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Current Opinion in Psychology

Internet-based treatment of depression

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A considerable number of randomized controlled trials have shown that Internet-based interventions are effective in the treatment of depression. In the past years a large number of studies are currently focusing on how this knowledge can be used and implemented in mental health care, including preventive services, primary care, specialized mental health care, and general medical care. Furthermore, research on Internet interventions can directly incorporate many new technological applications of the Internet and mobile technology, serious gaming, avatars and automatic emotion recognition, and smartwatches. There is no doubt that this field of research will have a large and lasting impact on mental health care.

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Current Opinion in Psychology 2015, **4**:131–135

This review comes from a themed issue on **Depression**

Edited by **Christopher G Beevers**

For a complete overview see the Issue and the Editorial

Available online 30th December 2014

http://dx.doi.org/10.1016/j.copsyc.2014.12.026

Introduction

Major depressive disorders constitute a major challenge for health care in the upcoming decades [1]. Major depressive disorders (MDD) are currently ranked fourth worldwide in terms of disease burden, and are expected to rank first in disease burden in high-income countries by the year 2030 [2]. The loss of quality of life for patients and their relatives is substantial, and is worse than in chronic medical conditions such as hypertension, diabetes, and arthritis [3]. Furthermore, the economic costs associated with depressive disorders are huge [4], especially because of production losses, but also by direct and indirect medical costs.

Psychological treatments are considered to be one of the most important interventions to contribute to a reduction of the disease burden of depressive disorders [5••]. Most patients in Western countries prefer psychological treatment above pharmacological treatments [6]. These treatments have been well developed in recent decades, and several evidence-based psychological treatments exist [7]. However, these treatments have not been scaled up to the extent that they may help reduce the disease burden of mental disorders [8•]. Less than half of the people experiencing mental disorders receive treatment, and this is much lower in adolescents, older adults, people with lower socio-economic status, and people from ethnic minorities. Furthermore, the most dominant format in which psychotherapies are delivered is via individual face-to-face contact. This format is much more expensive and time-consuming than other formats, such as guided self-help, and Internet-based treatments. At the same time, most research shows that formats other than individual treatments can also be effective [9,10].

In this paper, we will first present evidence showing that Internet-based guided self-help therapies are effective in the treatment of depression, and the series of studies that have been conducted in recent years to examine how the knowledge that these interventions are effective can be implemented in mental health care. Then we will discuss some recent developments that move away from the 'traditional' Internet interventions, toward mobile health, avatars and serious gaming.

Internet-based interventions are effective in the treatment of depression

A considerable number of randomized controlled trials have shown that Internet-based guided self-help interventions are effective in the treatment of depression [11•]. In a meta-analysis of studies comparing Internet-based guided self-help with control groups an effect size of $d = 0.56$ (95% CI: 0.41–0.71) was found. In another meta-analysis only studies among patients with a major depressive disorders were included [12]. This resulted in an effect size of $g = 0.78$ (95% CI: 0.59–0.96) compared with control conditions, which corresponds with a numbers-needed-to-be-treated (NNT) of two.

These effects correspond well with the effect sizes found for face-to-face psychotherapies for depression [13], such as cognitive behavior therapy and interpersonal psychotherapy. For these treatments effect sizes ranging from 0.5 to 0.8 are found when compared with control groups. Direct comparisons between different types of treatments and treatment formats typically show that there are no major differences between types of therapy for depression or types of treatment format [7].

In a meta-analysis of 21 studies directly comparing face-to-face treatments with guided self-help therapies for depressive and anxiety disorders, no significant difference was found (differential effect size $d = 0.02$) [9]. We also did not find a significant difference at 3, 6 and 12 months follow-up, nor did we find that the risk of dropping out from treatment was higher (or lower) in the guided self-help groups, compared with the face-to-face conditions [13]. These studies focused on guided self-help through the Internet but also through more conventional methods, such as self-help books with telephone support. A more recent meta-analysis focused specifically on trials that compared Internet-based guided self-help treatments with face-to-face therapies (so, no other guided self-help therapies were included) [14••]. The thirteen studies included in this meta-analysis were not only aimed at depression, but also at other problems such as social anxiety disorder, panic disorder, tinnitus, male sexual dysfunction, and body dissatisfaction. The overall difference of all studies was again virtually zero ($d = -0.01$) and not significant.

Guided Internet-based interventions can be considered as a specific type of guided self-help. Guided self-help can be defined as a psychological treatment in which the patient takes home a standardized psychological treatment protocol and works through it more or less independently [15]. This protocol describes the different steps the patient has to take for applying a generally accepted psychological treatment to himself or herself. The protocol can be presented in book form, or through other media, such as a television, video, computer, or the Internet. Contacts with therapists are not aimed at developing a traditional relationship between therapist and patient, and are only aimed at providing support and, if necessary, added explanation for working through the standardized psychological treatment. Contacts with therapists can be provided through personal contact, by telephone, by e-mail, or by any other available means of communication [15].

Applying Internet-based guided self-help in mental health care

Most of the research on Internet-based guided self-help for depression has been conducted in randomized trials among self-referred depressed people from the community who were recruited by means of advertisements, leaflets and the Internet. But the knowledge that these interventions are effective in the treatment of depression could be implemented in routine mental health care in several ways. Several research groups in Europe, the US and Australia are working on this part of the research agenda [16].

One interesting area where this knowledge can be applied is prevention [13]. Prevention interventions typically have a low intensity nature in terms of access and program intensity, which make Internet-interventions very well suited for this purpose. Several recent and ongoing trials are examining the possibilities of Internet-based interventions to prevent depression [17–20].

Other trials are aimed at examining if and how Internet interventions aimed at the treatment of depression can be integrated in routine primary care [21–23]. Internet-interventions can also be useful in specialized mental health care services, for example during the period between registration and the first contact with a therapist [24], in a 'blended' format where parts of the treatment are delivered in person and other parts through the Internet [25], or as relapse prevention and maintenance treatments [26,27].

A considerable number of trials has also focused on examining whether Internet interventions can be useful for depressed patients who also have a general medical disorder, such as cancer [28,29], diabetes [30,31], and heart disease [32,33]. The application of Internet-based interventions is also examined in areas outside health care, such as school [34], and in occupational settings [35,36].

Innovative applications in e-mental health: self-guided Internet interventions

In the previous paragraph, we saw that Internet-based guided self-help is effective in the treatment of depression that these effects are comparable to those of face-to-face treatments, and that many studies are now examining how this knowledge can be applied in mental and public health care. There are, however, also several new and innovative developments in the field of Internet-based interventions that currently have considerable interests among researchers.

One issue is the development of Internet interventions without any kind of human support. As indicated, Internet-based interventions with some kind of professional support have been found to be effective. When there is no support, however, and the patient has to work through the intervention all by himself or herself, the effects are significantly smaller than those of guided interventions [10,37]. In a meta-analysis of unguided Internet-based interventions for depression we found a small effect size of $d = 0.28$ (95% CI: 0.14–0.42) [38•]. If it would be possible to develop unguided interventions that are as effective as supported interventions, that would be much more efficient and less costly, allowing much broader implementation, because no infrastructure for delivery of the interventions, training and supervision of therapists would be needed. So, several trials continue to examine the effects of self-guided Internet interventions [39–41].

One could also argue that unguided Internet-interventions could be useful in low income and middle income

countries without an infrastructure for mental health care. These interventions may be somewhat less effective than guided self-help interventions or face-to-face treatments, they can still contribute considerably to a reduction of the disease burden. If the alternative is that depressed patients receive no treatment whatsoever, then these interventions can reduce the disease burden of depression, especially when the number of people using them is large [42•].

Technological innovations and Internet interventions

Technological innovations are an important driving force to new developments in e-health and mobile-health. It is beyond the scope of this paper to give a comprehensive overview of all new developments related to technological innovations, but there are some important examples we should mention.

One important innovation is mobile Internet and smartphones. Real-time assessments [43,44•], which are also called 'ecological momentary assessment' or 'experience sampling' offer new possibilities to measure and predict elements of mental health in the natural environment of patients. These types of measurements are often related to various other events [45]. Smartphones also have several sensors, such as the accelerometer that can be used to measure movement or GPS sensors that measure location [46]. The smartphone offers a wealth of (often unknown) indirect data as well. For example with innovative apps the actual use of the phone in terms of phoning, text messaging or Internet or social media use, can also be applied to develop personalized models for changes in depression over time and to predict changes in mood. This allows the development of personalized advice and 'ecological momentary interventions' which are based on the personal information of the user.

But there are other more technologically driven developments. A growing number of randomized trials have shown for example that interventions based on virtual reality (VR) have strong effects on depression [47]. This also holds for an even more recent development, that is, augmented reality (AR), that blends seamlessly virtual and real life components for example in the treatment of arachnophobia. Both VR and AR extend the array of exposure based formats between and interceptive and vivo exposure [48]. One advantage of AR over VR that it is cheaper and still more easy to implement in routine practice. 'Serious gaming' has also been shown to be effective in the treatment of depression in adolescents [49••]. Other technological applications that can be expected to change Internet interventions include the development of avatars, smartwatches and things like 'google glass'. Last but not least, an increased number of programs enable secured videoconferencing between professionals and between therapists and their patients for both consulting and therapeutic interventions with promising results for clinical effectiveness regarding depression treatments [50].

Although it is not clear how exactly these technological developments will change currently existing Internet interventions, it is clear that the impact will be large and that these will have a large impact on this field and the field of mental health treatments in general.

Conclusions

Since their first development in the late 1990s Internet-based treatments of common mental disorders, a considerable number of randomized controlled trials have shown that these interventions are effective in the treatment of depression, especially when they are using a guided self-help format. Although Internet-interventions without professional guidance are less effective than guided interventions, they still may have significant effects on reduction of depressive symptoms. Currently a large number of studies are examining how this knowledge can be used and implemented in mental health care, including preventive services, primary care, specialized mental health care, and general medical care. One interesting research question is if and how unguided interventions can be as effective as guided self-help interventions as this would enable large scale upscaling of low cost mental disorder prevention and treatment initiatives. We also showed that Internet interventions can build directly on the many new technological applications of the Internet and mobile technology, through ecological momentary assessment and intervention, serious gaming, avatars and automatic emotion recognition, and smartwatches.

The field of research on Internet interventions is booming and there are many possibilities for all kinds of innovative interventions and applications. There should be no doubt that this research will have a large and lasting impact on the field mental health care, the therapeutic process and patient–therapist relationships and thus it will change this field considerably. Robust evidence based studies should accompany however new technology based depression treatments before they are implemented in routine care.

Conflict of interest

None declared.

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