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Application of the cognitive-behavior therapy principles in the development of e-mental health tools: The case of Be a Mom, a web-based psychological intervention to prevent postpartum depression

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Abstract

E-mental health tools are a new format of treatment delivery that can increase population's access to mental health services. Its effectiveness is higher when grounded on evidence--based therapeutic protocols, such as Cognitive-Behavior Therapy (CBT). We aim to understand how CBT principles can be applied in the development of e-mental health tools, more specifically, in web-based interventions. We use the case example of the *Be a Mom* program, a web-based psychological intervention, grounded on the principles of CBT, designed to prevent postpartum depression and targeting high-risk postpartum women in the Portuguese population. We describe how the design of *Be a Mom* was grounded in CBT, by addressing: a) general CBT principles; b) its therapeutic mechanisms; and c) organization of sessions. Also, we discuss the relevance of the therapeutic alliance in web--based interventions and the importance of evidence-based interventions. By providing insight on how the principles of CBT can be operationalized in an innovative delivery format, we can contribute to the further development of web-based interventions, as well as to increase awareness and knowledge among mental health professionals about the similarities between the principles underlying web-based and face-to-face CBT interventions.

Keywords: *Be a Mom*, cognitive-behavior therapy, e-mental health, postpartum depression.

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Aplicação dos princípios da terapia cognitivo-comportamental no desenvolvimento de ferramentas e-mental health: O caso de *Be a Mom*, uma intervenção psicológica online para prevenir a depressão pós-parto

Resumo

As ferramentas e-mental health são um novo formato de aplicação de intervenções que potenciam o acesso da população aos serviços de saúde mental. A sua eficácia é maior quando são assentes em protocolos terapêuticos baseados na evidência, como a Terapia Cognitivo-Comportamental (TCC). Assim, procuramos compreender como os princípios da TCC podem ser aplicados no desenvolvimento de ferramentas de saúde mental, mais especificamente, em intervenções psicológicas *online*. Utilizámos o caso-exemplo do programa *Be a Mom*, uma intervenção psicológica *online*, assente nos princípios da TCC, concebida para prevenir a depressão pós-parto e destinada a mulheres em risco elevado no período pós-parto. Descrevemos como o *design* do *Be a Mom* foi fundamentado na TCC, considerando: a) princípios gerais da TCC; b) os seus mecanismos terapêuticos; e c) a organização de sessões. Também discutimos a relevância da aliança terapêutica em intervenções *online* e a importância de intervenções baseadas na evidência. Ao esclarecer como os princípios da TCC podem ser operacionalizados num formato inovador, podemos contribuir para o desenvolvimento de intervenções *online*, bem como para o aumento da consciencialização e do conhecimento nos profissionais de saúde mental sobre as semelhanças entre os princípios subjacentes às intervenções de TCC online e presenciais.

Palavras-chave: *Be a Mom*, terapia cognitivo-comportamental, e-mental health, depressão pós-parto.

E-MENTAL HEALTH TOOLS AS A WAY TO REDUCE THE TREATMENT GAP FOR MENTAL HEALTH DISORDERS: THE CASE OF POSTPARTUM DEPRESSION

Mental illness is a public health concern worldwide. Lifetime prevalence of mental disorders among adults ranges from 12.2% to 48.6% (World Health Organization International Consortium in Psychiatric Epidemiology, 2000). Portugal is one of the European countries with the highest prevalence of mental disorders, with data from the National Study of Mental Health showing that almost a quarter of the participants (22.9%) met criteria for the diagnosis of a psychiatric condition in the last 12 months (Almeida et al., 2013). Mental disorders are highly prevalent and highly disabling conditions, resulting in high socioeconomic costs for healthcare

systems and society at large (Lopez et al., 2006). However, despite its high impact, the treatment gap for mental disorders is still large across the world (Kohn et al., 2004).

This is also the case for postpartum depression (PPD), which is the most prevalent clinical condition in the postpartum period, affecting about 13% of Portuguese childbirth women (Maia et al., 2011). Untreated PPD poses adverse and long-term consequences for the mother (Woolhouse et al., 2014), the mother-child interaction (Field, 2010), and the infant's cognitive and socioemotional development (Slomian et al., 2019). However, despite the existence of effective treatments, few women with PPD seek professional help to address their mental health difficulties (McGarry et al., 2009). In a recent study conducted with the Portuguese population, only 13.6% of women presenting clinically relevant depression symptoms had sought professional help to address their symptoms (Fonseca et al., 2015), and this is related with knowledge (e.g., poor mental health literacy), attitudinal (e.g., stigma) and structural (e.g., time and financial constraints, struggles with transportation and childcare issues) barriers (Bina, 2008; Fonseca et al., 2015).

E-mental health tools (i.e., the use of the internet and related electronic communication technologies to deliver mental health information, services and care; Riper et al., 2010) are an innovative form of treatment delivery that can overcome some of the treatment barriers (e.g., stigma, structural barriers), given its reduced costs, flexibility and improved accessibility (Andersson & Titov, 2014). Therefore, e-mental health tools can be a form of outreach to individuals who may not access traditional face-to-face services (Taylor & Luce, 2003), as well as an appropriate way to scale-up preventive interventions for psychological disorders (Hayes et al., 2016). Considering the rapid growth and increased use of the internet and related electronic communication technologies during the last years, e-mental health tools can be an alternative or supplement to the more traditional delivery formats of psychological intervention (Barak et al., 2009).

One example of e-mental health tools is web-based psychological interventions. Web-based psychological interventions are highly structured intervention programs, based on evidence-based therapeutic protocols that are later operationalized and programmed to be administered via the internet (Mohr et al., 2013). The nature and content of the intervention protocols are similar to face-to-face interventions, although differences may be found in how information is delivered and in the communication with the therapist, which is often asynchronous (Andersson, 2015). Usually, these intervention programs attempt to create positive change and/or improve knowledge, awareness and understanding (about the problem) by providing (mental) health-related information materials and using interactive online components (Barak et al., 2009). There is evidence that web-based interventions have a greater likelihood of being acceptable and effective if they are grounded

in a theoretical background (Mohr et al., 2013), such as Cognitive-Behavioral Therapy (CBT).

In this paper, we will describe and discuss on how the principles of CBT can be applied in the development of web-based psychological interventions for the prevention and/or treatment of psychological disorders, particularly anxiety and mood disorders. As an illustrative example, we will describe how these principles underlie the development of a web-based psychological intervention to prevent postpartum depression among high-risk women in the Portuguese population: the *Be a Mom* program.

COGNITIVE-BEHAVIORAL PRINCIPLES APPLIED TO THE DEVELOPMENT OF E-MENTAL HEALTH TOOLS: THE CASE OF BE A MOM

CBT has been proven effective for the treatment of several mental disorders, namely mood and anxiety disorders (Butler et al., 2006). CBT has shown effectiveness as an individual face-to-face treatment, but it is also the psychotherapeutic model that almost exclusively has been transferred to other delivery formats such as guided self-help, telephone delivery and group treatment (Andersson, 2015). Moreover, there is prior evidence that CBT protocols tend to be easily operationalized in a web-based structured format (Cuijpers et al., 2008). Relying on a structured format which include therapists' treatment manuals and patients' materials, CBT was better suited than other psychotherapeutic models to be adapted to the web-based format (Hedman et al., 2012). There is evidence of the effectiveness of web-based psychological interventions to prevent and treat mood and anxiety disorders (Deady et al., 2017; Lal & Adair, 2014; van't Hof et al., 2009). There is also preliminary evidence on the effectiveness of web-based psychological interventions for perinatal mood disorders (Lee et al., 2016), suggesting its applicability to the perinatal period.

The *Be a Mom* program is a web-based, short-term, self-guided selective/indicated preventive intervention, grounded in the cognitive-behavioral therapeutic model (Fonseca, Pereira, et al., 2018), and incorporates the recent contributions of third-wave CBT approaches (e.g., self-compassion and acceptance and commitment therapy) applied to the perinatal context (Cree, 2015; Klausen, 2005). In this section, we will present and discuss how the design of the *Be a Mom* program was grounded in the cognitive-behavioral therapeutic model, in terms of: a) general CBT principles; b) cognitive-behavior therapeutic mechanisms underlying the intervention; and c) organization of sessions.

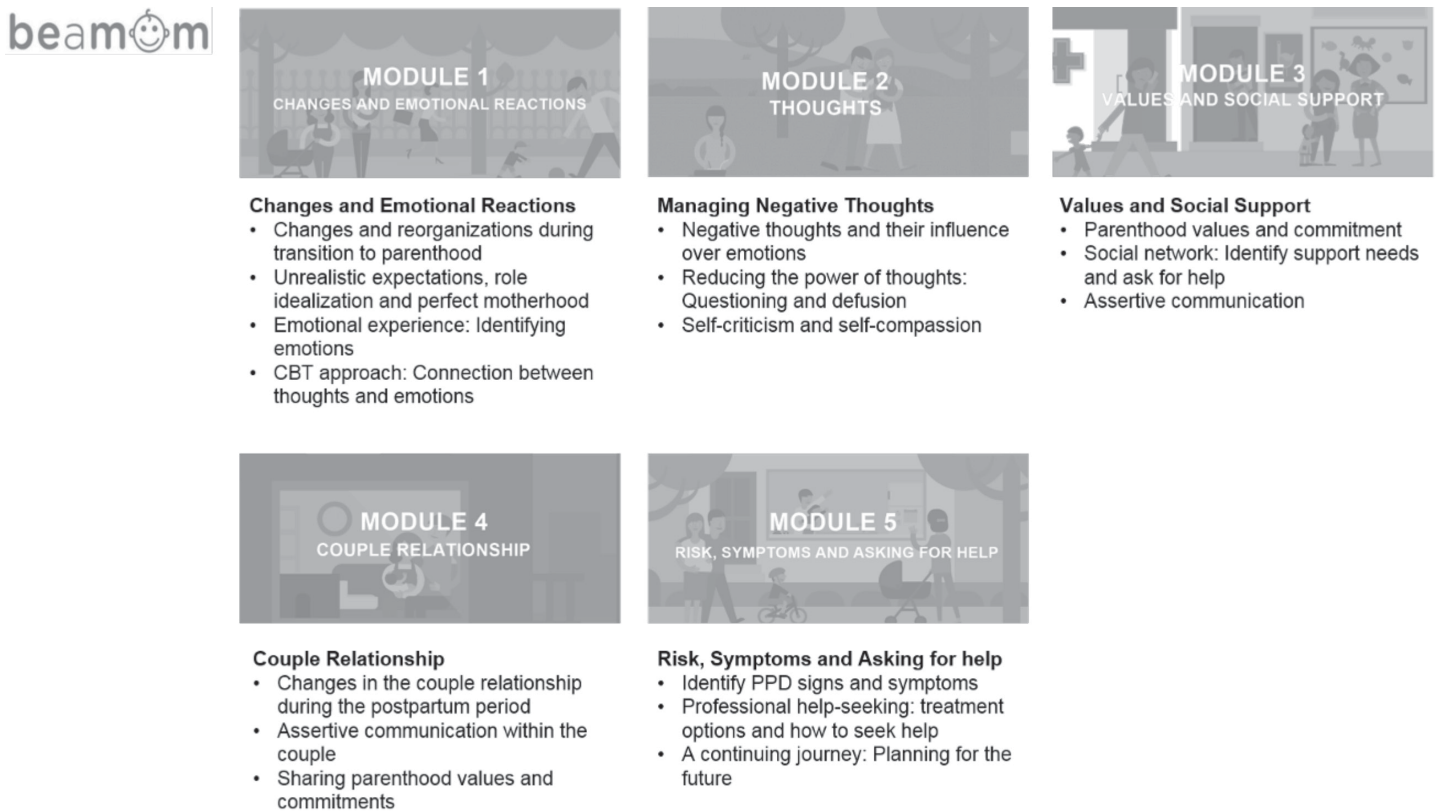
General CBT principles

The psychotherapeutic model of CBT grounds on some important key principles (Beck, 1995) that guide the development and implementation of the therapeutic protocols. These key principles are also applied in the development and implementation of web-based psychological interventions, such as the *Be a Mom* program.

1. *The focus of CBT is problem-oriented, with an emphasis on the present*. CBT main focus is on "here and now" problems and difficulties that are pertinent to the patient, which are described in specific terms, and in ways to resolving or reducing them, and improve the patient's current functioning and wellbeing (Beck, 1995). Web-based interventions target specific problems/conditions (e.g., depressive and anxiety symptoms, maladaptive health behaviors, social isolation) and their main objective is to enhance cognitive, behavioral and/or emotional change to deal with the problems experienced (Barak et al., 2009). The *Be a Mom* program was developed to prevent PPD among women who presented risk factors for this clinical disorder. Therefore, the *Be a Mom* program targets the challenges of a specific period (early motherhood) in women's life and it was designed to address both the promotion of CBT-based psychological processes/skills (e.g., emotion regulation abilities) and the minimization of risk factors (e.g., lack of social support, poor marital relationship) to prevent the development of a clinical diagnosis of PPD (Fonseca, Pereira, et al., 2018). Each of the modules addresses one or two specific thematic contents, as presented in Figure 1. It is important to note that the content of the modules is customized to the user's needs (e.g., content related to the promotion of the couple's satisfaction and intimacy is not displayed in case of single mothers; Fonseca, Pereira, et al., 2018).

Figure 1

Be a Mom: Structure and content



2. *CBT is educative in nature*. CBT ultimately aims to teach patients to be their own therapists, by helping them to understand their current difficulties and to develop skills to address those difficulties (Beck, 1995). Web-based psychological interventions include didactic information to educate about different topics (e.g., the link between cognitions, emotions and behaviors) which may be presented through text but also using other multimedia options (e.g., pictures/graphics, animations, audio and video) to engage patients with the program (Barak et al., 2009). The *Be a Mom* comprises psychoeducative information about several topics (e.g., the changes occurring during the transition to parenthood and its emotional impact, the role of useful vs. non-useful cognitions, the changes in couple relationship) and it relies on different formats to provide such information, including text, animations, and audio files (with exercises). At the end of each module, a two-three minutes video is presented in which a mental health professional synthesizes the main content of the module (Fonseca, Pereira, et al., 2018). By using different multimedia tools, there is an increased likelihood of the information being understood by the patients, which may translate into a great ability to put the skills/changes into practice.

3. *CBT emphasizes collaboration and active participation*. CBT grounds on the establishment of a collaborative relationship between the patient and the therapist (collaborative empiricism) and on the active role of the patient to achieve therapeutic change (Beck, 1995). Web-based interventions rely on interactive tools (e.g., interactive exercises and experiences, self-monitoring), feedback and support tools (e.g., personalized feedback based on user responses, either displayed by automatic programming or with guidance by human technicians; Barak et al., 2009). In each module, the *Be a Mom* includes interactive exercises with personalized feedback to support learning concerning psychoeducative information. One example of exercise is the *Expected vs. Felt Emotions exercise*, where women were asked to identify how they imagined they would feel after the infant's birth (during pregnancy) and how they actually feel, with the aim of normalizing and identifying the diversity of women's emotional experience. Interactive exercises were also used to allow self-monitoring of particular aspects (e.g., *Thoughts Record exercise*, to understand the link between thoughts, emotions and behaviors) or to help to put into practice the strategies and skills that are implemented in session and are expected to be rehearsed by the women during the following weeks (e.g., *Valued Behaviors into Practice exercise*, which consists in selecting one behavior that is consistent with the women's parenting values and compromise to putting it into practice during the next week).

4. *CBT is a structured and time-limited treatment*. Given their problem-oriented and present-focus nature, CBT is per nature a time-limited treatment (Beck, 1995). Web-based interventions have a pre-determined number of modules, each addressing specific thematic contents (Kelders, 2012). Likewise, the *Be a Mom* program

has a modular setup, including five modules, each addressing one or two specific thematic contents (see Figure 1). The participants were instructed that they should complete one module per week, although a slower pace was also allowed, in light of the high caregiving requirements that women usually face in the early postpartum period. They were also given the option of pausing the module and resuming the last page visited during subsequent access (Fonseca, Pereira, et al., 2018).

Cognitive-behavior therapeutic mechanisms underlying the intervention

The rationale for the development of the therapeutic protocols for the prevention and treatment of emotional disorders grounds on the cognitive-behavioral understanding of the specific emotional disorder, including the factors that contributed to the occurrence of symptoms and for its maintenance over time (Beck, 1995; Beck et al., 1985; Beck et al., 1979), and this applies both to face-to-face and for web-based therapeutic protocols. The development of the *Be a Mom* program was grounded on the cognitive-behavioral comprehension of postpartum emotional disorders.

Cognitive-behavioral approaches for PPD (Milgrom et al., 1999; Wenzel & Kleiman, 2015) ground on the Beck's cognitive model for depression (Beck, 1987; Beck et al., 1979) and have postulated that: a) some women present biological and psychological vulnerability factors that put them at increased risk of experiencing emotional distress and of developing PPD; b) these vulnerabilities are often activated in times of stress, including the stress related with the caregiving demands after childbirth; and c) dysfunctional core beliefs (reflecting negative global judgments of the self, of others or of the future, e.g., "I am a failure" or specific judgments about maternal competence, e.g., "I'm not a good mother" or about what it means to be a mother, e.g., "I should be more dedicated to my baby") emerge from vulnerability factors and play an important role in the development of PPD (Wenzel & Kleiman, 2015). The specific motherhood-related beliefs are crucial in understanding the development of PPD, as there is evidence that depressive symptoms result from an interaction between specific types of dysfunctional beliefs and stress-inducing events that are congruent with the important components of these beliefs (Coyne & Whiffen, 1995). When activated by motherhood-related stress-inducing events, specific dysfunctional beliefs may influence the way women interpret the events, leading to the occurrence of negative automatic thoughts (Fonseca & Canavarro, 2018), which are associated with the maintenance and exacerbation of depressive symptoms. Moreover, the way in which women themselves and their support network (e.g., partner, family, friends) respond to their PPD symptomatology (e.g., thoughts, emotions) may contribute to exacerbate or maintain it. For example, the

women's negative responses to their symptoms may include negative cognitive (e.g., thoughts of parental inadequacy), affective (e.g., feelings of guilt, anger, anxiety, frustration) and behavioral (e.g., poor parenting skills, difficulties in mother-baby interaction, marital conflicts) responses (Milgrom et al., 1999), which may accentuate PPD symptoms. It is important to note that interpersonal maintenance factors are particularly relevant for PPD. The postpartum period is associated with significant changes and disturbances in interpersonal relationships (e.g., with partner, with parents, with friends), and women often describe discrepancies between desired levels of support and the support they actually receive in that period (O'Hara, 1994). Congruently, lack of social support and poor quality of marital relationship have been constantly identified as risk factors for the occurrence of PPD (Beck, 2001; Beck, 2002; Robertson et al., 2004).

Finally, Milgrom et al. (1999) also highlighted the important role of sociocultural factors, which can have an important role both in precipitating and in maintaining/exacerbating PPD. Examples of relevant sociocultural factors include unrealistic myths/expectations about motherhood (e.g., the myth of perfect motherhood or the joy of motherhood) and the lack of social support structures (due to the fact that many couples currently live apart from their families of origin, namely due to professional circumstances).

More recently, third-wave CBT approaches have added to the understanding of the occurrence of psychopathology, highlighting the important role of other constructs, such as self-criticism (*vs.* self-compassion; Gilbert, 2005) and psychological (in)flexibility (Hayes et al., 2006). Although third-wave CBT approaches have seldom applied to the perinatal context (Cree, 2015; Klausen, 2005), there is some recent research focusing on the role of such constructs in the maintenance of postpartum depressive symptoms.

On the one hand, there is some evidence that early negative experiences (e.g., critical and hostile interactions with attachment figures) may contribute to the development of a self-critical thinking style (i.e., intense and persistent form of internal dialogue that expresses hostility and contempt towards the self when one is unable to attain their self-imposed high-standards) that affects the individual's interpretation of events (Cree, 2015; Gilbert, 2005; Shahar, 2015). Women with a self-critical thinking style may feel unable to comply with their self-imposed high standards of "perfect motherhood" (Maia et al., 2012), which may translate into higher levels of postpartum negative automatic thoughts, a more negative evaluation of their thoughts as unwanted (i.e., metacognitive appraisal of their thoughts), which consequently may lead to higher depressive symptoms (Pedro et al., 2019). Conversely, a more self-compassionate attitude towards one's own suffering (Gilbert, 2005) has been associated with decreased self-criticism and with a non-judgmental approach to the

women's privative negative experiences (emotions and thoughts), which has been associated with less depressive symptoms (Cohen, 2010; Fonseca & Canavarro, 2018).

On the other hand, psychological inflexibility, which is a core concept in the Acceptance and Commitment Therapy (ACT) model, has been considered as an important transdiagnostic process associated with psychopathology, including depression (Levin et al., 2014). Psychological inflexibility may be defined as the "rigid dominance of psychological reactions over chosen values and contingencies in guiding action" (Bond et al., 2011, p. 678), which often occurs when individuals attempt to avoid experiencing unwanted internal events. Postpartum women with high self-imposed standards concerning the maternal role may have greater difficulties in accepting their private negative emotions and thoughts, being fused with such internal experiences (i.e., "If I think that I am a bad mother, this is because I am a bad mother") and engaging in experiential avoidance strategies (e.g., rumination, behavioral avoidance of activities with the baby because of fear that private internal experiences arrive; Fonseca, Monteiro, & Canavarro, 2018). Although these strategies may seem effective in short-term, they may begin to deviate women from engaging in behaviors that are in accordance with their parenting values (to avoid negative experiences), which in the long-term can lead to a perception of failure/ineffectiveness in their maternal role and translate into more depressive symptoms (Fonseca, Monteiro, & Canavarro, 2018; Li et al., 2016; Zhu et al., 2015). Conversely, the promotion of psychological flexibility – a self-regulatory skill in which individuals are able to regulate their emotions and actions despite the experience of unpleasant thoughts and feelings (Hayes et al., 2006) – has been considered a protective factor for the development of PPD (Monteiro et al., 2019).

In sum, the cognitive-behavioral approaches for PPD allow us to identify some modifiable targets of intervention (*vulnerability factors*) that should be addressed to prevent a clinical diagnosis of PPD: 1) Cognitive vulnerabilities, including dysfunctional beliefs about motherhood (e.g., role idealization and maternal responsibility) often grounded in sociocultural factors (the "myth of perfect motherhood") and a self-critical thinking style, which impact the way women interpret the events; 2) Non-acceptance of the diversity of internal experience (i.e., negative emotions and thoughts) during the postpartum period, which translate into cognitive (e.g., metacognitive appraisal of the thought's and emotion's content as inadequate), affective (e.g., guilt) and behavioral (e.g., avoidance) responses that increase the likelihood of negative thoughts and feelings, and prevent women from engaging in actions that are relevant to their parenting values; 3) Lack and/or inadequate social support; and 4) Poor quality of marital relationship. The *Be a Mom* program aims to address each one of these vulnerabilities in its modules. In Table 1, we describe the *Be a Mom's* goals for each module, and how they relate with these different vulnerabilities.

Table 1
Be a Mom *program: Modules, vulnerability factors address and goals*

Module	*Vulnerabilities addressed*	*Module's goals*
1 Changes & Emotions	Non-acceptance of the diversity of internal experiences Cognitive vulnerabilities (dysfunctional beliefs about motherhood and self-critical thinking style)	Educate about the changes and reorganizations (at the individual, familiar and social levels) during the transition to parenthood; Normalize the usual discrepancy between the women's expectations and the postpartum reality (in terms of changes/reorganizations), and promote the acceptance and coping with the characteristics of this life period; Normalize and identify the diversity of women's emotional experience, and promote its non-evaluative acceptance of the different emotions; Educate about the cognitive-emotional-behavioral link (understanding the relationship between thoughts, emotions and behaviors).
2 Cognitions	Non-acceptance of the diversity of internal experiences Cognitive vulnerabilities (dysfunctional beliefs about motherhood and self-critical thinking style)	Normalize and identify the occurrence of negative automatic thoughts in the postpartum period; Educate about the individual's cognitive functioning (e.g., how cognitive fusion and thoughts suppression strategies contribute to the maintenance and exacerbation of negative thoughts); Promote cognitive flexibility (e.g., acceptance and non-evaluative approach to previously avoided private experiences, cognitive defusion) and self-compassion as ways to deal with the women's private cognitive experience.
3 Values & Support	Non-acceptance of the diversity of internal experiences Lack and/or inadequate social support	Identify, create and clarify parenthood values, and making committed actions in accordance to those values; Reduce women's social isolation; Identify support needs, sources of support and activate practical and emotional support from others; Promote assertive communication skills.
4 Couple Relationship	Non-acceptance of the diversity of internal experiences Poor quality of marital relationship	Educate about the changes in couple relationship (e.g., intimacy and satisfaction, sexual relationship) during the transition to parenthood; Promote effective communication, negotiation and conflict management skills within the couple; Promote affection and intimacy within the couple; Normalize and accept differences in parenthood values within the couple and negotiate and commit with shared values.
5 Signs of PPD & Help-seeking		Educate about signs and symptoms of PPD, treatment options and its benefits; Develop a plan for professional help-seeking, in case of need. Prevent future difficulties and challenges, by identifying them and reflecting on how the learned skills may be used in future situations.

The cognitive-behavior therapeutic protocols often include a relapse prevention session by the end of treatment that aims to teach clients to anticipate and cope with the possibility of symptoms' relapse (Beck, 1995). In the *Be a Mom* program, this is targeted in the last module, where the occurrence of future motherhood-related challenges is discussed (e.g., first time the child is sick, return to work) and the women are encouraged to critically appraise the usefulness of strategies learned during the program and how these learned skills may help women to address those challenges. Finally, and given the preventive nature of the *Be a Mom* program and the importance to promote further professional help-seeking in the presence of clinically relevant postpartum depressive symptoms, the last module of *Be a Mom* also targets education about signs and symptoms of depression and promotes the development of a professional help-seeking plan in case of need (Fonseca, Pereira, et al., 2018).

Organization of sessions

CBT sessions are structured to increase the treatment efficiency, improve learning and focus therapeutic efforts on specific skills training (Beck, 1995; Fenn & Byrne, 2013). A CBT session usually begins with an agenda-setting process for the session and with a following up on the previous session's homework/tasks, after which the main thematic content of the session is addressed in a collaborative way between the therapist and the patient (e.g., through psychoeducative information, practical exercises, etc.). By the end of the session, the therapist revises the main contents of the session and usually assigns homework activities to extend the patient's efforts beyond the confines of the treatment session and to reinforce learning of CBT skills (Thase & Callan, 2006). Web-based interventions are usually organized into modules with a pre-defined structure (Andersson & Titov, 2014; Cuijpers et al., 2008) that includes the presentation of session goals, the main thematic content and the final review of the session. In the case of *Be a Mom*, each module begins with the presentation of the session goals, after which the main thematic content of the module is presented interchangeably with several interactive exercises. Specifically, psychoeducative information is combined with the presentation of practical strategies to be implemented and rehearsed by the women during the following weeks. The module ends with a brief summary of the module content (provided in a two-three minutes video by a mental health professional), an assessment of the relevance and utility of the module's content by the user, and with the presentation of a homework activity to guarantee therapeutic practice (Fonseca, Pereira, et al., 2018).

A NOTE ON THE THERAPEUTIC ALLIANCE

Although in CBT's past the therapeutic relationship (and its characteristics of warmth, genuineness and accurate empathy) was seen as necessary but not sufficient itself for positive change in therapy (Beck et al., 1979), it has been increasingly considered as one of the most valuable factors in therapy, suggesting that the use of both technical and interpersonal factors can result in favorable outcomes (Leahy, 2008). In web-based psychological interventions, the degree of contact with therapists may vary from unguided self-help programs (without assistance of a therapist) to guided self-help, with the regular support of a therapist (van't Hof et al., 2009). Communication with the therapist can be synchronous (i.e., that takes place in real time, e.g., telephone, chat) or asynchronous (e.g., email; Sucala et al., 2012). Unguided and guided web-based interventions have different advantages and disadvantages. Meta-analytic studies have shown that unguided/self-guided interventions show less promising results than guided web-based psychological interventions (Andersson & Titov, 2014; Cuijpers et al., 2010; Richards & Richardson, 2012), and one explanation for these results may be that the human support in guided interventions increases treatment adherence, leading to lower dropout compared to unguided/self-guided interventions (Karyotaki et al., 2015). On the other hand, self-guided interventions can reach a very large audience in a cost-effective way (Andersson, 2015), being adequate tools for preventive purposes.

The therapist alliance in web-based interventions has been also a matter of interest, although there are inconsistent findings concerning the importance of the therapeutic alliance for treatment outcomes (Andersson, 2015). In a recent review, the results supported similar levels of therapeutic alliance in web-based interventions compared to face-to-face interventions (Sucala et al., 2012). Congruently, it is important to note that, as mentioned by Andersson (2015), the development of a therapeutic alliance may not necessarily require direct face-to-face contact with a therapist, but may include other interactions (e.g., treatment interface components or text material) that can boost empathy and alliance.

The *Be a Mom* program is a self-guided intervention, so no direct contact with mental health professionals exists during the sessions. *Be a Mom* includes only asynchronous communication channels: reminders (sent by email if women go seven days without accessing the program) and an e-mail contact, mostly used for technical support. To improve user engagement within the program, *Be a Mom* includes one character – *the psychologist* – who presents the session goals and the key messages of each module and proposes exercises during the modules (Fonseca, Pereira, et al., 2018). In fact, when examining the perceptions of the

users, more than 80% of the women who had access to the program felt that the character (psychologist) helps them to feel a greater closeness to the program, and more than 60% of women reported that they have created a relationship of empathy and trust with the psychologist's character (Fonseca, Monteiro, Alves et al., 2018).

EVIDENCE-BASED NATURE OF INTERVENTIONS

Evidence-based interventions are treatments that have been proven effective (to some degree) through outcome evaluations. CBT has been investigated in fairly rigorous clinical trials and this has been replicated in web-based psychological interventions, showing the efficacy of web-based psychological interventions for the prevention and treatment of several emotional disorders (Deady et al., 2017; Lal & Adair, 2014; van't Hof et al., 2009), as previously mentioned.

The development of the *Be a Mom* followed an iterative formative evaluation process adapted from the Stage I of the Stage Model of Behavioral Therapies Research (Rounsaville et al., 2001), and including the methodological recommendations for the development of web-based behavioral interventions (Danaher & Seeley, 2009). The formative evaluation process included two phases: a) a scoping literature review to identify the main characteristics and therapeutic goals of existing preventive interventions for PPD; b) a focus group with mental health professionals working with the perinatal population, to identify the perceived needs of the stakeholders (Fonseca, Pereira, et al., 2018). The formative evaluation process led to the development of a preliminary version of the *Be a Mom*. A pilot randomized trial was conducted, including 194 postpartum women (intervention group: n = 98; control group: n = 96), to gather preliminary evidence of the *Be a Mom's* efficacy, as well as on its acceptability and feasibility. The results suggested that women in the intervention (*Be a Mom* group) experienced a significantly larger decrease in both depressive and anxiety symptoms from baseline to post-intervention compared to the control group, supporting the preliminary efficacy of the program. Although the dropout rates were about 60% (i.e., only 40% of women completed the program), the *Be a Mom* program was found to be a useful and relevant program among users (Fonseca et al., 2020). The user's perceptions about the different program features were also considered in the development of the final version of the *Be a Mom* program, which will be examined through a full powered randomized controlled trial to assess its (cost)-effectiveness.

CONCLUDING REMARKS

In this paper, we have tried to systematically present and discus how the principles of CBT can be applied to the development of web-based interventions, using the *Be a Mom* as a case example. This might be important, as the design of web-based interventions should be informed by psychotherapeutic models, in order to increase its acceptability and effectiveness (Mohr et al., 2013). A deeper understanding on how the general principles of CBT, its therapeutic mechanisms and organization of sessions could be operationalized in a different delivery format may contribute for the further development of web-interventions, but also to make mental health professionals more aware and knowledgeable about the similarities between the principles underlying web-based and face-to-face CBT interventions.

Moreover, e-mental health interventions have been increasingly recognized as a treatment delivery format that may widen the individual's access to effective treatments, by overcoming some of the treatment uptake barriers. However, the advantages of e-mental health tools are not limited to geographical convenience or instrumental circumstances (e.g., flexible schedule). The advances on research on the cost-effectiveness of e-mental health tools and the discussion about its potentialities *vs.* limitations and risks has highlighted the transversal role that technologies can play in the provision of psychological services, either as a sole option or in complementarity with face-to-face interventions (Andersson & Titov, 2014). However, this does not mean that web-based psychological interventions are the most adequate delivery format for every person. For example, the patient's familiarity with the internet, the severity/characteristics of the problem, or the efficacy of web-based interventions in the specific clinical condition should be some of the aspects to be considered when recommending web-based psychological interventions (Andersson, 2015). Currently, there is still limited knowledge about the characteristics that determine which patients are more suitable and benefit more from web-based interventions (Andersson & Titov, 2014). Moreover, important questions concerning web-based assessment and diagnosis (e.g., difficulties in checking and/or gathering additional information) and with therapeutic issues (e.g., therapeutic alliance) should also be considered. Taken these aspects into account, several international associations [e.g., American Psychological Association (2013), British Psychological Society (Berger & Skinner, 2009), Australian Psychological Society (2011)] developed specific guidelines for the use of e-mental health tools. Recently, the Portuguese Board of Psychologists also made available a set of recommendations for the use of information and communication technologies to deliver psychological services (Carvalho et al., 2019).

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