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Current trends and future directions of mHealth in psychology: Challenges and promising perspectives

Tendencias actuales y futuras de mHealth en psicología: Desafíos y perspectivas prometedoras

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Abstract:

The following text aims at investigating the importance of mobile health (mHealth) applications in mental health, addressing their integration into traditional clinical settings, their effectiveness in diverse populations, and the ethical challenges associated with their use. It seeks to understand how mHealth interventions can complement and reinforce the work of mental health specialists, as well as identify the specific needs of different groups. In addition, it aims to highlight the importance of considering ethical aspects such as privacy, data security, and fairness in access to these technologies. It seeks to provide a comprehensive view of the benefits, challenges, and future directions in the use of mobile health applications to improve psychological care.

Keywords:

e-health, m-health, intervention, mental health, psychology

Resumen:

El objetivo del siguiente texto es explorar la importancia de las aplicaciones de salud móvil (mHealth) en la salud mental, abordando su integración en entornos clínicos tradicionales, su efectividad en diversas poblaciones y los desafíos éticos asociados con su uso. Se busca comprender cómo las intervenciones de mHealth pueden complementar y reforzar el trabajo de los especialistas en salud mental, así como identificar las necesidades específicas de diferentes grupos. Además, se pretende destacar la importancia de considerar aspectos éticos como la privacidad, la seguridad de los datos y la equidad en el acceso a estas tecnologías. Se busca proporcionar una visión integral de los beneficios, desafíos y futuras direcciones en el uso de aplicaciones de salud móvil para mejorar la atención psicológica.

Palabras Clave:

e-health, m-health, intervención, salud mental, psicología

INTRODUCTION

E-health interventions, like m-health or mobile health, have gained much attention for their potential to address psychological problems. The World Health Organization defines e-health as "the use of Information and Communication Technologies (ICTs) to support health and health-related areas."[1] This term encompasses a wide range of applications, including telemedicine, interventions, human and economic capital management, just to mention a few.[2] In addition, mobile health is defined as "the use of mobile technologies (cell phones, tablets, wearables, among others) for health purposes."[1]

The benefits of e-health and mHealth interventions include their availability, accessibility, cost-effectiveness, scalability, and ability to personalize content.[3] In addition, these interventions provide real-time strategies that can calibrate the intensity of the intervention according to the user's needs.[4] They also have the potential to expand the scope of psychology services, improving the health and well-being of children, young people, and their families, as well as positively intervening in sleep quality, fatigue, and physical activity in patients and survivors of some diseases such as cancer.[4–6]

Additionally, mHealth interventions are associated with stress and depressive symptom reductions, higher levels of emotional well-being, and improved mental health outcomes in diverse populations.[6,7] That is why e-health and mHealth interventions have shown promise in supporting health specialists.

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IMPACT OF MHEALTH APPS ON MENTAL HEALTH

The use of mobile applications has a significant impact on health, as they complement and reinforce the specialist's work. However, it is relevant to note that they do not fully replace the assistance and accompaniment of a health professional.[8]

The literature highlights the importance of integrating psychological theories into mHealth applications to improve their impact and adherence to mental health interventions.[9] The most commonly used psychological approach in this type of intervention is cognitive-behavioral therapy, as it offers various techniques that can be self-administered (self-recording thoughts, beliefs, emotions, breathing techniques, among others) with appropriate training.[10] In addition, it has been observed that these interventions can have long-term effects, such as the sustainability of healthy behaviors and the continuous improvement of mental health.[11,12]

However, the need for more research to comprehensively assess the impact of mHealth apps on mental health, especially in specific populations such as cancer patients, older adults, and healthcare workers, is recognized.[13–15] Furthermore, it emphasizes the importance of considering sociocultural experiences and user preferences when developing mHealth applications for mental health.[16,17]

ACCESSIBILITY AND REACH OF PSYCHOLOGICAL SERVICES THROUGH MHEALTH

The accessibility and scope of psychological services through mHealth are crucial due to technology viability. Despite acknowledging the potential benefits of mHealth in providing psychological interventions to diverse populations, such as children, adolescents, or college students[18], mHealth adoption remains a challenge in these environments.[19] This is because, despite being constant internet and mobile app users, they usually don't use health apps.[20]

It is crucial to comprehend the factors that impact the quality, regulation, and scope of virtual psychological counseling services.[20] Some studies have shown that knowledge about mHealth among university students in developing countries is low, and there are barriers to its use, such as ethnicity.[21] For example, in countries such as Ghana, Benin, and Nigeria, where cell phone penetration is high, many people are unaware of the benefits provided by these devices to improve their health. In addition, the usability of mobile health apps varies, with some studies indicating low usability scores.[22]

It emphasizes the potential of mHealth to support community health workers in delivering psychological interventions in underserved rural areas. [18] In addition, the use of mHealth has been identified as a viable modality to help vulnerable populations manage their chronic conditions, including mental health conditions.[23] However, the effectiveness of mHealth interventions in developing countries, especially in the context of psychological services, remains unclear.[24]

A relevant point to ensure the success of mHealth interventions is to consider the commitment and motivation that the user has to adhere to the solutions offered by those who develop the intervention programs.[25] It is also necessary to consider the design principles (mentioned in the section on user-centric application development and design) of mHealth interventions to achieve sustainable changes in health behaviors.[26]

The development and evaluation of psychological care mHealth apps, especially for vulnerable populations such as pregnant women, people with disabilities, ethnic communities, migrants, and others, require specialized frameworks to ensure the quality and effectiveness of the apps.[27]

Thus, while mHealth holds promise for expanding the accessibility and reach of psychological services, especially in developing countries, there are challenges related to adoption, usability, and efficacy. Understanding the specific needs of target populations and developing personalized mHealth solutions, along with rigorous assessment and regulation, are crucial to harnessing the full potential of mHealth in the provision of psychological interventions.

ETHICAL CONSIDERATIONS IN THE USE OF MHEALTH

The use of mHealth in psychology raises relevant ethical considerations, especially about interventions' privacy, safety, and quality. mHealth apps' privacy policies are essential, as they collect and store personal data, including sensitive information. They also require transparent and comprehensive privacy policies to protect the user's data.[28] For example, policies that ensure data encryption, limited access to sensitive information, and establish clear protocols for handling sensitive data.

Mobile health research, regulated and unregulated, presents ethical challenges requiring measures to protect end-users and ensure their benefits. [29] Ethical planning, implementation, and evaluation frameworks are essential, especially in sensitive areas such as treatment adherence. Throughout the process, participant autonomy, informed consent, and personal data protection must be integrated. [30]

Ensuring privacy and security in mHealth applications requires critical criteria and countermeasures to safeguard user data and maintain trust in these technologies.[31] Understanding the barriers and facilitators of mobile health applications from a security perspective is crucial to addressing ethical concerns and ensuring these technologies' safe and effective use. [32] For example, implementing robust security protocols such as two-factor authentication and limited access to sensitive data can help protect users' privacy and mitigate security risks. Furthermore, it is imperative to set the agenda for bioethics in the mobile healthcare revolution to address ethical challenges and protect vulnerable groups from harm and discrimination.[33] It is crucial to consider the circumstances of vulnerable groups, such as those with limited access to resources or facing systematic discrimination, to implement measures that protect their integrity and rights.

These references underscore the ethical complexities surrounding mHealth use in psychology, emphasizing the need

for robust privacy policies, regulatory frameworks, and security measures to ensure the ethical use of mobile technologies in psychological interventions. Identifying and addressing potential risks from a bioethical standpoint is essential to ensure equity and protection for all participants.

USER-CENTRIC APPLICATION DEVELOPMENT AND DESIGN

Mental health app design exerts a relevant influence on user experience and adherence to interventions.[1] First, it highlights the importance of developing the application based on user-centered design principles, which refer to an approach that puts the end user in the design process, ensuring that the interface and functionalities are suited to the needs and preference of the target users.[34]

Usability refers to the ease of use and effectiveness of the app. Accessibility which refers to the app's ability to be used by people with different skills and needs, which are crucial factors contributing to user engagement and adherence to interventions.[35]For it, it is necessary to ensure intuitive navigation and a clear presentation of information. To create user-friendly mental health apps, it is crucial to integrate principles that align digital programs with the best practices in user-centered design. [35]

The app should prioritize maintaining the user-provider relationship, fostering a sense of connection and support, especially in the mental healthcare context.[34] Furthermore, developing interventions that promote user engagement and strengthen care networks is vital for enhancing the user experience.

INTEGRATION OF MHEALTH IN TRADITIONAL CLINICAL SETTINGS

The clinical setting is where tasks, activities, and processes aimed at providing care for, promoting, protecting, and restoring a defined population's health are carried out.[36] It is within this context that mHealth has been documented in various healthcare settings, from disease diagnosis to medication referral, patient medical education, and disease management.[37] These apps seek to address the unmet needs of health systems by providing tools that empower healthcare providers, disseminate health information, and facilitate contact tracing during a health crisis such as a pandemic.[38]

It has been proven that MHealth supports healthcare workers' performance by providing clinical updates, learning materials, and reminders, especially in underserved rural areas.[18] It is important to note that conventional treatment interventions using technology alone may have limited efficacy. For example, an intervention carried out entirely with technology, applied in the pediatric obesity context, faced treatment adherence problems.[39] However, mHealth applications have demonstrated efficacy in promoting changes in health behaviors and improving health outcomes by providing quick access to health information and facilitating interactive interventions.[40] Furthermore, technology-based remote interventions, such as using phones, pedometers, and internet-based methods, have shown promise in promoting physical activity compared to minimal treatments.[41] Healthcare provider training has also extended through using mHealth applications and mobile phones as innovative work assistants for community healthcare professionals.[42] The prioritization of mobile health in healthcare models has been observed in countries with higher life expectancies and the need for continuous patient monitoring[43]

Notwithstanding these advancements, the impact of mobile medical photography applications on clinical care is still unclear, highlighting the need for further research in this area.[44] As mHealth continues to expand, it enables healthcare providers to deliver better care to patients in remote and underserved communities, thus addressing the challenges of healthcare accessibility.[45] Mobile and web applications offer opportunities for promoting oral health, indicating the potential of mobile health to contribute to preventive healthcare measures.[46]

It is essential to recognize the substantial benefits of conventional practices and manual therapy in healthcare, especially in the stroke rehabilitation context.[47] The potential of mHealth applications to monitor overweight and obesity within the Internet of Things framework has been proposed, highlighting the role of technology in promoting healthy behaviors and providing automated interventions.[48]

The effectiveness of mobile health technologies in enhancing healthcare services has been highlighted, with emerging literature on the application of mobile technologies in low-income countries.[49] It is crucial for mHealth applications to incorporate evidence-based approaches to minimize the risk of harm and ensure the safe application of knowledge by users.[50] Personalized healthcare systems facilitated by mHealth services and applications enhance communication between patients and healthcare providers, thereby helping to improve health outcomes.[51]

MHEALTH & SPECIFIC POPULATIONS

This technology has been widely used in psychology, to address the specific needs of diverse populations, including adolescents, older adults, women, and individuals with particular disorders. We conducted a systematic review on digital mental health interventions for depression and anxiety and improving psychological well-being among college students. Most selected studies were conducted in the United States, United Kingdom, Ireland, Australia, Canada, and China. The analysis included eighty-nine studies. We found that 47% of the interventions evaluated showed effectiveness, while 34% demonstrated partial effectiveness. These results underscore the significant potential of these interventions to address the mental health needs of young university students globally.[52]

In a gender-responsive study conducted in Brazil, they evaluated a wellness app designed to provide relaxation training and positive psychology principles to reduce chronic stress and improve the overall well-being of working women. After implementing the intervention, the experimental group had a

17% increase in subjective well-being (measured by the WHO-5 scale) compared to the control group.[53]

In another study carried out in China, a mobile app intervention was developed for pregnant women, aiming to train them in mindfulness to mitigate perinatal depression and other mental health problems. The study involved 1,140 women. As a result, the group that received the intervention experienced a 60.9% reduction in the risk of depressive symptoms compared to those that did not receive the training through the mobile app.[54]

Single-session mobile-enhanced interventions in severe mental illness have been investigated through a randomized controlled trial, indicating the potential of brief mobile interventions to address mental health problems. The impact of cell phone support on psychosocial outcomes of young people living with HIV and non-adherence to antiretroviral therapy has also been studied, which demonstrates the potential of mobile interventions to support people with specific healthproblems.[55]

APPS CREATED IN MEXICO

Despite the advances in the use of mobile applications to promote people's well-being and the presence of a wide variety of these in the various application stores, there is scarce scientific evidence related to mobile applications' design specifically applied to the Mexican population. Table 1 summarizes the interventions carried out in Mexico.

The first app is called 'What happens if you go too far?'[56] This program aimed to prevent substance use in adolescents and was implemented on a high school campus as part of the introductory curriculum for the school year. We applied a pretest-posttest design and used a Google form to assess life skills. Participants received training on the effects and risks of psychoactive substance use, along with strengthening life skills. The intervention was complemented by strategies at home, and lasted 10.5 hours distributed in group sessions.

This intervention sought to equip adolescents with skills to resist peer pressure and make healthy choices regarding substance use. It is highlighted that using mobile technologies in intervention processes can expand the scope of preventive work among adolescents. The following intervention: "RatinARBox,[57]" intended to develop an augmented reality environment to teach operant conditioning to psychology students. This research held group video calls to download the application and applied evaluations regarding the experience. A significant improvement was observed in students who used the app compared to those who did not. Participants highlighted the usefulness and interactivity of the application. It is concluded that the "RatinARBox" application is a promising tool to strengthen the understanding of operant conditioning concepts in psychology students, demonstrating its potential in technology-based education.

The third intervention or application carried out in Mexico corresponds to an intervention carried out on adults with the name 'Live without Tobacco...'[58], to help participants quit smoking. Although it was a pilot study, it was widely accepted by participants and generated high satisfaction levels and participation throughout the 12-week program. At the end of the program, through biochemical examinations, it was verified that 40% of the participants had quit smoking. These findings suggest that mobile interventions may be an effective tool to promote smoking cessation in underserved communities, highlighting the importance of accessibility and personalization in health care.

These intervention examples demonstrate that mobile apps have a lot to offer in the health area, from addressing addictive behaviors to providing training for students. We are just beginning an advance in quality and acceptance by the Mexican population in relation to these applications."

Table 1. *mHealth interventions carried out in the Mexican population.*[58-60]

App Name	Population	Target
"What happens if you go too far?"	Adolescents (12-18 years)	Increase the perception of the risk of tobacco, alcohol, and marijuana use
RatInARBox	Students (average age 18)	Augmented Reality Environment for Teaching Operant Conditioning
Live Tobacco-Free... Make up Your Mind!	Adults (>18 years)	Smoking Cessation Plan

CHALLENGES AND FUTURE DIRECTIONS

Mobile technology for health has emerged as a promising field in psychology, providing innovative interventions to address mental health service delivery challenges. However, some current challenges and areas require further research, as possible future directions and advancements will also demand it.

These include measuring user engagement in eHealth and mHealt behavior change interventions.[59] In addition, it points to the need for strategies for mHealth research, as researchers may face unique challenges in this research line. It also highlights the importance of understanding the information needs of informal caregivers in managing behavioral and psychological symptoms of people with dementia, as well as the design of mHealth applications to address these needs.[60] Another crucial challenge is the inclusion of people with disabilities in mHealth, as its omission could lead to health disparities.[61]

It is essential to recognize the existence of the digital divide, which affects marginalized social, cultural, and demographic groups, leading to inequalities in access, trust, and technological skills.[62] Although modern life is strongly linked to cell phone use,

we cannot ignore the reality of those who face difficulties accessing technology. It is crucial to address and decrease the impact of technology exclusion to achieve fair and effective implementation. In this sense, digital literacy, which implies the ability to use, understand and leverage ICTs effectively, emerges as an essential element to close the digital divide and promote technological inclusion.[63]

CONCLUSION

In today's era, technology has become an indispensable part of our lives, offering unprecedented opportunities for healthcare professionals. mHealth emerges as a crucial tool in this landscape, providing additional support and facilitating patients with healthcare access. Although, in psychology, there has been some resistance towards adopting these interventions due to ignorance and perceived risks, it is important to recognize their potential to provide relief to more people and offer complementary alternatives in patient health care. It is essential to be open to exploring and taking advantage of the opportunities that technology offers us in the continuous improvement of health care and the well-being of our patients.

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