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Interventions of computerized psychotherapies for depression in Primary Care in Spain

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Currently, depression is a global health problem recognized by the WHO. The prevalence of this pathology in Primary Care is estimated at 19.5% worldwide, and 20.2% in Spain. In addition, the current intervention policies and protocols involve significant costs, both personal and economic, for people suffering from this disorder, as well as for society in general. On the other hand, the relapse rates after pharmacological interventions that are currently applied and the lack of effective specialized attention in mental health services reflect the need to develop new therapeutic strategies that are more accessible and profitable. Therefore, one of the proposals that are being investigated in different parts of the world is the design and evaluation of therapeutic protocols applied through Information and Communication Technologies, especially through the Internet and computer programs. The objective of this work was to present the current situation in Spain regarding the use of these interventions for the treatment of depression in Primary Care. The main conclusion is that although there is scientific evidence on the effectiveness of these programs, there are still important barriers that hinder their application in the public system, and also the need to develop implementation studies that facilitate the transition from research to clinical practice..:

Keywords: Internet-based intervention, Depression, Primary Care, Computerized therapy, Online psychotherapy

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Intervenciones de psicoterapia por ordenador para la depresión en Atención Primaria en España

La depresión es, desde hace ya unos años, un problema de salud pública a nivel mundial reconocido por la OMS. La prevalencia actual de esta patología, en los servicios de Atención Primaria, se estima en 19,5% a nivel mundial y en 20,2% en España. Además, las políticas y protocolos de intervención actuales están suponiendo unos importantes costes, tanto personales como económicos, para las personas que padecen este trastorno, así como para la sociedad en general. Por otro lado, los índices de recaídas tras las intervenciones farmacológicas que se aplican actualmente y la falta de una atención especializada eficaz en los servicios de salud mental, ponen de relieve la necesidad de desarrollar nuevas estrategias terapéuticas más accesibles y coste-efectivas. En esta línea, una de las propuestas que se están investigando en diferentes partes del mundo es el diseño y evaluación de protocolos terapéuticos aplicados a través de las Tecnologías de la Información y la Comunicación, especialmente, a través de internet y de programas de ordenador. Por ello, el objetivo de este trabajo es presentar la situación actual de la atención en España respecto a la utilización de estas intervenciones para el tratamiento de la depresión en Atención Primaria. La conclusión principal es que, aunque existe evidencia científica sobre la eficacia de estos programas, todavía existen barreras importantes que dificultan su implantación en el sistema público, y, por otro lado, la necesidad de desarrollar estudios de implementación que faciliten la transición de la investigación a la práctica clínica

Palabras clave: Intervención basada en internet, Depresión, Atención Primaria, Terapia computerizada, Psicoterapia online

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INTRODUCTION

The prevalence of mental disorders and specifically emotional disorders is a matter of interest in recent years due to its implications both for people who suffer from it and for the society in general. Depression is one of the most common health problems worldwide. In 2004, the World Health Organization (WHO) estimated that 151.2 million people suffered from disability as a result of this disorder, of which 22.2 million lived in Europe, and stated that in 2030 the depression will be the most disabling disease in the whole world¹. Currently, WHO estimates that 320 million people worldwide suffer from depression, 44 million in Europe and 2.4 million in Spain, and it is the third cause of years lived with disabilities in 2017¹. On the other hand, several epidemiological studies have concluded that it is the mental disorder that has the greatest impact on people's health²⁻⁶.

In Primary Care (PC), a recent meta-analysis concluded that the general prevalence of depression is 19.5%⁷, while in Europe it is estimated to be 12.2%⁸. Specifically in Spain, the prevalence throughout life is 10.6% and the annual is 4.0%, being below the average European levels⁹; and approximately 30% of people treated in PC have suffered an episode of depression¹⁰, with a general prevalence of 20.2%¹¹.

It is known that depression entails significant personal and economic costs for the individual and society. The evidence shows that it is associated with various chronic diseases such as cancer, diabetes and chronic pain, affecting quality of life, productive capacity and economic income^{5,12,13}. Regarding the socio-health impact, it is the most expensive disease for Europe, assuming 33% of the resources allocated to mental health, and 1% (118 billion euros) of its economy. Specifically in Spain, the costs of emotional disturbances in 2010 were 10,763 million euros¹⁴. These results are consistent with those found in other studies conducted on PC, stating that it is a public health problem in Spain, in Europe and in the world^{6,15}.

There are currently evidence-based treatments for depression.¹⁶ In fact, it can be treated effectively with pharmacological interventions, psychotherapies, or a combination of both^{17,18}. These treatments are considered well established treatments¹⁹⁻²², and are recommended by the Institute of Excellence for Health and Care of the United Kingdom (NICE)²³. From the psychological approach, Cognitive Behavioral Treatments (CBT) are the ones that have the most empirical support for the treatment of multiple mental disorders, and more specifically for depression^{19,20,24}. On the other hand, SSRIs are the antidepressants with greater evidence and better risk/benefit balance for patients, and therefore the first choice²⁵.

However, although the combination of both strategies has been proven to be more effective than individual application²⁶, there is a tendency to pharmacological prescription as the only intervention in PC, despite the population's preference for psychological interventions, and the high rate of relapse after drug treatment²⁷⁻²⁹. In addition, many people do not seek help among other reasons for fear of stigmatization. Furthermore, even in well-endowed health care systems, it is difficult to gather enough qualified therapists to offer psychological interventions³⁰⁻³², and as a consequence, a significant number of people with depression do not receive treatment^{33,34}.

In Spain, a report by the Spanish Agency for Medicines and Health Products estimated that the consumption of antidepressants tripled between 2000 and 2013, and that in many cases people are medicated who are simply in a grieving process or suffer from stress chronic³⁵. Although this is not consistent with the recommendations, there are reasons that can explain this situation. One of the difficulties for the integration of psychotherapy in PC is the standard duration of these programs (between 10-12 weeks). Other difficult are the current policies regarding psychological care, limited resources, and the lack of mental health professionals in the context of PC²⁵.

It can be concluded that mental health resources dedicated to depression are not adequate in terms of accessibility and quality³⁶, since less than 50% of people with depression are treated by a health professional, and only a fourth party receives the appropriate treatment due to the costs and demands of face-to-face treatments, the time required for its application or the lack of trained therapists³⁷.

As a result of the difficulties in integrating psychological interventions within the PC, it is necessary to apply strategies that facilitate this process. Prestigious authors in this field propose to develop more efficient interventions to reduce the disease burden of depression and allow their access to the population regardless of socioeconomic status^{16,38}. One of the alternatives under investigation is the use of low intensity interventions²³ as: a) brief psychotherapies between 6-10 sessions from the CBT³⁹, problem solving, interpersonal therapy⁴⁰, b) bibliotherapy⁴¹, c) self-help programs⁴² y d) computer-assisted psychotherapy programs⁴³. This, together with the stepped treatment model, proposed by national and international guides, are suggested as the most feasible alternatives to be introduced in the health system^{23,44,45}. The objective is to treat as soon as possible, a large proportion of patients with therapies that are known to be effective, reducing direct and indirect costs, as well as the impact on health. Other advantages of the stepped treatment is that it is simpler than formal psychotherapies and can be provided by health professionals besides mental health experts. However, even with the possibility of using

these interventions, individual psychotherapy, the dominant model in the provision of psychological services, is unlikely to satisfy these needs^{36,46}. We will therefore have to think about other possibilities. Information and Communication Technologies (ICTs), especially the use of the Internet to apply psychological treatment programs, have proven to be a powerful vehicle for their effective deployment in mental health services^{31,47}.

APPLICATION OF ICTs: INTERNET-BASED TREATMENTS

In recent years, important contributions have been made regarding the use of the Internet to apply psychological treatments in the field of emotional disorders. These are evidence-based treatment protocols that are manualized and adapted to be applied over the Internet using multimedia materials (videos, strips, texts ...). The work carried out by different groups around the world stands out, being the first studies by Isaac Marks and Judith Proudfoot in the United Kingdom, who developed the *Fear Fighter* and *Beating the Blues* treatment programs, included in the NICE Guidelines for the treatment of depression and panic disorder.

The data indicate that these interventions are a promising alternative to current strategies⁴⁸, and numerous meta-analysis have demonstrated the clinical efficacy and effectiveness of Internet-based treatments for depression.^{49,50} In addition, evidence indicates that they are as effective as traditional treatments^{42,51}. It has been proven that they are a feasible solution and a useful strategy to promote evidence-based psychotherapies, solve accessibility problems and facilitate the implementation of interventions⁵². The literature indicates that these psychological interventions applied through the Internet can help solve important mental health problems and overcome access barriers to treatments such as geographical limitations since they can reach populations of patients who do not attend therapy due to distance or the economic cost, or reduce the stigma associated with receiving psychotherapy^{36,53,54}. In this way, a recent meta-analysis based on individual data from 3,876 patients confirms that self-guided psychological treatments applied by the Internet are effective in treating depressive symptoms, providing substantial evidence for clinical and political decision making, since the data indicate that such strategies can be considered as an evidence-based approach of choice for the treatment of depression⁵⁵.

Within the framework of the European OPTIMI project ("*Online Predictive Tools for Intervention in Mental Illness*"), a manualized treatment protocol called Smiling is Fun was developed, which was also adapted to be applied through the Internet^{56,57}. This program combines effective psychological procedures for stress management and depressive symp-

tomatology with strategies to promote emotional regulation, coping ability and resilience. Its objective is for the person to learn different psychological techniques such as adaptive new ways of coping to deal with clinical symptoms, as well as to deal with everyday problems.

The original program consisted of 8 modules that includes classic components of CBT, such as psychoeducation, motivation for change, cognitive therapy and relapse prevention⁵⁸. In addition, it incorporates a behavioral activation component⁵⁹ and a positive psychology component that offer strategies to promote and improve positive mood⁶⁰. Subsequently, two additional modules were developed, one focused on sleep hygiene strategies and another on medication management. Table 1 shows the objectives of all module. Each modules delves into an important aspect to improve coping capacity and includes exercises designed to learn several psychological techniques.

The protocol was adapted to the web system becoming an interactive, self-applied intervention tool, and to be applied through the Internet. In its development, special attention was paid to the easiness of use, with a minimalist design that emphasises the content over the rest of the elements and a linear navigation, which allows users with less experience with ICTs to know at all times where they are and how to continue advanced.

The program begins with the "Home" module where it is explained what it is, what the objective is, who can benefit from it and who are the professionals behind the development of the program (See Figure 1).

The structure of the modules follows the following scheme: questions related to the previous module, the explanation of the contents of the module, the performance of the exercises and, finally, the self-test questions to check if the user has understood what has been explained. If user does not answer a question, the program immediately provides the correct feedback with a simple explanation. Subsequently, the tasks that have to be done to practice what has been worked on in the module are indicated, and its performance is recommended. In addition to the 10 treatment modules, tools are offered that help the user throughout the entire process:

- **-Activity Diary:** designed so that the person pays attention to the activities he/she performs daily, what he/she spends time on and how this influences mood, coping ability and stress level.
- **-Schedule:** it provides information to the person about his/her progress throughout the program. It lets user know where he/she is, what he/she need to finish and gives his/her feedback on the tasks he/she still has pending and those he/she has already done.

| Table 1 | | Objectives of the program "Smiling is Fun" |
|---------------------------------------|---|--|
| Modules | Main Objectives | |
| 1. "Medication management" | The guidelines for the proper use of the medication are presented (if prescribed). | |
| 2. "Sleep hygiene" | Guidelines for adopting healthy sleep habits are presented. | |
| 3. "Motivation for change" | The objective of this module is to get the user to analyze if they really want to change and to consider the benefits and costs of the change. | |
| 4. "Understanding emotional problems" | Information is provided so that the person can understand emotional problems. | |
| 5. "Learning to move on" | The importance of "getting started" is taught to adopt an adequate level of activity and involvement with life. | |
| 6. "Learning to be flexible" | The person learns the importance of making their thinking more flexible and interpreting situations | |
| 7. "Learning to enjoy" | The importance of positive emotions and being in contact with other people is emphasised. | |
| 8. "Learning to live" | The person learns the difference between positive experiences, which involve moments of momentary pleasure, and the achievement of psychological well-being and helps identify their own strengths. | |
| 9. "Living and learning" | Life is a process of constant learning and all experiences are useful and it is important to "learn to learn" from them. The person is taught to identify and detect moments of well-being. | |
| 10. "From now on, what else?" | Everything explained above is worked on in the relapse prevention component. | |



Figure 1

Module "Home"

Smiling is Fun was initially tested in a community sample under stress^{56,57} obtaining good results. Likewise, another study was carried out in a community sample with depressive symptomatology⁶¹ with also positive results. Based on these studies, it was decided to use this program to test its effectiveness in PC at several Spanish regions.

THE USE OF ICTS FOR THE TREATMENT OF DEPRESSION IN PC IN SPAIN

Despite the evidence showing the effectiveness of ICT-based interventions, it has not been tested in the PC context in Spain until a few years ago. Thus, with the objective of comparing the effectiveness of low intensity programs based on the use of the Internet versus the usual treatment in PC for major depression, a randomized controlled clinical trial (RCT) was designed using the program *Smiling is Fun*:

- **How am I:** it offers graphical feedback on the evolution throughout the program, as well as the level of activity, emotional distress and the intensity of positive and negative emotionality.

The study is an RCT consisting of three groups, each associated with different treatment conditions. Patients received the usual improved treatment (TAU), or the program *Smiling is Fun* with or without support from a therapist; the

support implied that the patient could request advice from a professional up to a maximum of three contacts by mail during the period of treatment.

The participants were selected by family doctors in PC centers in Andalusia, Aragon, Balearic Islands and Valencia. They were selected through the use of case search questionnaires by the general practitioner and subsequently evaluated by an independent investigator using the International Neuropsychiatric Interview (MINI). Patients between the ages of 18 and 65 with a diagnosis of Major Depressive Disorder according to the DSM-5 and ICD-10 guidelines, whose level of severity was mild or moderate according to the Spanish Beck Depression Inventory-II, were considered adequate for the study. Those patients who had received psychological treatment during the previous year were not included, nor those who met criteria for any other Axis I disorder and patients with severe depression. The participants were reassessed after completing the program as well as at 3, 6 and 15 months of post-intervention follow-up.

In the post-treatment assessment there were no significant differences in the effectiveness of the three types of treatment in reducing depressive symptomatology. However, the two conditions that included the program *Smiling is Fun* proved to be more effective than the TAU at both 6 and 15 months. There were no differences regarding the effectiveness between the two experimental groups.

Regarding the results obtained in the variables "mental health" evaluated with the Short Form Health Survey (SF-12) and "quality of life" with the EuroQol (EQ-5D), the results followed a similar pattern. Regarding the quality of mental health, the results were similar for the three types of intervention at 3 months follow-up. However, both Internet intervention programs proved to be more effective than TAU at 6 and 15 months. Similarly, the three types of intervention did not differ in improving the quality of life at 3 months follow-up. However, the Internet intervention program with therapeutic support did prove to be more effective at 6 and 15 months.

The economic analysis of the intervention was carried out from the perspective of the payer (direct costs of medication and use of health services) and social (indirect expenses for loss of working hours and sick leave) comparing the TAU group. The timeframe covers the 12-month duration of the study and cost-effectiveness (CE) and cost-benefit (CB) analyzes were performed. The CE analysis compares the expenses and health outcomes of both interventions. Their results are expressed in terms of the increase in cost effectiveness of one intervention with respect to the other (ICER) per health unit (in this case reduction of depressive symptomatology).

$$ICER = \frac{\begin{array}{l} \text{Cost treatment intervention group} \\ - \\ \text{Costs treatment control group} \end{array}}{\begin{array}{l} \text{Effectiveness treatment intervention group} \\ - \\ \text{Effectiveness treatment control group} \end{array}}$$

The Cost-utility (CU) analysis estimates the profitability of the interventions and uses standardized health units as a reference, such as the years of life adjusted for quality of life (QUALYS) or years of life adjusted for disability (DALYS). The results are expressed as the increase of (ICU), which is the difference in costs necessary to achieve a unit of measurement of these dimensions of both interventions.

$$ICUR = \frac{\begin{array}{l} \text{Cost treatment intervention group} \\ - \\ \text{Costs treatment control group} \end{array}}{\begin{array}{l} \text{QUALY won in intervention group} \\ - \\ \text{QUALY won in control group} \end{array}}$$

The results of the study showed significant differences in favor of the intervention group⁶⁵. The net costs (direct + indirect expenses) of the TAU group was 1,716€ per patient while those who followed online treatment had an average cost of 1,532€ per patient, which means a net saving of 184€ per treated patient. On the other hand, the analysis of economic results by intention to treat showed an ICER of -169.50€ and an ICUR of -496€ favorable for the group treated by internet. Therefore, the results of the economic analysis showed that the Internet treatment of mild and moderate depressive symptoms in PC is cost effective and efficient.

Based on the experience developed during the first RCT carried out in Spain and the evidence published by research groups from other countries on the evaluation of the effectiveness of short and low intensity psychological intervention programs applied through ICTs, we worked on the design of a multicenter RCT, in which three psychological interventions were adapted to a short format to be applied through a website. The final objective was to design a therapeutic strategy that facilitates access to psychological treatment by PC patients.

The three adapted interventions were: a) lifestyle psychoeducation, b) positive affect promotion, and c) mindfulness. Each program consisted of 4 online modules with multimedia material and with an estimated duration of 60 minutes. The programs were designed to be carried out in a period of 4-8 weeks, although it would depend on the pace of the participant. Tables 2, 3 and 4 present the objectives of all modules, and Figure 2 shows the home page of the program where it is specified who can benefit from it and more relevant information prior to the start of the intervention.

The inclusion / exclusion criteria, randomization recruitment and follow-up followed the same line in the previous RCT. However, the severity of depressive symptomatology was assessed with the PHQ-9 scale, and other scales were added such as the FFMQ to assess the level of mindfulness, the PHI for analyzing subjective well-being, and the CSRI that includes information on the use of health services as well as the economic impact that patients experience. Participants were assessed before beginning the intervention, at the end, and two follow-ups at 6 and 12 months post-treatment.

Although the results of this project are not yet finished, they are expected to provide evidence on the evaluation of three short interventions of low intensity and applied through ICTs in the improvement of depressive symptom-

atology as well as on the feasibility of the implementation of this type of therapies in PC⁶⁶.

DISCUSSION

The objective of this paper has been to present the current situation regarding the use of Internet psychotherapy programs for the treatment of depression in PC in Spain. The first conclusion to emphasise is that it is an incipient field, but has already given positive results. Data from both clinical and economic perspective support the use of these strategies to give better attention to citizens. However, just showing efficacy is not enough, at this time it is necessary to carry out implementation studies to design and test the possible strategies that allow the incorporation of these pro-

| Table 2 | | Objetivos de los módulos del programa de psicoeducación en estilo de vida |
|---------|---------------------------------------|--|
| | Modules | Main Objectives |
| 1. | "Beginning of a lifestyle change" | Know the relationship between a healthy lifestyle and physical and mental well-being. Identify healthy and risky behaviors as well as obstacles and excuses that make it difficult to adopt an adequate lifestyle. |
| 2. | "Physical activity. Learning to move" | Emphasise the importance of physical activity and its influence on mood, and learn the keys to increase motivation and start being more active. |
| 3. | "Diet. Learning to eat" | Know the relationship of a healthy and balanced diet with emotional health. Identify the barriers that make it difficult to adopt and maintain an adequate diet. |
| 4. | "Sleep. The importance of good sleep" | Provide general information about sleep and its alterations, learn strategies to handle sleep-related problems and sleep better. |

| Table 3 | | Objectives of the promotion of positive affect modules |
|---------|-----------------------|---|
| | Modules | Main Objectives |
| 1. | "Learning to live" | Emphasise the importance of the role of meaningful activities in mood and well-being, as well as seek the support of other people to carry them out. |
| 2. | "Learning to enjoy" | Analyze the importance of positive emotions and the value of the "little things" of everyday life, and the importance of knowing how to live and enjoy in the present moment. |
| 3. | "Accepting to live" | Develop an adaptive relationship and satisfaction with past experiences. Build trust towards the future and learn to handle events that disrupt and disturb moments of well-being. |
| 4. | "Living and learning" | The user learns strategies to increase resilience and psychological well-being. Identify the potentialities linked to values and develop an action plan to achieve a meaningful life. |

| Table 4 | | Objectives of the promotion of positive affect modules |
|--|---|--|
| Modules | Main Objectives | |
| 1. "Getting to know mindfulness" | Learn what is and what is not mindfulness. Know the problem of inattention and know the benefits and basic recommendations of the practice. | |
| 2. "Establishing formal and informal practices" | Know the difference between formal and informal practice, and the main practices (mindfulness in breathing and three minutes practice). | |
| 3. "Thought management, body scan practice and values" | Learn to manage thoughts. Differentiate between primary and secondary suffering. Understand the importance of values in life and know the practice of the body scanner. | |
| 4. "Self-compassion. Integrating mindfulness in everyday life" | Learn maintain the practice in daily life. Expose and do the practice of mindfulness walking, the practice of compassion, and how to introduce and | |



Figure 2 | Homepage

grams in routine care for the treatment of depression and other problems of mental health in PC.

These programs have different advantages over the usual treatment that should be considered. Eells and collaborators on the one hand, and Cuijpers and Riper on the other, conducted two reviews^{64,65} on the use of these programs for the treatment of depression and their conclusions indicate that they are a cheaper and more efficient option than the usual treatment since once designed and adapted to a website or computer program it is less expensive to administer to a larger number of patients. It facilitates access to the intervention for any person who has internet access, being available whenever a person needs it, saving the geographical barriers and waiting lists of health services. They allow to standardize the treatment components so that they

are better organized, both the theoretical contents and the practical exercises for each patient as well as the possibility of adapting them to each particular case. These programs also favor better management of the information obtained from the patient, allow continuous monitoring of their progress and provide data to health services and those responsible for health policies about interventions that work (or do not), which is essential in making action decisions. And finally, adherence to treatment could be significantly increased taking into account aspects such as stigma often associated with suffering from a mental illness, since some patients prefer therapy applied through an Internet rather than attending an expensive psychotherapeutic session to face with a therapist.

However, despite these advantages, it is important to consider the possible limitations of these interventions. The first is that they do not have the human factor, and therefore, the empathic aspect that is present in the traditional therapies can be reduced causing some patients to be reluctant to this format. Another limitation is the difficulty in designing attractive and useful programs for all patients and that are at least as effective as standard therapy. Another issue is the difficulty in trying to transfer them to clinical practice; sometimes, programs that have shown their effectiveness in the experimental phase have obtained not so positive results in their application in PC. Therefore, implementation studies are essential. It has also been observed that the attitude of professionals is sometimes more negative compared to that of patients regarding this type of interventions. Finally, it is important to consider that many questions still remain unanswered, for example, the mechanisms of action of this therapeutic format are unknown, for which specific patient profiles is more beneficial, or what is the best way to adapt them to different cultural contexts.

There is a lot of research to be done to achieve an effective and efficient application of these programs in health services, and in this way they can be useful for people. In this regard, several lines of work are being opened that will be key to achieving not only the objective of implementing these interventions on PC but also going beyond what traditional models allow to apply psychological treatments. For instance, the Ecological Momentary Assessment (EMAs) and the Ecological Momentary Intervention (EMIs) are strategies that allow to obtain direct information in real time of the person's experiences while in their natural environment as well as to intervene clinically with greater ecological validity. These methodologies are possible thanks to the use of smartphones and sensors integrated in these devices, portable biosensors and the application of personalized evaluation reports. Miller's work stands out⁶⁶ pointing out the revolution that these developments will bring to psychology. At the moment, several reviews have shown that even being new strategies and with important possibilities for improvement there are important benefits in their application in the case of depression by allowing the continuous evaluation of the patient's mood in the natural context thus reducing bias as a reminder, to carry out individualized interventions for each person, as well as the continuous review of the effect of the treatment. Undoubtedly, both EMAs and EMIs are becoming increasingly powerful resources for treatment and prevention due to advances in technological capacity and sophistication regarding data analysis⁶⁷⁻⁷⁰. This line of work is especially relevant for depression due to the characteristics of this disorder, especially fluctuations in symptoms over time; therefore, there is a need to create new evaluation and intervention tools that allow each individual to be served in the best possible way, taking into account their personal characteristics and context. In this regard, the first research studies of Spanish groups are being developed where different aspects of these methodologies are studied in the psychiatric population⁷¹⁻⁷⁴.

Another technological advance that is attracting the attention of researchers is virtual reality and augmented reality. Although there is still insufficient scientific evidence on the application of these tools in depression, there are controlled clinical trials and review and meta-analysis studies in which the effectiveness and effectiveness of virtual reality in a population with anxiety and / or emotional problems⁷⁵⁻⁷⁸ in which it is concluded that it is a promising tool in improving the treatment of this symptomatology.

Despite the above, it is important to bear in mind that the paradigm shift presented by these technological advances applied to psychotherapy implies unprecedented forms of person / machine interaction that can generate new dilemmas and ethical obstacles to achieve the ultimate objective of any psychological intervention; although the data indicate that these scientific innovations are being well

accepted by patients^{55,79} and the programs designed and applied, both through the internet and virtual reality, lack adverse effects⁸⁰ showing themselves as promising alternatives to current therapeutic strategies.

Exist randomized controlled studies conducted in the PC setting in Spain that have successfully applied and tested psychological treatment protocols applied through the Internet for depression.

These studies have proven to be effective and cost-effective compared to traditional treatment.

There are still important barriers to integrate these new technological and clinical advances in the public health system and for this it is necessary to carry out implementation studies.

In addition to the Internet-based treatment programs, there are other technologies such as virtual reality, augmented reality or the use of sensors and smartphones, which have been developed in recent years, which are important to keep in mind since they are going to lead to important advances in this field.

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COMPETING INTERESTS

The authors declare that they have no financial or other competing interests.

REFERENCES

1. World Health Organization. The global burden of disease 2004. Switzerland; 2004.
2. Wittchen HU, Jacobi F, Rehm J, Gustavsson A, Svensson M, Jönsson B, et al. The size and burden of mental disorders and other disorders of the brain in Europe 2010. *Eur Neuropsychopharmacol*. 2011;21(9):655-79.
3. Paykel ES, Brugha T, Fryers T. Size and burden of depressive disorders in Europe. *Eur Neuropsychopharmacol*. 2005;15:411-23.
4. Moussavi S, Chatterji S, Verdes E, Tandon A, Patel V, Ustun B. Depression , chronic diseases , and decrements in health: results from the World Health Surveys. *Lancet*. 2007;370:851-8.
5. Kessler RC, Bromet EJ. The Epidemiology of Depression Across Cultures. *Annu Rev Public Heal*. 2013;119-38.
6. Haro J, Ayuso-Mateos J, Bitter I, Demotes-Mainard J, Leboyer M, Lewis S, et al. ROAMER: roadmap for mental health research in Europe. *Int J Methods Psychiatr Res*. 2014;24:1-14.

7. Mitchell AJ, Vaze A, Rao S, Infi R. Clinical diagnosis of depression in primary care : a meta-analysis. *Lancet*. 2009;374(9690):609-19.
8. King M, Nazareth I, Levy G, Walker C, Morris R, Weich S, et al. Prevalence of common mental disorders in general practice attendees across Europe. *Br J Psychiatry*. 2008;362-7.
9. Gabilondo A, Rojas-farreras S, Vilagut G, Haro JM, Fernández A, Pinto-meza A, et al. Epidemiology of major depressive episode in a southern European country : Results from the ESEMeD-Spain project. *J Affect Disord*. 2010;120(1-3):76-85.
10. Serrano-Blanco A, Palao DJ, Luciano J V, Pinto-Meza A, Luján L, Fernández A, et al. Prevalence of mental disorders in primary care: results from the diagnosis and treatment of mental disorders in primary care study (DASMAP). *Soc Psychiat Epidemiol*. 2010;(45):201-10.
11. Hortal EG, Royo JMV, Abad JMH, Soriano IB, Blanca AJ, Prat MA. Prevalencia y detección de los trastornos depresivos en atención primaria. *Aten Primaria*. 2002;29(6):329-35.
12. Simon GE, Chisholm D, Treglia M, Bushnell D, Group TL. Course of Depression, Health Services Costs, and Work Productivity in an International Primary Care Study. *Gen Hosp Psychiatry*. 2003;(April):293-308.
13. Scott KM, Bruffaerts R, Tsang A, Ormel J, Alonso J, Angermeyer MC. Depression – anxiety relationships with chronic physical conditions : Results from the World Mental Health surveys. *J Affect Disord*. 2007;103:113-20.
14. Parés-Badell O, Barbaglia G, Jerinic P, Gustavsson A, Salvador-Carulla L, Alonso J. Cost of Disorders of the Brain in Spain. *PLoS One*. 2014;9(8).
15. Ferrari AJ, Charlson FJ, Norman RE, Patten SB, Freedman G, Murray CJL, et al. Burden of Depressive Disorders by Country , Sex , Age , and Year : Findings from the Global Burden of Disease Study 2010. *PLoS Med*. 2013;10(11).
16. Nathan P, Gorman J. *A Guide to Treatments that Work*. 4rd ed. Press OU, editor. New York; 2015.
17. Cuijpers P, Reynolds C, Donder T, Li J, Andersson G, Beekman A. Personalized treatment of adult depression: medication, psychotherapy, or both? A systematic review. *Depress Anxiety*. 2012;29(10):855-64.
18. Cuijpers P, van Straten A, Andersson G, van Oppen P. Psychotherapy for depression in adults: A meta-analysis of comparative outcome studies. *Consult Clin Psychol*. 2008; 76(6):909-22.
19. Hollon SD, Ponniah K. A review of empirically supported psychological therapies for mood disorders in adults. *Depress Anxiety*. 2010;932(May):891-932.
20. Cuijpers P, Straten A Van, Warmerdam L. Behavioral activation treatments of depression: A meta-analysis. *Clin Psychol Rev*. 2007;27:318-26.
21. Linde K, Rucker G, Sigterman K, Jamil S, Meissner K, Schneider A. Comparative effectiveness of psychological treatments for depressive disorders in primary care: network meta-analysis. *BMC Fam Pract*. 2015 Aug 19;16:103.
22. Zhang A, Franklin C, Jing S, Bornheimer LA, Hang A, Himle JA, et al. Journal of Affective Disorders The effectiveness of four empirically supported psychotherapies for primary care depression and anxiety: A systematic review and meta-analysis. *J Affect Disord*. 2019;245(November 2018):1168-86.
23. National Collaborating Centre for Mental Health. *Depression. The treatment and management of depression in adults*. London, England: The british psychological society and the royal college of psychiatrists; 2010.
24. Karyotaki E, Smit Y, Holdt-Henningsen K, Huibers M, Robays J, de Beurs D, et al. Combining pharmacotherapy and psychotherapy or monotherapy for major depression? A meta-analysis on the long-term effects. *J Affect Disord*. 2016;194:144-52.
25. Grupo de trabajo de la Guía Clínica sobre el Manejo de la Depresión en el Adulto. *Guía de Práctica Clínica sobre el Manejo de la Depresión en el Adulto*. Avalia-t, editor. Ministerio de Sanidad, Servicios e Igualdad. Agencia de Evaluación de Tecnologías Sanitarias de Galicia (avalia-t); 2014.
26. Cuijpers P. Combined Pharmacotherapy and Psychotherapy in the Treatment of Mild to Moderate Major Depression? *JAMA psychiatry*. 2015;2014-5.
27. McHugh R, Whitton S, Peckham A, Welge J, Otto M. Patient Preference for Psychological vs. Pharmacological Treatment of Psychiatric Disorders: A Meta-Analytic Review. *J Clin Psychiatry*. 2014;74(6):595-602.
28. Haan M De, Ph D, Dyck R Van, Ph D. Patients' preferences in the treatment of depressive disorder in primary care. *Psychiatry Prim Care*. 2004;26:184-9.
29. Gill D, Hatcher S, Gill D, Hatcher S. Antidepressants for depression in medical illness (Review). *Cochrane Database Syst Rev*. 2010;(4).
30. Mohr D, Hart S, Howard I, Julian L, Vella L, Catledge C, et al. Barriers to psychotherapy among depressed and nondepressed primary care patients. *Ann Behav Med*. 2006;32(3):254-8.
31. Titov N. Internet-delivered psychotherapy for depression in adults. *Curr Opin Psychiatry*. 2011;24(1):18-23.
32. Barney L, Griffiths K, Christensen H, Jorm A. Exploring the nature of stigmatising beliefs about depression and help-seeking: implications for reducing stigma. *BMC Public Health*. 2009;9(1):61.
33. Andrews G, Henderson S, Hall W. Prevalence, comorbidity, disability and service utilization: overview of the Australian National Mental Health Survey. *Br J Psychiatry*. 2001;178(2):145-53.
34. Spijker J, Bijl R, de Graaf R, Nole W. Care utilization and outcome of DSM-III-R major depression in the general population: results from the Netherlands Mental Health Survey and Incidence Study (NEMESIS). *Acta Psychiatr Scand*. 2001;104(1):19-2.
35. AEMPS. *Utilización de medicamentos antidepresivos en España durante el periodo 2000-2013*. Madrid; 2015. Available from: <https://www.aemps.gob.es/medicamentosU-soHumano/observatorio/docs/antidepresivos-2000-2013.pdf>.
36. Kazdin A, Blase S. Rebooting psychotherapy research and practice to reduce the burden of mental illness. *Perspect Psychol Sci*. 2011;6(1):21-37.
37. Andrews G, Issakidis C, Sanderson K, Corry J, Lapsley H. Utilising survey data to inform public policy: comparison of the cost-effectiveness of treatment of ten mental disorders. *Br J Psychiatry*. 2004;184(6):526-33.
38. Kazdin A. Technology-Based Interventions and Reducing the Burdens of Mental Illness: Perspectives and Comments on the Special Series. *Cogn Behav Pract*. 2015;22:359-66.
39. Santoft F, Axelsson E, Öst L, Hedman-Lagerlöf M, Fust J, Hedman-Lagerlöf E. Cognitive behaviour therapy for depression in primary care: systematic review and meta-analysis. *Psychol Med*. 2019;28:1-9.
40. Cuijpers P, van Straten A, Warmerdam L. Problem solving therapies for depression: a meta-analysis. *Eur Psychiatry*. 2007; 22:9-15.
41. Gualano M, Bert F, Martorana M, Voglino G, Andriolo V, Thomas R, et al. The long-term effects of bibliotherapy in depression treatment: Systematic review of randomized clinical trials. *Clin Psychol Rev*. 2017;58:49-58.
42. Cuijpers P, Donker T, van Straten A, Li J, Andersson G. Is guided self-help as effective as face-to-face psychotherapy for depression and anxiety disorders? A systematic review and meta-analysis of comparative outcome studies. *Psychol Med*.

- 2010;40(12):1943-57.
43. Twomey C, O'reilly G, Meyer B. Effectiveness of an individually-tailored computerised CBT programme (Deprexis) for depression: A meta-analysis. *Psychiatry Res.* 2017;256:371-7.
 44. Benjamin D, Jr JWW. NIH Public Access. 2013;43(2).
 45. García-Herrera J, Nogueiras-Morillas V, Muñoz-Cobos F, Morales-Asensio J. *Guía de Práctica Clínica para el Tratamiento de la Depresión en Atención Primaria.* Málaga; 2011.
 46. Kazdin A, Rabbitt S. Novel models for delivering mental health services and reducing the burdens of mental illness. *Clin Psychol Sci.* 2013;1(2):170-91.
 47. Cuijpers P, Donker T, Johansson R, Mohr D, van Straten A, Andersson G. Self-guided psychological treatment for depressive symptoms: a meta-analysis. *PLoS One.* 2011;6(6).
 48. Andersson G. Internet-delivered psychological treatments. *Annu Rev Clin Psychol.* 2016;12(1):157-79.
 49. Richards D, Richardson T. Computer-based psychological treatments for depression: a systematic review and meta-analysis. *Clin Psychol Rev.* 2012;32(4):329-42.
 50. Spek V, Cuijpers P, Nyklicek I, Riper H, Keyzer J, Pop V. Internet-based cognitive behaviour therapy for symptoms of depression and anxiety: a meta-analysis. *Psychol Med.* 2006;37(03):319.
 51. Andrews G, Cuijper P, Craske M, McEvoy P, Titov N. Computer therapy for the anxiety and depressive disorders is effective, acceptable and practical health care: a meta-analysis. *PLoS One.* 2010;5(10).
 52. Kaltenthaler E, Parry G, Beverley C, Ferriter M. Computerised cognitive-behavioural therapy for depression: systematic review. *Br J Psychiatry.* 2008;193(3):181-4.
 53. Andrews G, Newby JM, Williams AD. Internet-Delivered Cognitive Behavior Therapy for Anxiety Disorders Is Here to Stay. *Curr Psychiatry Rep.* 2015;17(1):1-5.
 54. Bauer S, Golkaramny V, Kordy H. E-Mental-Health. *Psychother* 2005. 2005;50:7-15.
 55. Karyotaki E, Kemmeren L, Riper H, Twisk J, Hoogendoorn A, Kleiboer A, et al. Is self-guided internet-based cognitive behavioural therapy (iCBT) harmful? An individual participant data meta-analysis. *Psychol Med.* 2018;48(15):2456-66.
 56. Botella C, Moragrega I, Baños R, García-Palacios A. Online predictive tools for intervention in mental illness: the OPTIMI project. *Stud Heal Technol Inf.* 2011;163:86-92.
 57. Botella C, Mira A, García-Palacios A, Quero A, Navarro M., Riera López del Amo T, et al. Smiling is fun: a Coping with Stress and Emotion Regulation Program. *Stud Heal Technol Inf.* 2012;181:123-7.
 58. Barlow DH, Allen LB, Choate ML. Toward a Unified Treatment for Emotional Disorders. *Behav Therivior.* 2004;35:205-30.
 59. Lejuez CW, Hopko DR, Hopko SD. A Brief Behavioral Activation Treatment for Depression: Treatment Manual. *Behav Modif.* 2014;25(2):255-86.
 60. Seligman MEP, Csikszentmihalyi M. Positive psychology: An introduction. *Am Psychol.* 2000;55(1):5-14.
 61. Mira Pastor A. Eficacia diferencial de un programa de intervención auto-aplicado a través de Internet para la prevención y el tratamiento de la depresión leve o moderada con apoyo y sin apoyo por parte del terapeuta. 2014.
 62. Romero-Sanchiz P, Nogueira-Arjona R, García-Ruiz A, Luciano JV, García-Campayo J, Gili M, et al. Economic evaluation of a guided and unguided internet-based CBT intervention for major depression: Results from a multi-center , three-armed randomized controlled trial conducted in primary care. *PLoS One.* 2017;12(2):1-15.
 63. Castro A, García-palacios A, García-campayo J, Mayoral F, Botella C, García-herrera JM, et al. Efficacy of low-intensity psychological intervention applied by ICTs for the treatment of depression in primary care: a controlled trial. *BMC Psychiatry.* 2015;15:1-10.
 64. Cuijpers P, Riper H. Internet Interventions For Depressive Disorders: An Overview. *Rev Psicopatología y Psicol Clínica.* 2014;19(3):209-16.
 65. Eells TD, Barrett MS, Wright JH, Thase M. Computer-Assisted Cognitive - Behavior Therapy for Depression. *Psychotherapy.* 2014;51(2):191-7.
 66. Miller G. The Smartphone Psychology Manifesto. *Perspect Psychol Sci.* 2012;7(3):221.
 67. Hogenelst K, Schoevers RA. Clinical Psychology Review Mood disorders in everyday life: A systematic review of experience sampling and ecological momentary assessment studies. *Clin Psychol Rev.* 2012;32(6):510-23.
 68. Ebner-priemer UW, Trull TJ. Ecological Momentary Assessment of Mood Disorders and Mood Dysregulation. *Ecol Momentary Assess Mood Disord Mood Dysregulation.* 2009;21(4):463-75.
 69. Stephen MS, Aguilera A, Mohr DC. Ecological momentary interventions for depression and anxiety. *Depress Anxiety.* 2017;34(6):540-5.
 70. Wenze SJ, Miller IW. Clinical Psychology Review Use of ecological momentary assessment in mood disorders research. *Clin Psychol Rev.* 2010;30(6):794-804.
 71. Barrigón ML, Berrouguet S, Carballo JJ, Bonal-Giménez C, Fernández-Navarro P, Pfang B, et al. User profiles of an electronic mental health tool for ecological momentary assessment: MEmind. *Int J Methods Psychiatr Res.* 2017;26(1):1-9.
 72. Colombo D, Palacios AG, Alvarez JF, Patané A, Semonella M, Cipresso P, et al. Current state and future directions of technology-based ecological momentary assessments and interventions for major depressive disorder: protocol for a systematic review. *Syst Rev.* 2018;7(1):1-7.
 73. Hidalgo-Mazzei D, Mateu A, Reinares M, Murru A, Bonnin M, Varo C, et al. Psychoeducation in bipolar disorder with a SIMPLE smartphone application: Feasibility , acceptability and satisfaction. *J Affect Disord.* 2016;200:58-66.
 74. Magallón-Neri E, Kirchner-Nebot T, Fornis-Santacana M, Calderón C, Planellas I. Ecological Momentary Assessment with smartphones for measuring mental health problems in adolescents. *World J Psychiatr.* 2016;6(3):303-10.
 75. Fodor LA, Cote CD, Cuijpers P, Szamoskozi tefan, David D, Cristea IA. The effectiveness of virtual reality based interventions for symptoms of anxiety and depression : A meta- analysis. *Sci Rep.* 2018;(December 2017):1-13.
 76. Botella C, Baños R, García-Palacios A, Quero S. Virtual Reality and Other Realities. In: Hofmann S, Asmundson GJ, editors. *The Science of Cognitive Behavioral Therapy.* United Kingdom: Academic Press; 2017. p. 551-90.
 77. Botella C, Fernández-Álvarez J, Guillén V, García-Palacios A, Baños R. Recent Progress in Virtual Reality Exposure Therapy for Phobias: A Systematic Review. *Curr Psychiatry Rep.* 2017;19(7).
 78. Botella C, Serrano B, Baños RM, García-Palacios A. Virtual reality exposure-based therapy for the treatment of post-traumatic stress disorder: a review of its efficacy, the adequacy of the treatment protocol, and its acceptability. *Neuropsychiatr Dis Treat.* 2015;2533-45.
 79. Guillén V, Baños RM, Botella C. Users ' Opinion About a Virtual Reality System as an Adjunct to Psychological Treatment for Stress-Related Disorders: A Quantitative and Qualitative Mixed-Methods Study. *Front Psychol.* 2018;9(June):1-14.
 80. Rozental A, Magnusson K, Boettcher J, Andersson G, Carlbring P. Journal of Consulting and Clinical Psychology For Better or Worse: An Individual Patient Data Meta- Internet-Based

Cognitive Behavior Therapy For Better or Worse: An Individual
Patient Data Meta-Analysis of Deterioration Among Participants

Receiving Int. J Consult Clin Psychol. 2017;85(2):160-77.