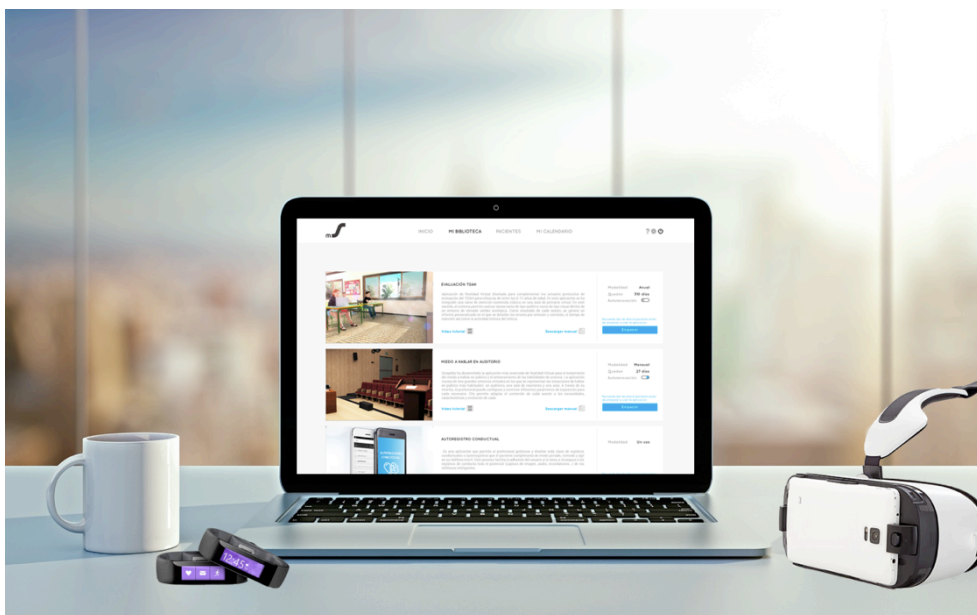
Figure 1. The mSinaptiks platform

The platform has an interface for the patient and a web access service for the practitioner (figure 2):

- **The patient**: Patients have access to a variety of apps from the Smartphone, including those based in the use of immersive VR and AR technologies. In these last cases, the patient needs to slip the smartphone into a Head Mounted Display (HMD) to be immersed within 3D virtual worlds.
- **The practitioner**: The health professional accesses to the platform from a mobile device or a desktop computer and is able to register new patients, link them to the apps contained in the platform, review each session or obtain detailed information of the patients' activity. In the case of VR and AR applications, the interface allows the professional to see what the patients sees, adapt in real time the content of the virtual worlds according to the patients' needs, create graphs, take notes and other features.

Practitioners can use the platform during face-to-face sessions but can also use it

remotely. Despite this, note that all applications need the direct supervision of a practitioner. In a wider sense mSinaptiks allows for a regular and constant connection between the practitioner and the patient.
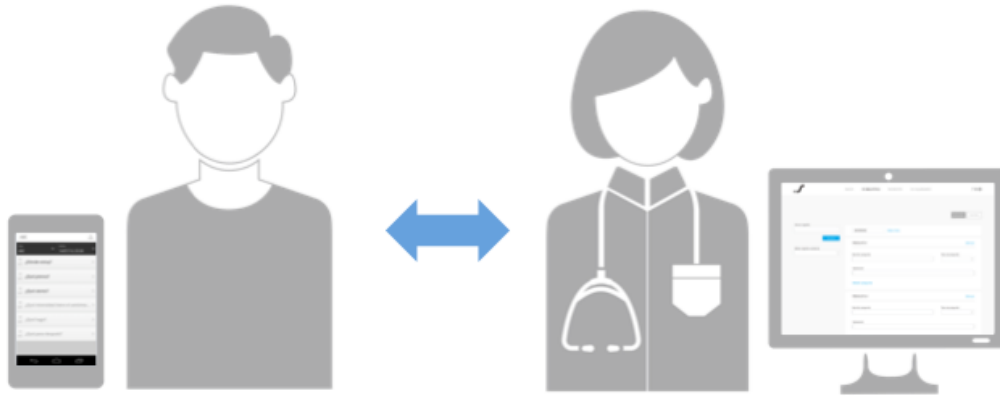

Figure 2. mSinaptiks contains a patient interface and a practitioner control panel

4. FIRST APPLICATIONS OF THE PLATFORM

The first applications of mSinaptiks are mainly focused in mental health evaluation and treatment:

- **Fear of public speaking / oratory skills training**. The application contains three VR environments that represent the most common situations related to public speaking: an auditorium (figure 3), a meeting room and a classroom. The users can practice oratory skills and confront their fears in a systematic and controlled way.


Figure 3. The virtual auditorium

- **ADHD assessment**. A VR screening tool developed to evaluate the effects of pharmacological and/or psychological interventions for ADHD (figure 4). The app contains a virtual classroom and uses a HMD and a head tracking system. Within the virtual scenario, children are assessed for performance in visual or audio attention tasks while a series of typical classrooms distracters appear. As a result of each session, the system provides information about the attention performance and the behavior of the child.

Figure 3. Virtual classroom for the evaluation of ADHD

- **Coping with anxiety and pain.** Immersive VR experience designed as a method for distracting patients during highly painful and/or stressful situations (figure 4). The user will visit a pleasant tropical island that contains a variety of captivating situations: a Japanese garden, a waterfall, a dam, an ancient tree, etc. This tool can be used in a variety of contexts: dental clinics, pain and surgery units, health centers or in patients with anxiety or stress.
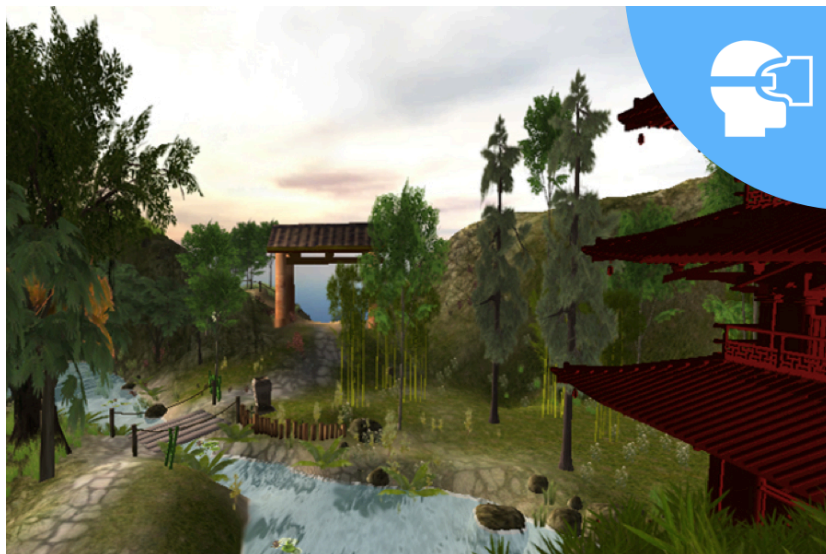
Figure 4. The virtual island

- **Behavioral self-reports.** This application allows to design and manage cognitive-behavioral self-reports that patients can fill out through the Smartphone in their daily live (figure 5). Unlike traditional paper-and-pencil self-reports, the practitioner can incorporate multimedia elements (such as pictures or audio notes) and reminders.

Figure 5. App for design behavioral self-reports

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