Why mHealth interventions are the new trend in health psychology?

Effectiveness, applicability and critical points

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Introduction

Mobile health, widely referred to as mHealth, constitutes part of eHealth and signifies the usage of mobile and wireless technologies designed to achieve medical objectives (World Health Organization [WHO], 2011). Mobile phones, tablets, smartphones, wireless devices, sensors, biometrics and GPS (Global Position Systems) are the most commonly used technological devices for the delivery of mHealth interventions (Olla & Shimskey, 2015). Among the several offered features, mHealth programmes and interventions utilize more SMSs (Short Message Services), MMSs (Multimedia Messaging System) and smartphone applications (Ben-Zeev et al., 2015). Smartphones have an advanced operating system, which incorporates many of the previously separately sold technological devices, providing users with a high tech apparatus (Boulos, Wheeler, Tavares & Jones, 2011). Grartner Inc (2014) in its annual report announced that the number of smartphones sold worldwide for 2014 was one billion, which is estimated to double in the next two years. Moreover, the most recent reports estimate that by 2018 there will be approximately six billion mobile phone users and half of the global population will be using smartphones (Statista, 2015a; 2015b).

Smartphones' software enables the operation of health and medical applications to be used both by patients and healthcare professionals. In 2014 the number of health and medical applications officially registered in the lists of the two major application stores (Apple App Store and Google Play Store) was around 100,000 and is expected to grow annually (Lupton, 2014). Interestingly enough health and wellness applications have the highest usage rates and are considered the biggest consumers' market with the greatest potential for the field of applications' development (Malvey & Slovensky, 2014). Health and medical applications can be categorized with respect to their medical objectives. There are various applications targeting health and wellness, behavioural modification, patients' compliance, patients' monitoring, medical professionals' efficiency and productivity, improvement of community health and health education (Ola & Shimskey, 2015).

Healthcare in the digital age

In effect, the penetration of mHealth has radically changed the practice of medicine. Healthcare professionals were the first to integrate the use of smartphones in their daily professional routine and there are numerous applications specifically designed to assist in medical practice, training and decision making (Boulos et al., 2011; Recio-Rodríguez et al., 2014). Another very important factor highlighting the impact of mHealth on healthcare is the digitalization of patients' medical records. So far Electronic Health Records (EHRs) have proven very helpful and efficient since doctors can easily

communicate with each other, immediately access their patients' records regardless of place and time, especially in case of emergency (King, Patel, Jamoom & Furukawa, 2014). Similarly, the UK has set an ambiguous goal, regarding the digitalization of all medical records of every patient using the National Health System (NHS) by the end of 2018 (Department of Health, 2013). However, the potential downside to EHRs may be egradation in the art of medical history taking. More specifically, the automation of medical history taking via EHRs can result in doctors being observers and not participants of the actual procedure (Chi & Verghese, 2014). Thus, EHRs can assist in the practice of medicine if accompanied by careful surveillance and supervision and without underestimating the dynamics of the doctor-patient relationship.

mHealth continuously evolves. The latest development regarding mHealth technologies is the integration of medical applications and wearable devices. An instance of this, are watches able to support medical applications, such as the recently released Apple Watch. It has embedded sensors, which can track levels of physical exercise, heart rate and other body metrics. Since the day of its release all the developers have focused upon designing suitable health applications for this technological innovation, " health on the wrist" (Apple Inc, 2015). Medical professionals already use it as its ergonomic design enables them to directly communicate via video conferences.

Apple Inc (2015) also announced the launching of ResearchKit, an interdisciplinary research platform addressed to medical professionals and developers. ResearchKit overcomes many previous obstacles such as the recruitment of participants, volume of data, multicultural populations, flawless record of medical information, frequent data and the protection of information privacy. Similarly, Medic Mobile is a platform designed by health workers addressed

to health workers, which offers a variety of mobile services and tools to implement mHealth projects and interventions. Specifically, it provides health workers with the appropriate tools, guidance and information to design their projects, implement and evaluate them and simultaneously be part of a bigger multidisciplinary healthcare team working to improve public health (Medic Mobile, 2015). mHealth is a revolution in the medical field and medical research since it transforms a mobile phone to a well-equipped research laboratory with worldwide range (Kazemi, Cochran, Kelly, Cornelius & Beck, 2014).

Examples of mHealth interventions

The simplest technologically-wise form of one mHealth intervention is sending educational and informational SMSs and has shown some success with regard to greater adherence to medication and behavioural change in the short term (Clauson et al., 2013). An instance of this is a mHealth intervention conducted on patients with type 2 diabetes mellitus, which showed that after 12 months of receiving informational SMSs a significant decline was noted in their glycosylated hemoglobin levels (Clauson et al., 2013). Text messaging seems to also be a successful strategy for smoking cessation. Personalized text messages help smokers cope with craving and relapse, and help them feel encouraged and accompanied in their effort to quit smoking (Buller et al., 2014). The most enlightening example of a mHealth intervention has been implemented in Turkey by the National Institute of Health (NIH, 2010). The project was addressed to whoever attended a smoking cessation facility and was based on sending SMSs designed using a cognitive behavioural approach. So far the results are very promising and there is an intention of scaling up the effort and developing the same

programme in the US.

Undoubtedly, the new trend in healthcare services and health promotion interventions is to incorporate the element of technology and especially smartphone applications in order to achieve the desirable behavioural changes. The applications which are based upon the patient centered approach are focusing on the distinctive individual characteristics in order to scrupulously understand users' particular needs (Lupton, 2012). The rationale behind this is to motivate patients to fully engage in changing their lifestyle and actively participate in their treatment process (Wofford, 2013). In effect, consumers of medical applications and mHealth interventions' participants report that applications are more convenient and less judgmental than the human alternative both in terms of medical practice and research participation (Sánchez-Ortiz, 2011).

Congruently, mHealth has proven to be a useful platform for facilitating patient self-management when the condition requires adherence to the prescribed medication and self-monitoring (Tufts et al., 2015). A mobile device can monitor and transmit information automatically to the healthcare provider or researcher the moment the targeted behaviour occurs (Lupton, 2014; Shaw et al., 2014). Thus, participants and researchers have the opportunity to immediately intervene by providing participants/patients with positive reinforcement and/or by sending a personalized message that increases the possibility of repeating the action, which means altering a maladaptive behaviour in the longer term (Davis & Oakley-Girvan, 2015). Similarly, the introduction of mHealth applications in mHealth interventions moves a step further, as there is a plethora of applications focused on mental health problems. Mobilyze! is an application targeting depression, which takes data from sensors installed in users' smartphone to spot states that may be relevant to their treatment, such as

location, activity, social content and mood (Burns et al, 2011).

The great success of mHealth lies on its flexibility and interoperability. mHealth technologies can be used globally and easily adapted independently of socioeconomic background and age at all the different areas of health interventions such as prevention, promotion, surveillance and evaluation (Jordan-Marsh, 2010). Moreover, the potential of mHealth is limitless given its feasibility, cost-effectiveness, physical and regional accessibility (Ni Mhurchu et al., 2014). People from remote areas, patients with severe mobility problems as well as patients after serious operations can reach their doctor, receive reminders to take their medication and easily access informational resources (West, 2013).

mHealth in developing countries

One of the foremost contributions of mHealth is related to healthcare services in the developing countries. Internet penetration and laptop ownership is extremely low in the developing world. However, data from the International Telecommunication Union (ITU) indicates that 90 per cent own mobile phones (ITU, 2013; The Radicati Group Inc, 2014). mHealth has emerged in order to better respond to the medical needs of the disfranchised population, assist in the direct delivery of healthcare, diagnosis and dissemination of health-related information (Chib, Car & van Velthoven, 2015; ITU, 2013). Designing tailored mHealth interventions, which can be addressed to specific cultural backgrounds and different languages, illustrates the opportunity of providing people from under-resourced regions with informational and educational material at minimal cost (Davis & Oakley-Girvan, 2015). Nevertheless, mHealth is another way of promoting and supporting health

as a non-negotiable human right underpinning universality, equity and solidarity and in effect tackling health inequalities (European Observatory on Health Systems and Policies, 2015). Thus, it is imperative that mHealth research and funding focus on the delivery of interventions in developing countries considering the positive consequences these initiatives could have on public health.

The encouraging results that mHealth interventions can have on non-communicable diseases (such as cancer, diabetes, cardiovascular diseases) provide an exemplar (Majumdar, Kar, Palanivel & Misra, 2015). A recent example is "mDiabetes", an mHealth intervention started in Senegal focusing on the prevention of complications that diabetic patients usually encounter during the month of Ramadan due to the associated cycles of fasting and feasting. In a similar line, Lund and her colleagues (2014) launched a mHealth project in Zanzibar focusing on maternal health and prevention of antepatrum complications. The results revealed that there was an increased number of mothers who complied with the instructions they received through SMSs, followed by an increased number of visits for the desired check-ups (Harvard School of Public Health, [HSPH], 2012).

Critical issues and challenges

The exciting developments in mHealth need to be welcomed with some caution. There is not yet any official regulatory framework that mHealth researchers and interventionists should follow. The US Food and Drug Administration (FDA) has only provided guidance for the regulation of the medical applications targeting on self-management and self-diagnosis in order to reassure that patients using them will be at no risk (Malvey & Slovensky, 2014; FDA, 2013). However, both FDA and EU (European Medicines

Agency) regulations neither guide nor impede the design and dissemination of medical applications. Since this is becoming the biggest pitfall of mHealth research it is urgent that policy makers publish official guidelines and legislation. The proliferation of medical applications highlights the need for them to be under greater scrutiny, be authorized via a licensing system and undergo legislative oversight for users' data protection and guarantee confidentiality to prevent personal data misuse (ITU, 2014; Rich & Miah, 2014). It is of vital importance to warrant the security of the medical data received, to ensure that different cultural norms are respected, to evaluate the usability of the application, the service reliability and prevention of attrition (WHO, 2011; Boulos et al., 2011).

Despite the fact that the usefulness of mobile technologies is scientifically acknowledged their integration into healthcare systems is still underestimated (Shaw et al., 2014). Additionally, the exponential development of smartphone applications in the field of healthcare has not been accompanied by sufficient scientific evidence of their actual impact on the improvement of population health (Recio-Rodríguez et al., 2014). A possible explanation could be that technology continuously evolves and its progress does not coincide with the scientific evaluation of its published results (Fjeldsoe, Miller, O'Brien & Marshall, 2012). Additionally, many applications are being withdrawn without allowing for longer-term evaluation of their effectiveness (Becker et al., 2014).

Furthermore, patients should be informed of all the negative consequences the reliance upon applications can have. More precisely, diagnostic outcomes from an application should always be accompanied by a proper consultation with the appropriate healthcare professional (Becker et al., 2014). The content of mHealth interventions also needs to be regularly adapted so as to engage

participants over time and maintain their interest (Shaw et al., 2014). Regarding the stakeholders involved it is imperative that they are technologically-up-to-date and well trained in order to incorporate all the above in the implementation of mHealth interventions (Clauson et al., 2013). Nevertheless, it should be stated that although mHealth interventions are technologically sophisticated they typically lack a theoretical background. Thus, the development of methodology and further research are imperative (Payne, Lister, West & Bernhardt, 2015; Tate et al., 2013).Therefore, all the professionals and stakeholders involved in the design and implementation of mHealth interventions should anchor their projects and applications on an evidenced-based approach (Shaw et al., 2014).

Lastly, it is worth noting that mHealth technologies in general and mHealth applications in particular, do not by any means replace the importance of physical contact and social interaction. For example, the pivotal role that the expression of emotions plays in the process of medical care cannot be substituted by any medical applications. mHealth technologies can be a very convenient interventional and medical material as well as profitable diagnostic tool. Yet this does not imply that mHealth technologies can replace and undermine the actual need for better healthcare facilities. Despite all the critical points mHealth is undoubtedly a new world of opportunities offering great potential in the healthcare field.

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