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FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES

DOCTORAL SCHOOL EVIDENCE-BASED PSYCHOLOGICAL ASSESSMENT AND INTERVENTIONS



Ph.D. THESIS SUMMARY

E-REBT

**AN REBT-INSPIRED WEB-BASED PLATFORM:
EFFICACY, THERAPEUTIC RELATIONSHIP
AND MECHANISMS OF CHANGE**

AUTHOR: Ph.D. CANDIDATE MUREȘAN VLAD CONSTANTIN

SCIENTIFIC ADVISOR: PROFESSOR Ph.D. DAVID DANIEL

CLUJ-NAPOCA

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Key words: Cognitive behavioral therapy, online interventions, avatars

CHAPTER I. THEORETICAL BACKGROUND

1.1. Introduction and research problem

Emotional disorders are widespread, as the lifetime risk of developing depression and anxiety disorders are between 6.7% and 18.1% according to the NIMH (Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Kessler, Berglund, et al., 2005). Depression is linked with poverty (Weich & Lewis, 1998) and is one of the main cause of disease burden in high-income countries (Mathers & Loncar, 2006), while anxiety negatively impacts daily life even at subclinical levels (Mendlowicz & Stein, 2000). Moreover people with an anxiety disorder are three to five times more likely to go to the doctor and six times more likely to be hospitalized than people without an anxiety disorder (Greenberg et al., 1999; Kessler & Greenberg, 2002).

Cognitive behavior therapy (CBT) is an effective and broadly used form of therapy for a great range of psychological disturbances, including depression and anxiety disorders (Hollon, Stewart, & Strunk, 2006). In most modern societies, the internet has become fully integrated into the daily lives of a large part of the population be it for work, entertainment, or retrieving health information. This expansion of the internet offers new treatment opportunities for patients and mental health professionals alike.

The standard of care for emotional disorders is cognitive-behavioral therapy (Elkin et al., 1989) however there are a great number of people who do not have access to empirically validated treatment programs. This is a problem for developed countries as well as emerging economies. Emotional disorders are associated with high health care costs both for clinical level or sub threshold disturbance intensity (Simon, Ormel, VonKorff, & Barlow, 1995). As an alternative to services offered in person (face-to-face) by mental health professionals, online cognitive-behavioral interventions (including online self-directed CBT) have been introduced as a cheaper, anonymous, and location independent solution (Barnett, 2005; Kiropoulos et al., 2008). There is evidence suggesting that self-directed treatments for anxiety and depressive disorders are clinical and cost-effective (Bower, Richards, & Lovell, 2001).

Compared to services offered in person (face-to-face) by mental health professionals, online cognitive-behavioral interventions have emerged as a cheaper, anonymous, and location independent solution (Barnett, 2005; Kiropoulos et al., 2008). Online CBT has certain advantages compared to classical therapy like reducing waiting lists and therapist time (Wright et al., 2005), saving travel expenses, increased anonymity for the client or accessibility for disabled patients (Marks et al., 2003). (Barnett, 2005; Kiropoulos et al., 2008). There is evidence suggesting that self-directed treatments for anxiety and depressive disorders are clinical-effective and cost-effective (Bower et al., 2001), though more research is needed to reach a definitive conclusion.

CHAPTER II. RESEARCH AIMS AND OVERALL METHODOLOGY

Although the topic of online application of psychotherapeutic interventions is a relatively new field of research, there are already a large amount of papers on efficacy, including randomized clinical trials and meta-analysis. However, there are a few key factors (detailed in the previous chapter) that might limit the efficacy of such interventions. This research aims to address these limitations while trying to answer a few questions related to the therapeutic relationship developed online in a web-based intervention, and the efficacy of specific cognitive restructuring strategies employed in REBT practice.

The first step in developing an online web-based intervention based on Elis' ABCDE model of emotional disturbance is to evaluate if current online psychotherapeutic interventions are efficient in modifying the proposed mechanisms of change in CBT (namely cognitions) similar to classical face-to-face therapy. A meta-analysis will be conducted on the efficacy of online interventions to change negative emotions, symptoms and cognitions. A meta-analysis refers to methods that focus on contrasting and combining results from different studies, in the hope of identifying patterns among study results, sources of disagreement among those results, or other interesting relationships that may come to light in the context of multiple studies. In its simplest form, meta-analysis is normally done by identification of a common measure of effect size. A weighted average of that common measure is the output of a meta-analysis, and is a reliable index of effect size for the sample of studies included (Borenstein, Hedges, Higgins, & Rothstein, 2011).

Following the development of the new automated web-based platform for treating dysfunctional emotions, our objectives will be to investigate its efficacy, evaluate the perception of the therapeutic relationship and develop a novel way of enhancing it, and looking into more detail on the efficacy of individual techniques of cognitive restructuring in an online environment. These objectives will be tested using the randomized clinical trial format. The randomized clinical trial (RCT) is a specific type of scientific experiment, and the gold standard for a clinical trial. The key feature of RCTs is that study subjects, after recruitment are randomly allocated to receive on or other of the alternative treatments (or conditions) under study. After randomization the groups follow the exact same procedure, and the only difference between the groups is the active condition. RCTs usually compare an active treatment condition to placebo, wait-list or standard treatment practices (Chalmers et al., 1981; Machin & Fayers, 2010; Schulz, Altman, Moher, & for the CONSORT Group, 2010).

Figure 1 presents the workflow of the studies included in this thesis.

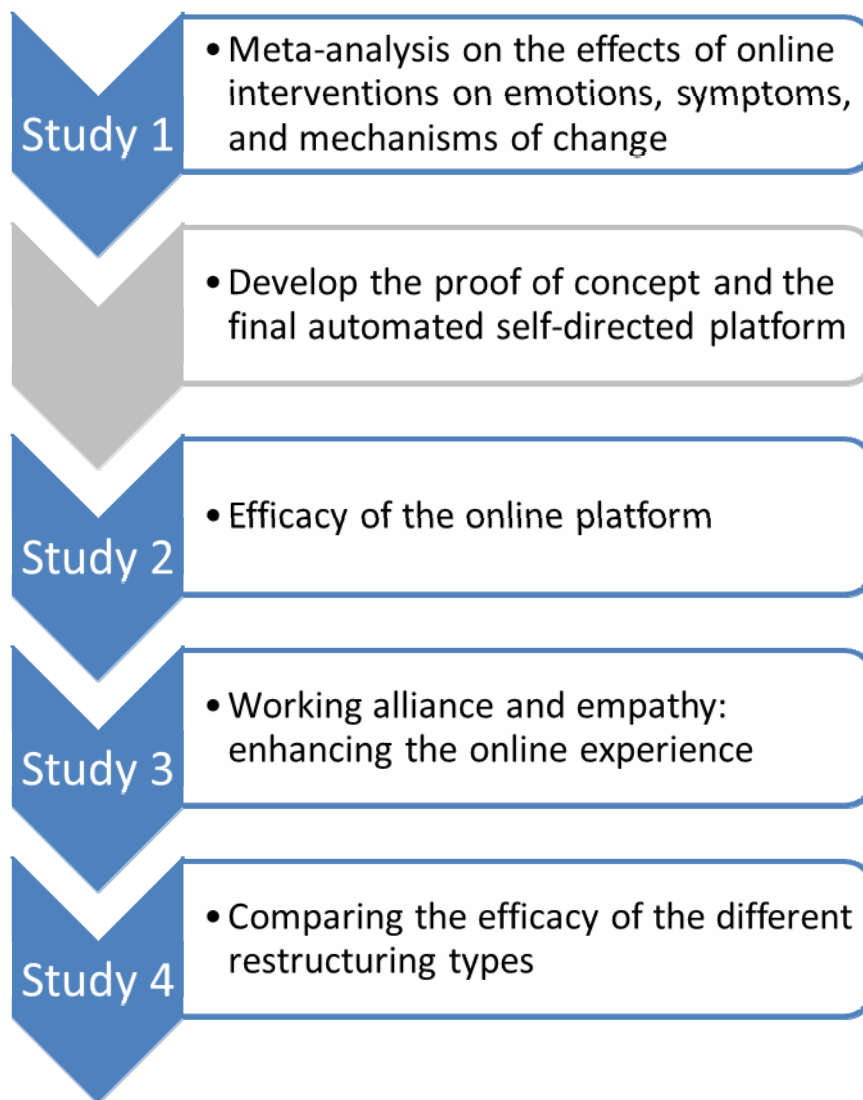


Figure 1. Workflow of studies included in the thesis

2.1. Theoretical advances and practical implications

Several previous meta-analyses analyzed online cognitive-behavioral interventions and found moderate to large effect sizes. While establishing the efficacy of online CBT for emotional disorder, the meta-analyses did not explore whether patient cognitions mediated clinical effects (Spek, et al., 2007). As mediators are the factors responsible for therapeutic change, a test of efficacy of treatment is not a test of the theory guiding that treatment (David & Montgomery, 2011). A new meta-analysis is necessary to evaluate both mechanisms of change and classical outcomes involved in psychopathology (i.e. symptoms, emotions and quality of life), in order to strengthen the link between CBT theory and its online applications in clinical practice.

While the flexibility and adaptability of an web-based system is clearly inferior to face-to-face therapy, the standardization and high structure of the medium lends itself very well to the study of specific, small components of therapy, that otherwise would be difficult to measure in a classical setting because of the inherent difficulty controlling of confounding variables. Given this opportunity, the present research will evaluate the individual efficacy of the different restructuring styles in rational-emotive behavior therapy. The results of this line of research have practical implications in predicting the outcome of a specific cognitive restructuring in REBT practice, thus enabling practitioners to select the arguments that patients' rational beliefs respond to, in turn increasing the efficacy of therapy.

2.2. Innovations and implications for the community

Taking into consideration the limits of existing self-directed web-based cognitive-behavioral interventions, a new system will be developed based on Ellis' model of emotional disturbance (Ellis, 1994), focused on evaluative cognition as the proximate cause of emotional dysfunction that incorporates a personalized clinical conceptualization, and content written especially for the web. The web-based system will be made freely accessible for the public. While access to psychotherapeutic interventions is limited, especially in Romania (because of lack of funding from the Social Security System, low socioeconomic status of the people who would benefit most from therapy, the stigma associated with going to a psychotherapist, and the lack of education concerning psychological conditions) a freely accessible, anonymous intervention would greatly benefit the community, both in terms of education, and actual psychotherapeutic intervention.

CHAPTER III. ORIGINAL RESEARCH

Study 1. Emotional outcomes and mechanisms of change in online cognitive-behavioral interventions. A quantitative meta-analysis of clinical controlled studies.¹

Depression and anxiety disorders are amongst the most prevalent disorders, with lifelong risks of developing such disorders between 6.7% and 18.1% according to the National Institute of Mental Health (Kessler, Chiu, et al., 2005; Kessler, Berglund, et al., 2005). Depression is often associated with unemployment and poverty (Weich & Lewis, 1998) and major depression is currently the leading cause of disease burden in North America and other high-income countries, and the fourth-leading cause worldwide (Mathers & Loncar, 2006). Anxiety disorders significantly compromise quality of life and psychosocial functioning even at subthreshold levels (Mendlowicz & Stein, 2000). Patients affected with emotional disorders like depression and anxiety face serious disability in their personal and professional lives, and such disorders have a lasting impact on the individual and his/her family, relationships and quality of life.

Cognitive-Behavioral Therapy

Cognitive-behavioral therapy (CBT) is the best researched psychological treatment approach to emotional and behavioral problems (Butler, Chapman, Forman, & Beck, 2006). The purpose of cognitive-behavioral interventions is to improve patient functioning by modifying negative automatic thoughts and underlying core beliefs, and by changing dysfunctional behavioral patterns responsible for the problem targeted in therapy. The cognitive conceptualization of emotional disorders consists of identifying the cognitions (e.g., automatic thoughts, core beliefs, and irrational beliefs) that mediate the relation between negative life events and dysfunctional emotions (Ellis, 1994).

Cognitive-behavioral interventions see cognitive mediators as the proximal cause of emotional disturbance. Cognitive-behavioral interventions employ a wide variety of techniques intended to help the patients overcome difficulties by teaching them skills for modifying beliefs, identifying and changing irrational thinking, and replacing distorted perspectives with more rational, realistic, and useful patterns of thinking.

Online Cognitive-Behavioral Therapy

As an alternative to services offered in person (face-to-face) by mental health professionals, online cognitive-behavioral interventions (including online self-directed CBT) have emerged as a cheaper, anonymous, and location independent solution (Barnett, 2005; Kiropoulos et al., 2008). Online CBT may reduce therapist time (Wright et al., 2005), reduce waiting lists, save travel expenses, allow the patient to work in complete anonymity and allow access to people with disabilities who could not otherwise benefit from traditional, in-person, “talk” therapy (e.g., people with hearing loss or those unable to leave the house) (Marks et al., 2003). The Internet has become an extremely versatile medium, partly because of emerging technologies that enrich the user’s experience via audio, video presentations, two-way video chat and virtual 3-D environments. Cognitive-behavioral therapy lends itself very well to adaptation to an online format as it is a structured, manualized treatment approach that

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combines psycho-education and homework exercises while encouraging patients to ultimately become their own therapist. The level of therapist involvement in online CBT interventions can vary from no “live” therapist assistance, to minimal therapist contact (e.g., by e-mail or telephone), to amounts of involvement equivalent to that seen in classic individual face-to-face therapy (e.g., conducted in real time text or video chat) (Barak, Hen, Boniel-Nissim, & Shapira, 2008).

While establishing the efficacy of online CBT for anxiety and depression, these meta-analyses did not explore whether patient cognitions mediated clinical effects. Evidence supporting change in hypothesized CBT mediators, as well as in clinical outcomes, would further support online CBT as a viable treatment approach (Kazdin, 2007) (see Figure 1).

The goal of the current meta-analysis was to investigate whether the effects of online cognitive-behavioral therapy are consistent with CBT theory. Specifically, we plan to test the hypothesis that CBT effects on emotional outcomes are accounted for by changes in cognitive factors. To achieve this goal, we first replicated previous findings supporting the efficacy of online CBT (Barak et al., 2008; Spek et al., 2007). Second, we investigated associations between cognitive factors (putative mechanisms of change) and emotional outcomes. Lastly, we explored the impact of online CBT on patients with emotional problems of clinical intensity versus those with emotional problems of subclinical intensity. Clinical intensity problems were defined as those which meet DSM-IV-TR diagnostic criteria. Subclinical issues are defined as symptoms of depression or anxiety that are not severe enough to meet the criteria for a clinical diagnosis according to the American Psychiatric Association (American Psychiatric Association, 2000).

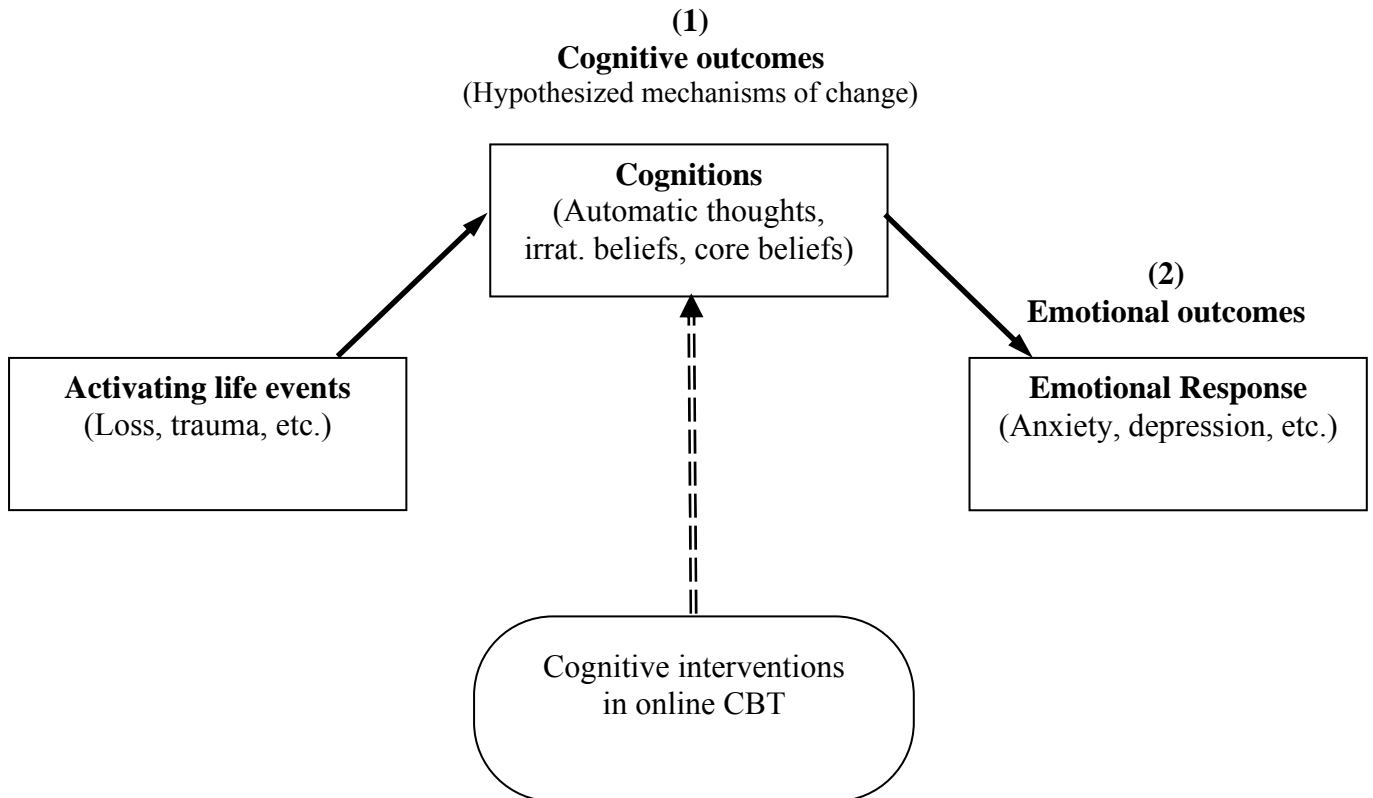


Figure 1 Clinical conceptualization and therapeutic model of Cognitive-Behavioral Therapy

Method

The sample included studies identified through a computer search of articles in English in the Medline, PsychInfo, and PsychArticles databases from January 1980 to March 2011. The key terms entered were *psychotherapy and internet and randomized trial*, *psychological and online and clinical trial*, *online therapy and web and controlled trial*, and all combinations of these terms. The initial search resulted in 1,182 potentially relevant articles. Inclusion criteria were (a) randomized clinical trial investigating the impact of CBT delivered online, (b) patients included in clinical trials had clinical or subclinical intensity depression or an anxiety disorder from the “Anxiety disorders” section of the DSM-IV-TR (APA, 2000), (c) studies included a measure of mediating cognitions, (d) the inclusion of a control group, and (e) studies provided sufficient data to allow for calculation of effect sizes. Eleven randomized clinical trials were selected based on these criteria (see Figure 2). Two clinical trials (Robinson et al., 2010; Warmerdam, van Straten, Jongma, Twisk, & Cuijpers, 2010) each studied two experimental groups. As the groups were independent, all were included in the analyses. Effect sizes from the 11 studies were based on a total of 90 effects.

For the analysis of data, we chose Cohen’s d (1988) as a measure of effect size. The value of Cohen’s d was reported by the authors for 34 effects in five studies. For the other studies that offered no effect size estimates, effect sizes were computed using Cohen’s formula for d , which is, the difference between the means of the experimental and control group divided by the pooled standard deviation. We computed d values in this way for 58 effects. For studies that only offered t or r values, we used the formulae suggested by Hunter & Schmidt (2004) for calculation of d , and in the cases where only F , chi-square or p values were available, we computed Cohen’s d using computer software designed for this purpose (ClinTools Software for Windows, Version 4.0; The meta-analysis calculator). As for the studies offering only F contrast as an estimate for individual effect sizes, we computed the value of d using the formulae provided by Rosenthal, Rosnow, and Rubin (2000).

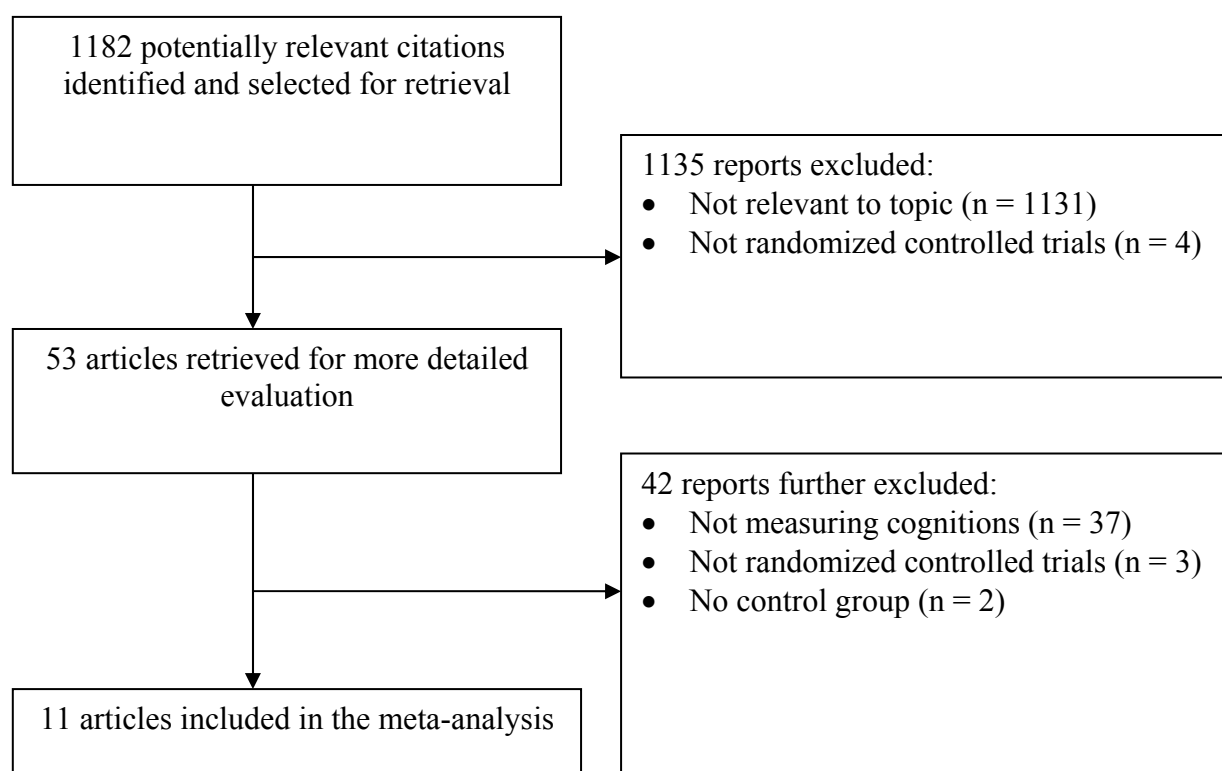


Figure 2. QUORUM flowchart

Results

Only one effect per intervention group was included in the overall effect size estimate ($d=.71$, $SD=.37$) indicating the effect of online CBT interventions on both cognitive (hypothesized mediators) and emotional (outcomes) factors. Due to the fact that the studies varied widely in sample size, the overall d value was corrected for sample size, and we obtained a weighted mean value (D) of .67, $VarD=.09$, indicating a moderate to large effect size based on Cohen's criteria. Taking all the studies into consideration, the 95% confidence interval about the mean was .50 to .84, $p<.05$, which indicates that the effect size differs statistically from zero. Descriptive data about individual effect sizes for each study is presented in Table 1.

Table 1

Study characteristics and effect sizes (Cohen's d)

<i>Study</i>	<i>N</i>	<i>Type of problem</i>	<i>Control type</i>	<i>Type of online intervention</i>	<i>Effect size per study (Cohen's d)</i>	<i>No. of effect sizes per study</i>
Carlbring et al. (2006)	60	clinical (PD)	wait-list	Custom self-help CBT	1.03	7
Carlbring et al. (2001)	41	clinical (PD)	wait-list	Custom self-help CBT	1.01	9
Hirai & Clum (2005)	27	sub-clinical (PTSD)	wait-list	Custom self-help CBT	1.16	6
Kenardy et al. (2003)	83	sub-clinical (ANX)	wait-list	Custom self-help CBT	.43	5
Klein et al. (2006)	28	clinical (PD)	information only	Panic Online	1.34	10
O'Kearney et al. (2006)	38	sub-clinical (DEP)	information + physical exercise	MoodGym	.22	3
Robinson et al. (2010) ¹	50	clinical (GAD)	wait-list	VirtualClinic	.97	5
Robinson et al. (2010) ²	47	clinical (GAD)	wait-list	VirtualClinic	.94	5
Ruwaard et al. (2010)	58	clinical (PD)	wait-list	Custom self-help CBT	.55	8
Titov et al. (2010)	40	clinical (GAD, PD, SP)	wait-list	Custom self-help CBT	.35	3
Warmerdam et al. (2010) ¹	51	sub-clinical (DEP)	wait-list	Coping with Depression	.42	9
Warmerdam et al. (2010) ²	51	sub-clinical (DEP)	wait-list	Custom Problem Solving	.58	9
Wims et al.	22	clinical	wait-list	Custom self-	.31	8

<i>Study</i>	<i>N</i>	<i>Type of problem</i>	<i>Control type</i>	<i>Type of online intervention</i>	<i>Effect size per study (Cohen's d)</i>	<i>No. of effect sizes per study</i>
(2010)		(PD)		help CBT		

Note. PD = Panic disorder; PTSD = Post-traumatic stress disorder; ANX = Anxiety symptoms; DEP = Depressive symptoms; GAD = Generalized anxiety disorder; SP = Social Phobia.

Effect size did not vary significantly with the sample size, $r = -.23, p > .05$; the relation can be seen in Graph 1.

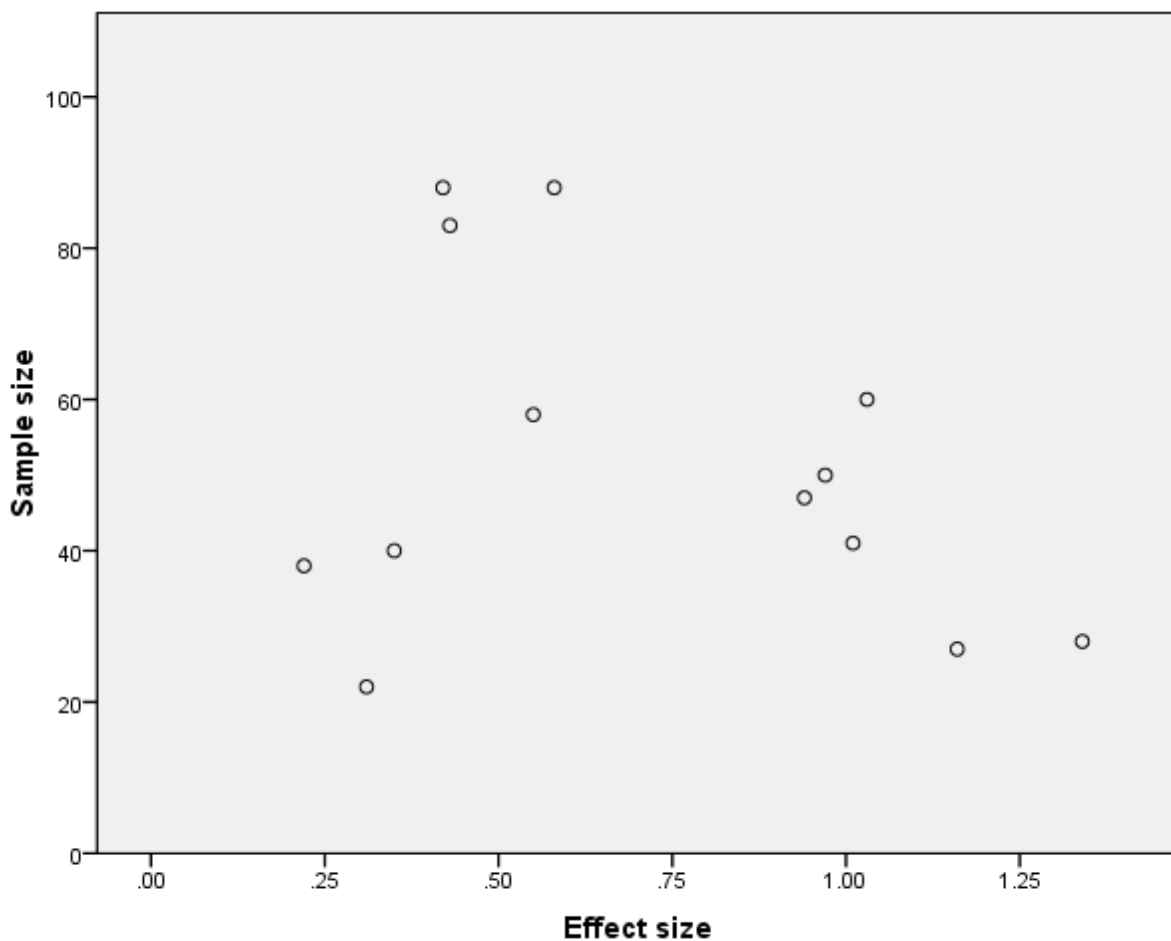


Figure 3 *Effect sizes (Cohen's d) and sample size*

Table 2 shows that online cognitive-behavioral interventions have a large impact on emotional outcomes and a moderate to large impact on cognitive factors (hypothesized mechanisms of change). The effect of online cognitive-behavioral interventions on depressed mood was moderate to large ($D=.70, VarD=.06$), while the effect of the interventions on anxiety was large ($D=.89, VarD=.27$). Also, we found a

significant correlation between cognitive factors and emotional outcomes, $r=.60$, $p<.05$.

Effect sizes were also calculated for clinical and subclinical intensity levels of the emotional problems.

The results revealed a large effect size for clinical intensity issues ($D=.82$, $VarD=.09$, 95% confidence interval: .61–1.03), and a moderate effect size for subclinical intensity issues ($D=.50$, $VarD=.05$, 95% confidence interval: .31–.70).

Therapist support in online CBT interventions did not have any noticeable impact on study outcomes; interventions that provided therapist feedback ($N=9$) by e-mail, telephone, or website support had a similar clinical impact ($D=.69$, $VarD=.08$, 95% confidence interval: .49–.88) as compared to those online interventions that did not provide therapist feedback ($N=4$), ($D=.61$, $VarD=.12$, 95% confidence interval: .27–.96).

Table 2

Secondary outcomes and effect sizes (Cohen's d)

<i>Outcome category</i>	<i>N</i>	Number of Effect Sizes per Outcome Category	Average weighted effect size (<i>D</i>)	<i>VarD</i>	95% CI of <i>D</i>
Emotional Outcomes	26	13	.77	.12	.57 – 0.96
Depressive symptoms		9	.70	.06	.53 – 0.88
Anxiety symptoms		10	.89	.27	.57 – 1.22
Cognitive Mechanisms	17	13	.69	.19	.45 – .93
Other symptoms	47	12	.62	.08	.45 – .79

Discussion

The overall mean effect size of online CBT observed in the present study ($D=.67$) is on par with that of Spek et al. (2007) ($D=.60$). This effect size is in the medium to large range according to Cohen's criteria and shows that online cognitive-behavioral interventions are effective in relieving anxiety and depressed mood compared to control conditions.

There was heterogeneity among the effect sizes included in the present meta-analysis (see Table 1). A possible factor accounting for this variation in effect sizes could be the difference in CBT efficacy for interventions used to treat clinical intensity problems vs. subclinical intensity problems. Indeed, when effect sizes were calculated separately for clinical and subclinical intensity problems, the results revealed medium effect sizes for subclinical intensity problems and large effect sizes for clinical intensity problems. Therefore, clinical intensity may be an important moderator. However, it is also important to note that all studies included in the clinical intensity problem group were treating anxiety disorders (panic disorder and generalized anxiety disorder), while the subclinical group presented symptoms from a larger spectrum of disorders (PTSD, anxiety, and depressed mood). Therefore, additional work is needed to better understand the impact of clinical intensity on the effectiveness of online CBT.

This limitation could explain the difference between the two groups in terms of efficacy. To sum up, the fact that as secondary outcomes, anxiety was better treated

than depression, and that all clinical interventions (who were also the most effective) were comprised of anxiety disorder treatments could suggest that the effect observed may be explained by this overlap. In other words, online CBT seems most effective for clinical intensity anxiety disorders and less effective for subclinical intensity problems related with depressed mood. This finding is consistent with the meta-analysis of Speck et al. (2007), where anxiety was treated more efficiently than depression. These results may also reflect that the clinical-level intensity problems group simply had a higher baseline of emotional disorder, and thereby a larger effect size was observed (there was more room to get better).

Study 2. The efficacy of an automated self-guided web-based cognitive-behavioral intervention

Emotional disorders are widespread, as the lifetime risk of developing depression and anxiety disorders are between 6.7% and 18.1% according to the NIMH (Kessler, Chiu, et al., 2005; Kessler, Berglund, et al., 2005). Depression is linked with poverty (Weich & Lewis, 1998) and is one of the main cause of disease burden in high-income countries (Mathers & Loncar, 2006) while anxiety negatively impacts daily life even at subclinical levels (Mendlowicz & Stein, 2000). Moreover people with an anxiety disorder are three to five times more likely to go to the doctor and six times more likely to be hospitalized than people without an anxiety disorder (Greenberg et al., 1999; Kessler & Greenberg, 2002). The standard of care for emotional disorders is cognitive-behavioral therapy (Elkin et al., 1989) however there are a great number of people who do not have access to empirically validated treatment programs. This is a problem for developed countries as well as emerging economies. Emotional disorders are associated with high health care costs both for clinical level or sub threshold disturbance intensity (Simon et al., 1995). As an alternative to services offered in person (face-to-face) by mental health professionals, online cognitive-behavioral interventions (including online self-directed CBT) have been introduced as a cheaper, anonymous, and location independent solution (Barnett, 2005; Kiroopoulos et al., 2008). There is evidence suggesting that self-directed treatments for anxiety and depressive disorders are clinical and cost-effective (Bower et al., 2001). Previous studies have shown that online-based CBT may reduce therapist time (Wright, et al., 2005), reduce waiting lists, save travel expenses related to reaching mental health professionals, allow patients to experience a higher degree of anonymity and provide easier access to services for people with disabilities (hearing disabled or movement impaired patients) that couldn't otherwise reach traditional means of getting psychological treatment (Marks et al., 2003).

The present study evaluates a 2 week self-directed web-based system based on REBT (Rational-Emotive Behavior Therapy) that incorporates goal setting, problem evaluation, education about functional/dysfunctional emotions, irrational beliefs identification and a special form of cognitive restructuring – disputation – that focuses on evaluative (e.g. “hot”) cognitions (demandingness, awfulizing, low frustration tolerance and global evaluation). The system provides the patient with a personalized conceptualization of his/her problems, and is built around a “wizard” interface (similar to computer programs), guiding the patient along the process with hints, examples and customized feedback, and reformulating the patient’s irrational beliefs into rational beliefs using automated algorithms.

Hypotheses

Hypothesis 1. We will observe a significant difference in terms of depressive symptomatology between the control and experimental group at the end of the intervention.

Hypothesis 2. We will observe a significant difference in terms of anxiety symptomatology between the control and experimental group at the end of the intervention.

Method

Participants

Participants were recruited from a list of undergraduate students and volunteers who responded to ads posted on socialization websites, who had expressed an interest in participating in an Internet-administrated self-directed program for personal optimization. Informed consent was obtained prior to participation.

To be eligible, participants had to have at least 18 years of age and not under any psychotropic medication. The mean age was 24.54, SD = 5.67.

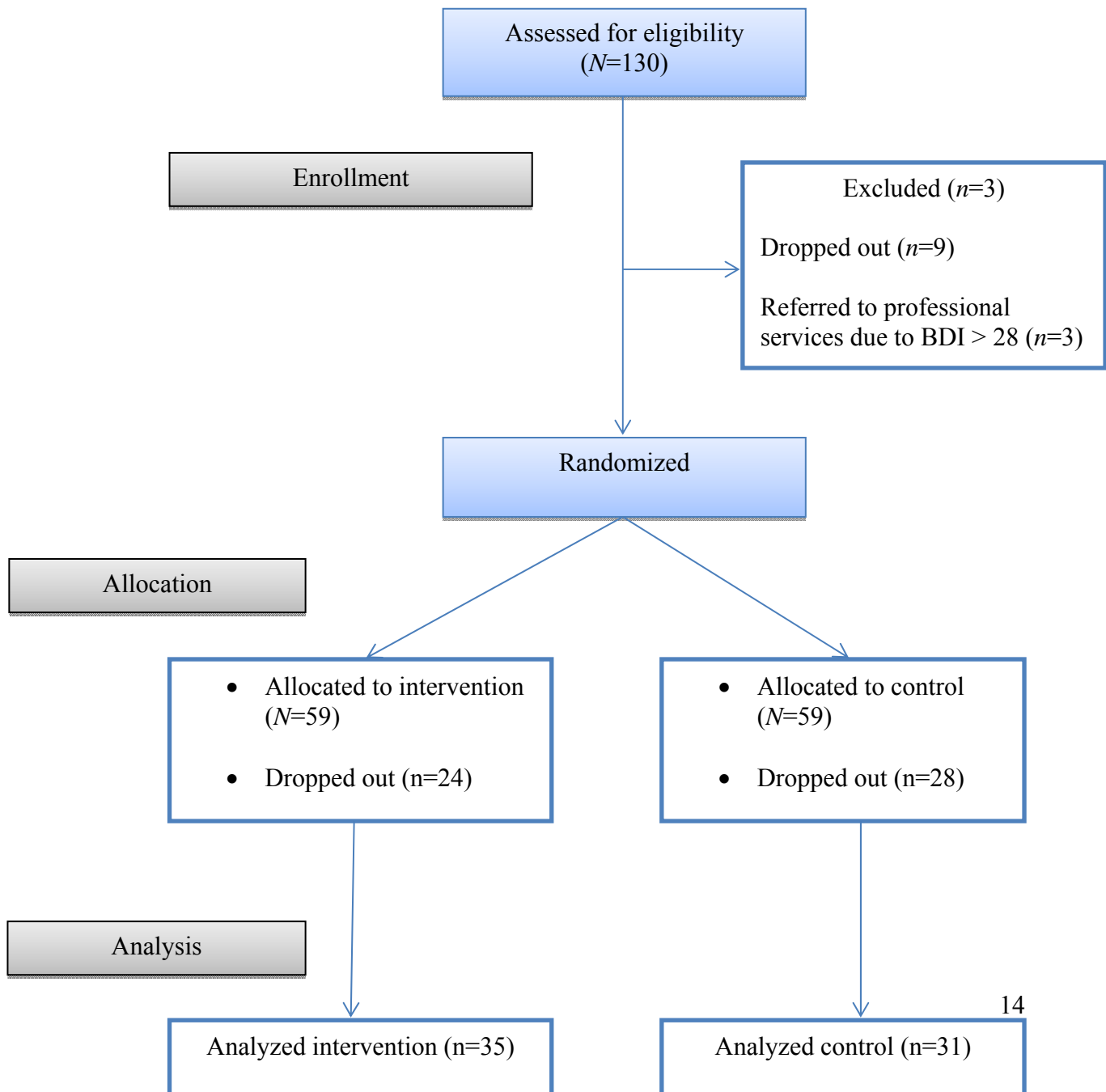


Figure 2. Flow diagram of the progress through the phases of the trial.

Design and procedure

Participants were randomly assigned to either a wait-list or the self-guided web-based system. The active condition consisted of bi-weekly visits of the online software, for two weeks. Subjects that did not access the system for 3 days or more received email reminders that encouraged them to use the system by reinforcing the importance of practicing rational thinking and applying REBT theory to everyday life.

Subjects completed psychological self-report measures before and after the intervention, online, using the same web-based platform.

Measures

The primary outcomes were related to symptom reduction – i.e. clinical symptoms related to anxiety, depression and quality of life, while secondary outcomes were related to hypothesized mechanisms of change and emotions – i.e. measures for cognitions and negative emotions.

Results

The basic descriptive statistics for both primary outcomes (depression and anxiety) and secondary outcomes (quality of life, cognitions and emotions) are presented in Table 1.

Table 1

Descriptive statistics for depressive symptoms, anxiety symptoms, quality of life, emotions and cognitions, and effect size for posttest.

	Pretest		Posttest		ES (Cohen's <i>d</i>)
	Wait-list (31)	Intervention (35)	Wait-list (31)	Intervention (35)	
BDI	12.45 (8.10)	14.38 (7.19)	15.10* (9.24)	9.90* (6.81)	.66
STAI	38.25 (14.07)	41.14 (14.74)	40.00 (14.55)	37.14 (15.45)	
QOL	90.55 (12.28)	89.90 (19.98)	93.60 (18.11)	95.52 (30.51)	
ATQ	67.04 (23.82)	60.67 (20.17)	66.92** (19.70)	43.67** (20.03)	1.17
ABS	84.80 (24.51)	80.81 (19.42)	84.55** (24.87)	64.10** (27.14)	0.78
POMS	72.30 (32.56)	75.33 (39.66)	69.05* (33.42)	47.95* (28.29)	0.7

Note. The table presents mean and standard deviations (in parentheses). BDI = Beck Depression Inventory; STAI = State-Trait Anxiety Inventory – State version; QOL = WHO Quality of Life BREF version; POMS = Profile of Mood States – negative emotion subset; ATQ = Automatic Thoughts Questionnaire; ABS = Attitudes and Belief Scale 2 – irrational score

* - significant at $p < .05$

** - significant at $p < .01$

Within group analysis

There were no significant differences between pre and posttest in the wait-list condition suggesting no systematic change as a consequence of time (BDI: $t(29)=-.356, p > .05$; STAI: $t(29)=.437, p > .05$; QOL: $t(29)=1.15, p > .05$; POMS: $t(29)=-.7, p > .05$; ATQ: $t(29)=-.53, p > .05$; ABS: $t(29)=-.468, p > .05$).

An independent-samples t-test was also conducted to compare primary and secondary outcomes for pre-post in the intervention condition.

Primary outcomes: depressive symptoms and anxiety symptoms. The analysis demonstrated that there was a significant difference between pre-post in terms of depressive symptoms $t(33)=2.295, p < .05$, but no significant difference in terms of anxiety symptoms $t(33)=.329, p > .05$.

Secondary outcomes: The analysis demonstrated that there was a significant difference between pre-post in terms of irrational beliefs $t(33)=2.139, p < .05$, automatic thoughts $t(33)=2.466, p < .05$, and negative affect $t(33)=2.825, p < .05$ but no significant difference and quality of life $t(33)=1.001, p > .05$.

The results are in line with the findings comparing the experimental and wait-list condition, suggesting that the difference in scores for the variables measured is due to the effect of the intervention.

Between group analysis

There were no significant differences between the wait-list and intervention conditions at pretest for depressive symptoms (BDI: $t(64)=-.498, p > .05$), anxiety symptoms (STAI: $t(64)=-.393, p > .05$), quality of life (QOL: $t(64)=.439, p > .05$), negative emotions (POMS: $t(64)=-.368, p < .05$), automatic thoughts (ATQ: $t(64)=.678, p > .05$) and irrational beliefs (ABS: $t(64)=-3.254, p < .05$) which suggests the groups were randomized correctly and there were no systematic differences between them regarding target variables.

An independent-samples t-test was conducted to compare primary and secondary outcomes for post-test in wait-list and intervention conditions.

Primary outcomes: depressive symptoms and anxiety symptoms. The analysis demonstrated that there was a significant difference between the two condition in terms of depressive symptoms $t(64)=2.058, p < .05$, but no significant difference in terms of anxiety symptoms $t(64)=.609, p > .05$. We calculated the Cohen's d (Cohen, 1988, 1992) for the difference in scores for the BDI and found a medium effect size ($d=.66$) which suggests the program was moderately efficient for reducing depressive symptoms (Cohen, 1988), and that also the result is clinically significant (Wolf, 1986). This result shows that 73% of the participants in the control group had worse scores on the BDI than the average patient in the experimental condition (McGough & Faraone, 2009).

Secondary outcomes: quality of life, negative affect and irrational beliefs. The analysis demonstrated that there was not any significant difference in terms of quality of life $t(64)=.244, p > .05$; however there was a significant difference between the two conditions in terms of irrational beliefs $t(64)=2.512, p < .01$, with a large effect size (Cohen's $d=.78$). This result shows that 76% of the participants in the control group had worse scores on the ABS than the average patient in the experimental condition (McGough & Faraone, 2009). We also found also a significant difference in terms of automatic thoughts $t(64)=3.757, p < .01$, with a large effect size (Cohen's $d=1.17$), showing that 84% of the participants in the control group had worse scores on the

ATQ than the average patient in the experimental condition, and also negative affect $t(64)=2.186, p < .05$, with a moderate to large effect size (0.7) showing that 76% of the participants in the control group had worse scores on the POMS than the average patient in the experimental condition.

Discussion

The present study investigated the effects of a web-based, self-directed, REBT-informed system on primary and secondary outcomes in a randomized wait-list controlled experiment.

The findings suggest the present system as an effective tool for reducing depressive symptoms and the underlying dysfunctional cognitions and negative emotions in our sample; however quality of life and anxiety symptoms were not systematically affected.

The results suggest that the system is effective for reducing depressive symptoms (Cohen's $d=.66$), negative emotions (Cohen's $d=.7$) and underlying automatic thoughts (Cohen's $d=1.17$) and irrational beliefs (Cohen's $d=.78$) when compared to a waiting list. However, there was no significant improvement in anxiety symptoms and quality of life.

The secondary outcomes were more systematically affected by the intervention. As the focus of the web-based self-directed interventions was the irrational cognitions underpinning emotional disturbance, as per the ABCDE model of REBT theory (David, Lynn, & Ellis, 2009; Ellis & Dryden, 2007), the reduction in irrational beliefs and negative emotions is to be expected. Indeed, the cognitions were the most affected by the intervention with a moderate effect size for both irrational beliefs and automatic thoughts. Also negative emotions showed a small to moderate effect size between intervention and wait-list, suggesting that the intervention improved the patient's emotional response to problems by also reducing negative emotions.

The results of the present study are in line with current research on the efficacy of web-based self-directed interventions, especially on non-clinical samples with regards to symptom reduction and overall efficacy (Kenardy, McCafferty, & Rosa, 2003; O'Kearney, Gibson, Christensen, & Griffiths, 2006; Warmerdam et al., 2010).

Future studies should try to extend the duration of the intervention, and also include a sample comprised of patients exhibiting clinical-intensity emotional disturbance, that would benefit more in terms of symptoms and quality of life (there would be more room to get better), thus increasing the observed effect size.

Study 3. Working alliance and empathy in an automated self-directed web-based cognitive-behavioral intervention

The therapeutic relationship is an important factor involved in the efficacy of cognitive-behavioral therapy (Lambert & Barley, 2001; Martin, Garske, & Davis, 2000). Indeed, it accounts for 30% of the outcome of psychotherapy, 40% being client variables, 15% expectancy and placebo effects, and 15% depending on the specific techniques used (Asay & Lambert, 1999).

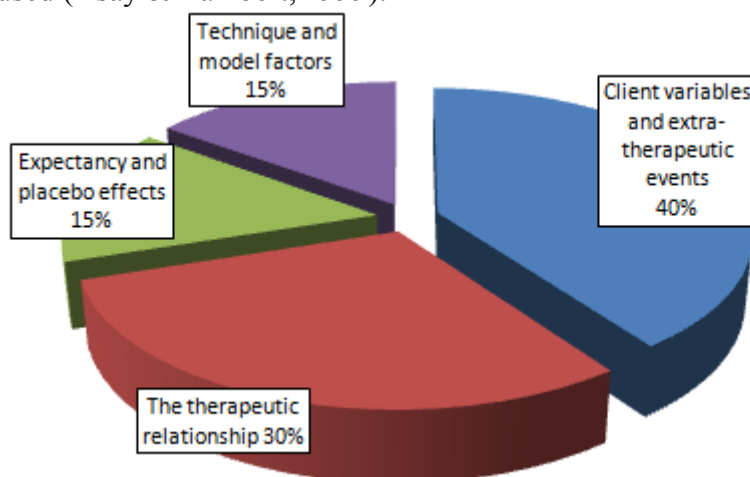


Figure 1. The common factors of psychotherapy (Asay & Lambert, 1999)

The American Psychological Association (Division 29) published guidelines that state that forms of psychotherapy that do not mention the therapeutic relationship are “seriously incomplete and potentially misleading on both clinical and empirical grounds” (Ackerman et al., 2001). The recommendation of the APA Interdivisional Task Force on Evidence-Based Therapy Relationships concludes that the therapeutic relationship makes consistent contributions independent of the specific type of treatment, and that it accounts for at least as much outcome as the technique used. The components identified as demonstrably effective are Alliance, Cohesion (for group therapy), empathy and client feedback (Norcross, 2011).

The therapeutic alliance in an online context.

From the beginning, therapy delivered by means of the Internet has been criticized by professionals in the mental field (Dever Fitzgerald, Hunter, Hadjistavropoulos, & Koocher, 2010; Lester, 2006; Wells, Mitchell, Finkelhor, & Becker-Blease, 2007) because of several limitations in existing programs. Some are inherent to the medium, however some can be addressed by careful design and implementation. Mainly, the lack of real-time face-to-face interaction prevents the therapist from evaluating non-verbal cues that would otherwise be important in understanding the patient’s feedback during therapy. Also, part of the therapeutic alliance is based on non-verbal feedback from the therapist. Recent research is trying to investigate the nature and reliability of the therapeutic relationship in non face-to-face scenarios (Bickmore, Gruber, & Picard, 2005).

A recent review (Sucala et al., 2012) investigated the characteristics of therapeutic relationship in e-therapy (therapist support via text means) over 11 studies and found e-therapy at least equivalent to face-to-face therapy (Sucala et al., 2012).

However, it is obvious that the therapeutic relationship can express itself (to a certain degree) in a online counseling context (online counseling defined as synchronous or asynchronous contact with a *real psychotherapist* via text, audio or

video conferencing software) (Barak, Klein, & Proudfoot, 2009). Patients and therapists can communicate nonverbally through audio or video conferencing, or even through text-based system with the help of emoticons or other props used for conveying emotion online (Barnett, 2005; Suler, 2009). A number of authors suggest principles and practical/innovative use of technology to enhance the process of online psychotherapy (Hsiung, 2001; Jerome & Zaylor, 2000; Laszlo, Esterman, & Zabko, 1999; Mallen, Vogel, Rochlen, & Day, 2005; Mallen, Vogel, & Rochlen, 2005; Mallen & Vogel, 2005), a comprehensive analysis of such techniques is beyond the scope of this article.

Avatars in computer mediated communication

The field of computer mediated communication is an emerging field that investigates the impact of computers and the internet on social interactions, be it between humans, or with a virtual agent (Barnes, 2003; Kiesler, Siegel, & McGuire, 1984; Thurlow, Lengel, & Tomic, 2004).

Another concern about computer emotional feedback and expression is illustrated by the concept of “uncanny valley” (Mori, 1970). The ‘Uncanny Valley’ refers to a sense of unease and discomfort when people look at increasingly realistic virtual systems that try to mimic humans (Brenton, Gillies, Ballin, & Chatting, 2005). In other words, artificial agents are perceived more positively as they resemble humans and human interaction more, however when the simulation gets closer (but not quite) to the real agent, there is a pronounced sense of rejection of the virtual agent (the “corpse” effect) (Brenton et al., 2005).

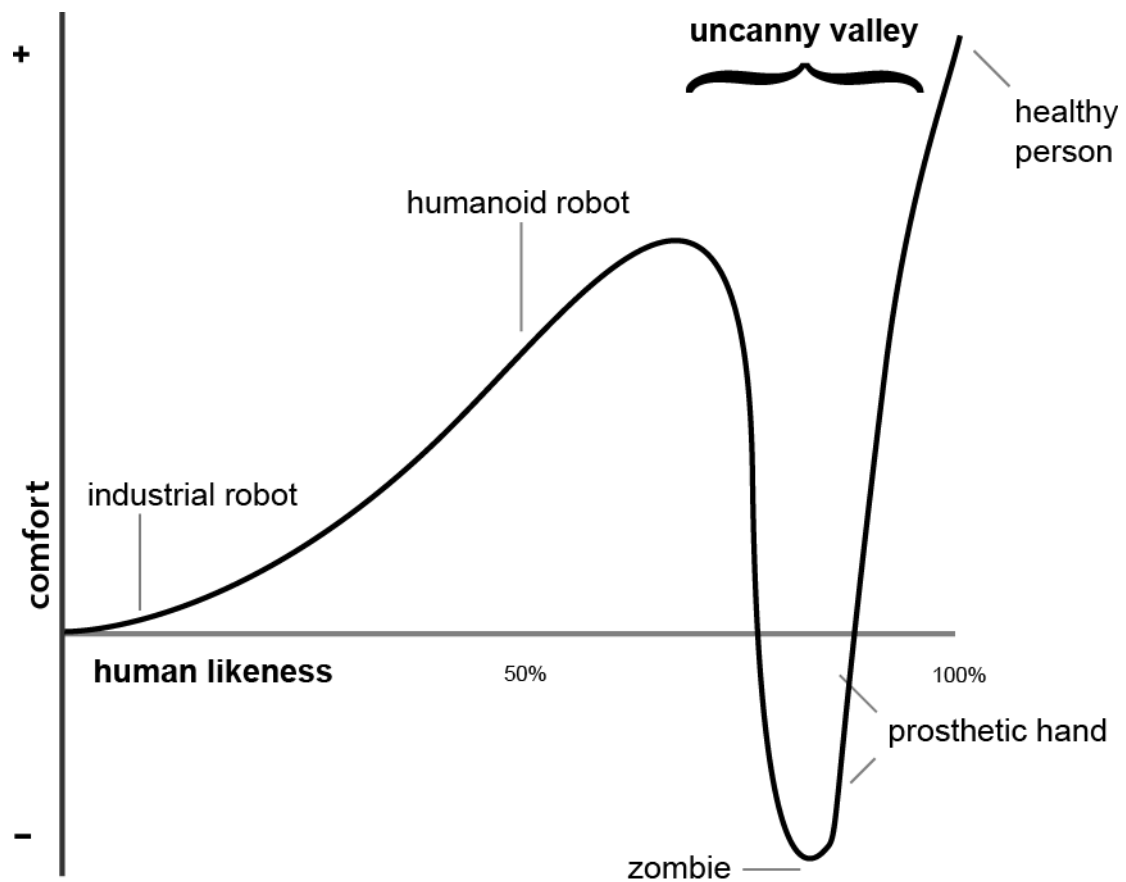


Figure 2. The uncanny valley (Mori, 1970)

Method

Participants

Participants were recruited from a list of undergraduate students who earlier had expressed an interest in participating in an Internet-administrated self-directed program. Informed consent was obtained prior to participation.

To be eligible, participants had to have at least 18 years of age and not under any psychotropic medication. One hundred and twenty-eight undergraduate students participated, in exchange for course credit. The mean age was 21.32, $SD = .84$.

Design and procedure

Participants were randomly assigned to one of the three groups: (1) Online, where participants accessed the system for one session, (2) Online + Avatar, where participants accessed the same system, but the instructions given throughout were accompanied by a short animation consisting of pictures of a female therapist, and (3) Face-to-face, where participants met with a therapist face-to-face for one session using the same protocol as the online treatment.

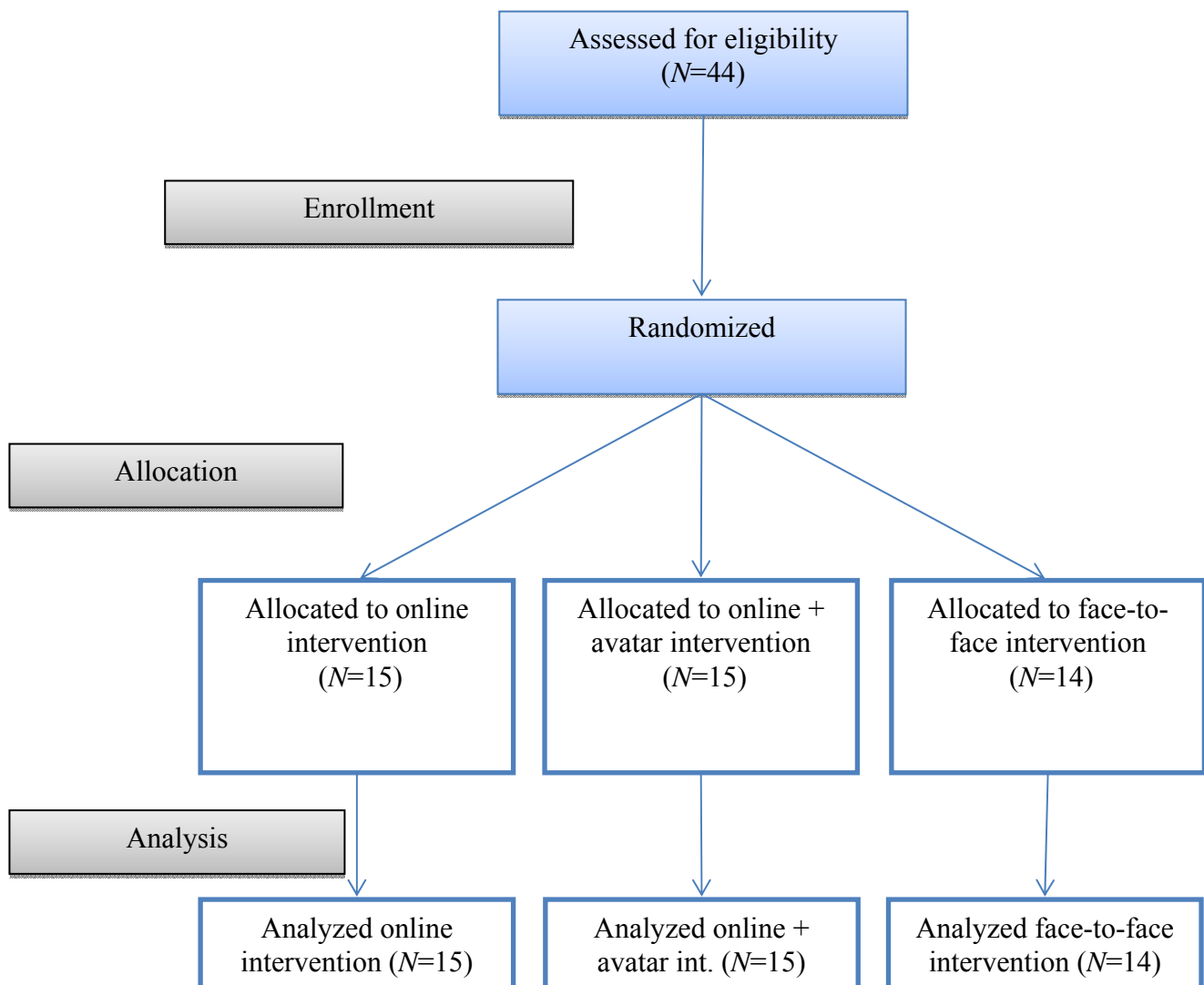


Figure 3. Flow diagram of the progress through the phases of the trial.

Measures

We used the following scales to assess the therapeutic relationship: Working Alliance Inventory, and the Barrett-Lennard Relationship Inventory (Barrett-Lennard, 1962). Also we used the Attitude and Belief Scale to control for initial level of irrational beliefs and to investigate whether alliance is correlated with irrationality.

Results

The basic descriptive statistics for the outcomes measured (therapeutic alliance, empathy and irrational beliefs) are presented in Table 2.

Table 2

Descriptive statistics for therapeutic alliance, empathy and irrational beliefs over the three experimental groups

	Online (<i>N</i> =15)	Online + Avatar (<i>N</i> =15)	Face-to-face (<i>N</i> =14)	ES η^2	ES Cohen's <i>d</i>
WAI-SR	59.8 (15.73)	60.5 (12.04)	208.86 (23.08)	.94	7.91
BLRI-ES	.93 (14.88)	11.4 (10.66)	15.57 (7.03)	.24	1.12
ABSs	9.76 (3.39)	8.53 (3.02)	9.71 (1.77)		

Note. The table presents mean and standard deviations (in parentheses). WAI-SR = The Working Alliance Inventory-Short Revised; BLRI-ES = The Barrett-Lennard Relationship Inventory – Empathy Scale; ABSs = Attitudes and Belief Scale Short Version – irrational score; ES = effect size eta squared, where small ES=0.01, medium ES=0.059 and large ES=0.138 (Cohen, 1988) and Cohen's *d* (Cohen, 1988, 1992)

In terms of therapeutic alliance there was a statistically significant difference between groups as determined by one-way ANOVA ($F(2,41) = 348.99, p < .01$). A Tukey post-hoc test revealed that the therapeutic alliance was statistically significantly lower after completing the online program (mean $59.8 \pm 15.73, p < .01$) and the online+avatar program (mean $60.5 \pm 12.04, p < .01$) compared to the face-to-face program (mean $208.86 \pm 23.08, p < .01$). There were no statistically significant differences between the online and online+avatar groups ($p > .05$). The effect size for the difference between groups (Eta squared) is $\eta^2 = .94$; and Cohen's $d = 7.91$, which is a very large effect size (Cohen, 1988, 1992). This can be interpreted as 99.9% of participants in the online+avatar group had a lower therapeutic alliance than the average of the face-to-face group (McGough & Faraone, 2009).

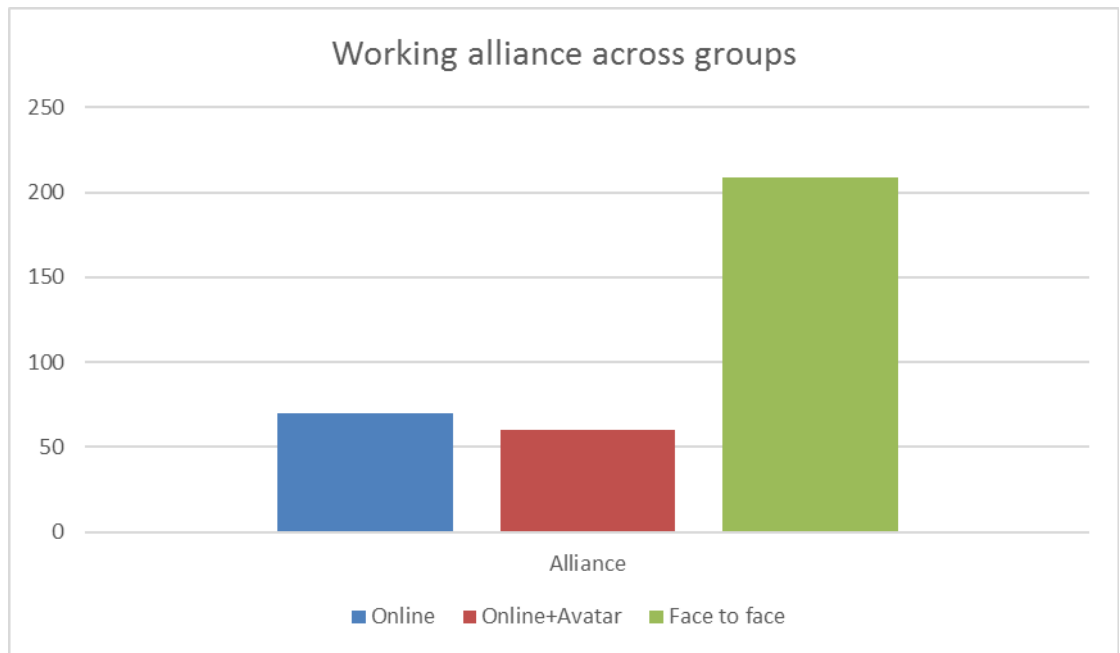


Figure 4. Average of scores on Working Alliance Inventory-Short Revised across groups

Empathy measured in the three conditions differed significantly between groups as determined by one-way ANOVA ($F(2,41) = 6.41, p < .01$). A Tukey post-hoc test revealed that empathy was statistically significantly higher after completing the face-to-face program (mean 15.57 ± 7.03) and the online+avatar program (mean 11.04 ± 10.66) compared to the online program (mean $.93 \pm 14.88$). There were no statistically significant differences between the face-to-face and online+avatar groups ($p > .05$). The effect size for the difference between groups (Eta squared) is $\eta^2 = .24$; and Cohen's $d = 1.12$, which signifies a large effect size (Cohen, 1988, 1992). In other words, 84% of participants in the online group had lower perceived empathy than the average participant in the online+avatar group.

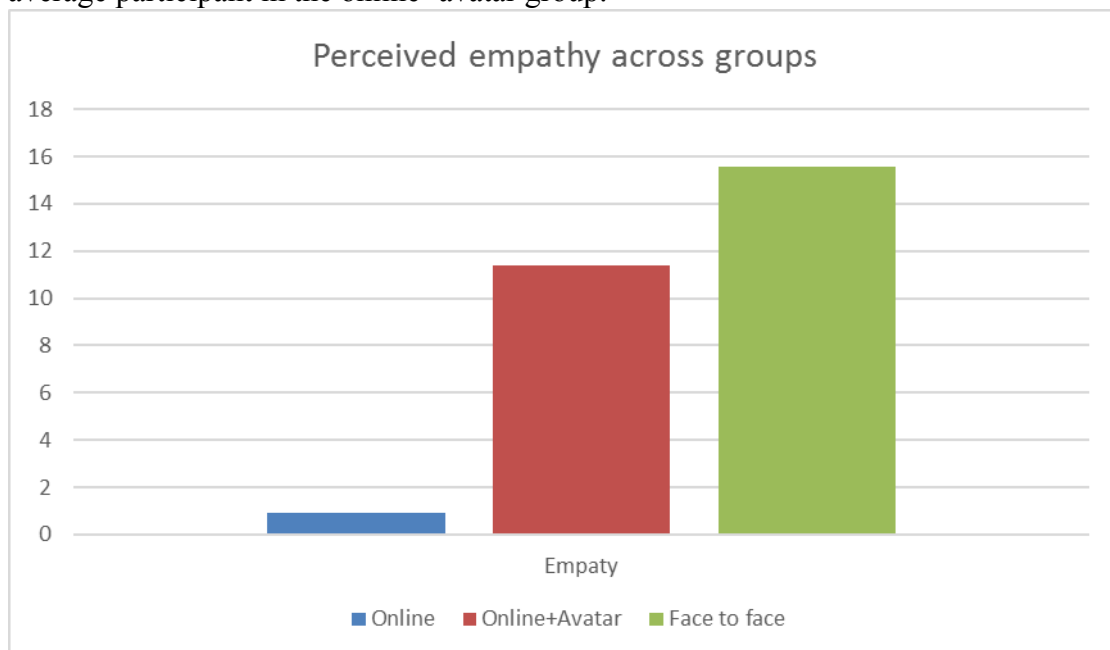


Figure 5. Average of scores on The Barrett-Lennard Relationship Inventory – Empathy Subscale across groups

There was no significant difference between the three groups in terms of irrational beliefs ($F(2,41) = .87, p > .05$) which suggests that the participants were randomized correctly in terms of irrationality over the three groups.

There was no correlation between irrationality and therapeutic alliance $r(42) = .09, p > .05$) or between irrationality and empathy $r(42) = -.11, p > .05$.

Discussion

The current study investigated the efficacy of a specific strategy to increase the perceived therapeutic relationship through the use of animated avatars in a self-help web-based psychotherapeutic intervention. The results suggest that while the animated avatars increased the perceived empathy, therapeutic alliance was not affected by this enhancement.

In terms of therapeutic alliance the results show that the intervention that included the animated avatars had no systematic effect on the patients completing the system. The online group did not differ significantly from the online+avatar group, while the face-to-face group showed a marked difference in perceived working alliance (a 3.5x difference). Clearly, face-to-face psychotherapy is more efficient in conveying that the therapist is working on the patient's side, conceptualized as the agreement on tasks and goals of therapy (Bordin, 1979). This result also shows that the current intervention is not very efficient in providing the patient with a sufficient level of working alliance. Whether reaching the same level of alliance as classical therapy is possible or not, future interventions should take into consideration this limitation and try to find new ways to develop this alliance or compensate its decreased effect through other means.

Perceived empathy when compared in the three conditions seems to be more affected by the animated avatar enhancement than the working alliance. In fact, when compared to classical face-to-face therapy, there is no significant difference between the avatar-enhanced condition and the face-to-face condition. Thus, empathy is similarly perceived in a face-to-face interaction with a therapist and in an intervention with a virtual agent, represented through a simple animated avatar. This finding suggests that animated avatars are efficient in conveying empathy by probably tapping in the patient's imagination and ability for projection while also leveraging previous experiences with online avatars.

The main limit of this study is the reduced size of the sample. Future studies should investigate if the results are observed in a larger population of participants.

The present study shows that perceived empathy can be easily enhanced in automated web-based interventions through the addition of animated avatars that elicit responses from the patient that are similar to face-to-face therapy. Future interventions that do not use therapist support can benefit of this effect with minimum cost and effort, and should try to implement similar solutions. While the working alliance is not enhanced with this technique, future interventions should attempt to address this limitation, through more creative use of the technology.

Study 4. The efficacy of specific cognitive restructuring styles in an automated rational-emotive behavior therapy online intervention.

Rational-emotive behavior therapy

Albert Ellis has long argued that human beings largely create and sustain their emotional disturbances by means of their irrational beliefs (Ellis, 1994). That is, emotional disturbance is largely the result of irrational beliefs. At the core of irrational beliefs is demandingness. Ellis explains: “According to the theory of REBT, neurotic disturbance occurs when individuals demand that their wishes be satisfied, that they succeed and be approved, that others treat them fairly, and that the universe be more pleasant” (Ellis, 2011, p. 211). In REBT theory, such demandingness is viewed as the cornerstone of emotional disturbance (Ellis & Bernard, 1985).

The ABCDE model of emotional disturbance proposed by Albert Ellis is a very specific and well documented strategy for restructuring dysfunctional cognitions focusing on 7 steps for working with patients (Dryden & DiGiuseppe, 1990; Ellis & Dryden, 2007):

- 1) Defining the problem
- 2) Identifying dysfunctional emotions and maladaptive behaviors (Cs)
- 3) Identifying the critical activating situations (As)
- 4) Identifying irrational beliefs (iBs) causing disturbance at C.
- 5) Challenging irrational beliefs by means of cognitive restructuring (D)
- 6) Replacing iBs with rational beliefs leading to functional emotions at C. (E)
- 7) Practicing rational beliefs by applying REBT principles to everyday life

The different restructuring styles of REBT

The major cognitive restructuring technique used in REBT is called ‘restructuring’ and consists of questions directed at the irrational beliefs the patient holds, intended to undermine their importance and promote rational thinking instead.

DiGiuseppe (DiGiuseppe, 1991) argued that disputes fall into one of three categories. First, there are empirical disputes which ask clients to put forward evidence attesting to the truth or falsity of the belief. Second, there are logical disputes which ask clients to consider whether the target belief is logical or not. Third, there are pragmatic disputes which ask clients to consider the functionality of the target belief. These different restructuring styles are targeted at both irrational beliefs and newly constructed rational beliefs. As is well accepted in REBT, irrational beliefs are inconsistent with reality, illogical and yield dysfunctional results while rational beliefs are consistent with reality, logical and yield functional results (Dryden & Branch, 2008; Dryden & DiGiuseppe, 1990; Ellis & Dryden, 2007).

The current study tries to evaluate the efficacy of each restructuring style taken individually and together on restructuring the irrational beliefs causing emotional disturbance. As automated web-based psychotherapeutic systems rely on specific and well determined protocols of intervention, they can be used to assess small (albeit potentially important) differences in the protocol used. The application used to investigate the different restructuring styles is a 2 week self-directed web-based system based on REBT (Rational-Emotive Behavior Therapy) that incorporates goal setting, problem evaluation, education about functional/dysfunctional emotions, irrational beliefs identification and cognitive restructuring (“disputation”) – that focuses on irrational beliefs (demandingness, awfulizing, low frustration tolerance

and global evaluation). The system provides the patient with a personalized conceptualization of his/her problems, and is built around a “wizard” interface (similar to computer programs). Using the automated self-directed system we compared the different restructuring styles by using customized interventions that included only one type of restructuring for e

Method

Participants

Participants were recruited from a list of undergraduate students who earlier had expressed an interest in participating in an Internet-administrated self-directed program. Informed consent was obtained prior to participation.

To be eligible, participants had to have at least 18 years of age and no uncontrolled major physical or psychiatric illness. The mean age was 26.82, $SD = 6.84$.

By the end of the two weeks of online sessions, 88 completed the program, including the final evaluation. The dropout rate was 54%, a rate that is typical for self-directed web-based interventions that don't involve therapist support, and that allow patients to anonymously withdraw from the intervention (for details see also (Cuijpers, van Straten, & Andersson, 2008).

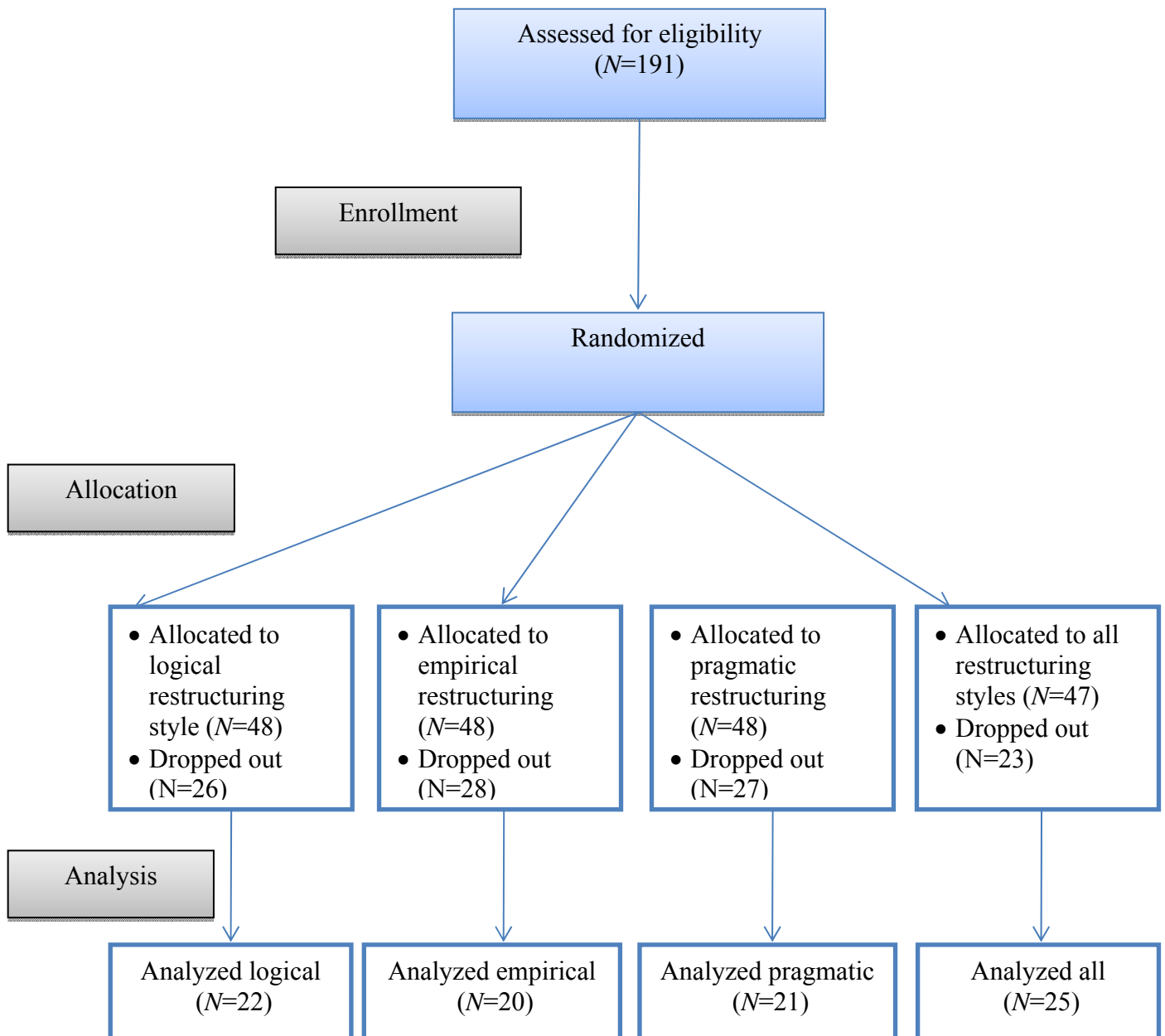


Figure 1. Flow diagram of the progress through the phases of the trial.

Design and procedure

Subjects completed psychological self-report measures before and after the intervention, online, using the same web-based platform.

Measures

The primary outcomes were related to symptom reduction – i.e. clinical symptoms related to anxiety, depression and quality of life, while secondary outcomes were related to hypothesized mechanisms of change and emotions – i.e. measures for cognitions and negative emotions. A short description of each measure used follows.

As predictor we used a measure of the preference for a specific type of restructuring:

Measure for preferred type of restructuring. We used a simple nominal scale where we asked subject to choose the preferred style of restructuring, after being

presented with an example of irrational belief, the three types of restructuring that can be used to challenge it (logical, empirical, pragmatic) and specific examples for each restructuring style. A fourth option was presented: “I have no preference”. The scale and restructuring style examples used can be found in Appendix 3.

Results

In Table 1 are presented the basic descriptive statistics for the outcomes measured in each of the experimental groups (logical restructuring, empirical restructuring, pragmatic restructuring, and all restructuring styles combined).

Table 1

Descriptive statistics for depressive symptoms, anxiety symptoms, quality of life, emotions and cognitions

	Restructuring Style Group							
	Logical (22)		Empirical (20)		Pragmatic (21)		All Combined (25)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
BDI	11.91 (8.17)	8.59 (5.29)	14.05 (6.67)	9.60 (6.59)	15.43 (8.22)	10.81 (5.24)	15.72 (7.02)	6.92 (6.45)
STAI	39.27 (10.74)	39.73 (16.33)	40.65 (15.53)	35.30 (14.21)	36.33 (12.08)	35.00 (16.24)	37.20 (11.51)	30.52 (16.48)
QOL	89.5 (11.1)	93.05 (22.39)	94.25 (9.73)	95.00 (20.91)	90.95 (12.15)	86.81 (19.83)	89.16 (14.67)	92.24 (20.59)
POMS	64.41 (28.32)	47.59 (29.75)	71.60 (40.65)	51.35 (23.16)	68.90 (40.57)	43.92 (27.08)	80.92 (40.18)	51.16 (30.64)
ATQ	64.41 (22.95)	51.14 (15.36)	71.50 (21.77)	39.10 (19.72)	67.33 (20.88)	46.62 (17.76)	63.48 (25.55)	45.56 (21.18)
ABS	86.55 (20.15)	66.91 (22.48)	89.05 (24.11)	64.60 (35.19)	80.10 (21.12)	57.10 (25.12)	77.16 (19.70)	64.44 (34.12)

Note. The table presents mean and standard deviations (in parentheses) for each variable at pre-intervention and post-intervention. BDI = Beck Depression Inventory; STAI = State-Trait Anxiety Inventory – State version; QOL = WHO Quality of Life BREF version; POMS = Profile of Mood States – negative emotion subset; ATQ = Automatic Thoughts Questionnaire; ABS = Attitudes and Belief Scale 2 – irrational score

* - significant at $p < .05$

** - significant at $p < .01$

Within group analysis

The table below shows the difference between pre and posttest in each of the four conditions for each outcomes.

	Restructuring Style Group			
	Logical (22)	Empirical (20)	Pragmatic (21)	All Combined (25)

	<i>t</i> (20)	<i>p</i>	<i>t</i> (18)	<i>p</i>	<i>t</i> (19)	<i>p</i>	<i>t</i> (23)	<i>p</i>
BDI	2.29	*	2.40	*	2.01		2.31	*
STAI	1.08		0.69		0.23		-0.19	
QOL	0.56		0.21		-0.18		-0.11	
POMS	0.98		1.25		1.68		0.86	
ATQ	2.23	*	2.69	*	2.16	*	3.36	**
ABS	1.25		2.19	*	1.39		2.34	*

Note. The table presents *t* values and statistical significance. BDI = Beck Depression Inventory; STAI = State-Trait Anxiety Inventory – State version; QOL = WHO Quality of Life BREF version; POMS = Profile of Mood States – negative emotion subset; ATQ = Automatic Thoughts Questionnaire; ABS = Attitudes and Belief Scale 2 – irrational score

* - significant at $p < .05$

** - significant at $p < .01$

The only significant differences in pre post were in scores on depression, automated thoughts, and irrational beliefs. Depression measured with the BDI was significant at pre-post for logical restructuring $t(19)=2.29$, $p < .05$; empirical restructuring $t(18)=2.40$, $p < .05$ and all types of restructuring combined $t(23)=2.31$, $i < .05$. Automated thoughts measured with the ATQ were significant at pre-post for logical restructuring $t(19)=2.23$, $p < .05$; empirical restructuring $t(18)=2.69$, $p < .05$, pragmatic restructuring $t(19)=2.16$, $p < .05$ and all types of restructuring combined $t(23)=3.36$, $p < .01$. Irrational beliefs measured with the ABS were significant at pre-post for empirical restructuring $t(18)=2.19$, $p < .05$, and all types of restructuring combined $t(23)=2.34$, $p < .05$.

Between group analysis

As there was no significant difference across the experimental groups at the end of the intervention in any of the variables, we decided to redistribute the groups in terms of the preference expressed for one of the restructuring styles. There was no difference in terms of preference for a specific restructuring style.

Subjects selected the preferred restructuring style unequally:

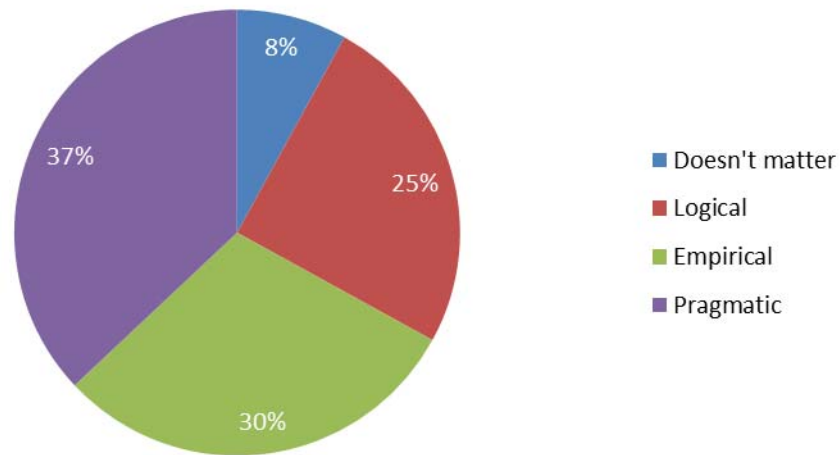
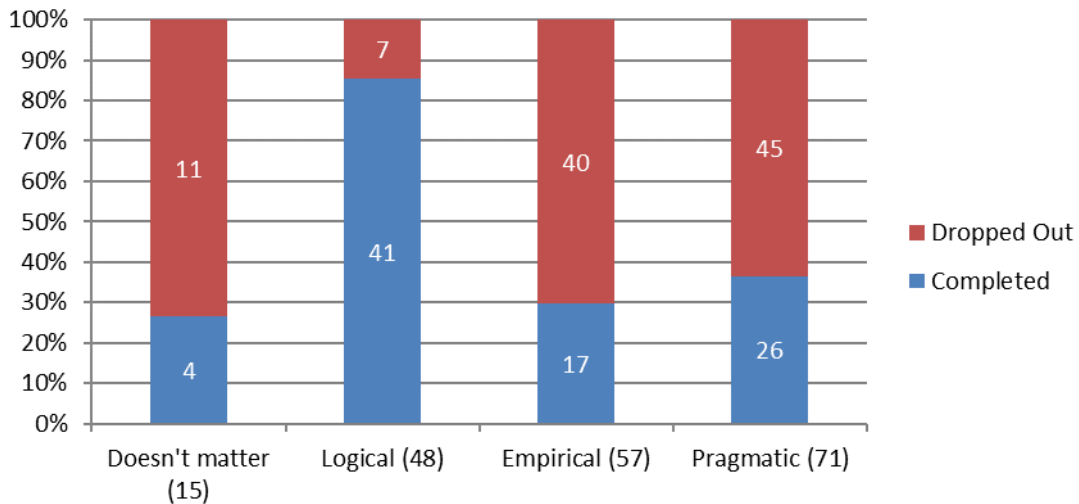


Figure 1. Subject preference for a restructuring style, at the beginning of the program

Additional post-hoc analysis

However, the dropout rate was not equal across preference groups. Almost all of the participants from the group that selected “Logical Restructuring” finished the program, while other groups lost more than half of the original number of participants. Figure 3 shows the difference in the number of participants who dropped out in each preference group.

Figure 3. Number of participants that dropped out per preference group



Discussion

The present study investigated the effects of different types of cognitive restructuring (the 3 types of restructuring irrational beliefs) on clinical and psychological outcomes. The study used a highly structured automated web-based intervention that lends itself to specific changes in protocol, as all other factors relating to the intervention are standardized across participants. The results suggest that whether using logical restructuring, empirical restructuring or pragmatic restructuring bears no systematic consequences on symptoms, quality of life or cognitive mechanisms of change. In other words, while classical face-to-face rational-emotive behavior therapy is effective (David, Szentagotai, Eva, & Macavei, 2005; Lyons & Woods, 1991), changing restructuring styles (in an automated online format) does not seem to affect outcomes.

While there was no effect of restructuring style on selected primary and secondary outcomes, we found an unexpected effect of preference for a specific restructuring style on dropout rates. Specifically, people who selected logical restructuring as the preferred restructuring style were the least likely to drop out of the program. People that chose logical restructuring as preferred were more than two times more likely to complete the program. This finding suggests that while logical restructuring was not the most popular (only 25%, while pragmatic restructuring was preferred 37% and empirical restructuring was preferred 30%), the participants that chose this option were more motivated to finish the program. These results falls in line with expectations about the cognitive restructuring techniques used in cognitive-behavioral therapy, mainly that they favor critical thinking, and that they use a logical and rational approach to treating emotional problems. This is not the only type of techniques used in CBT, however this (cognitive restructuring) was the main focus of the current web-based intervention. In general automated web-based programs present higher than face-to-face dropout rates (Cuijpers et al., 2008). Given this problem, predicting the drop-out rates for each participant could help improve its' efficacy and refer patients who would dropout to other programs that could bring more benefit, like online psychotherapy (via two-way real-time video). Such a screening tool would help the patients by recommending the most useful and efficacious treatment option for his/her problem (automated web-based vs. online real-time therapy), and also for the psychotherapists by using their resources only when they are needed.

Another possible explanation of the preference for logical restructuring for the participants who completed the program, could be that this preference reflects a higher level of cognitive complexity or intelligence. Future studies should include measures of intelligence in order to verify if intelligence is a predictor for dropout rates in self-directed web-based interventions.

Cognitive behavior therapy has a varied palette of specific techniques for changing dysfunctional beliefs, including behavioral techniques, and more emotive techniques like humor or metaphorical examples. Future studies should try to integrate more of these techniques in web-based systems, as more sophisticated technology becomes available.

CHAPTER IV. GENERAL CONCLUSIONS AND IMPLICATIONS

The current research project attempted to develop a novel psychotherapeutic intervention leveraging the ease of use and accessibility of the internet, while addressing some unanswered questions about mechanisms of change, therapeutic relationship, and specific differences in the efficacy of different cognitive restructuring techniques.

4.1. Theoretical contributions

In our first investigation (Study 1) we tried to evaluate the degree that online interventions can affect the hypothesized mechanisms of change in cognitive-behavioral interventions (namely cognitions), in order to help plan and justify an intervention based on reducing irrational thinking. More specifically, this meta-analytical study reviews the current literature on the efficacy of online interventions including not just primary outcomes – as several existing meta-analyses already attempted (Barak et al., 2008; Reger & Gahm, 2009; Spek et al., 2007; Van't Hof, Cuijpers, & Stein, 2009) – but also including secondary, cognitive measures in evaluating the efficacy of these treatments. Indeed, the results proved that online interventions are also efficient in reducing cognitive processes responsible for psychopathology, similar to the way therapy is conducted in classical face-to-face scenarios. This result encouraged us to develop an internet-based intervention focused on evaluative cognitions, Ellis' irrational beliefs.

The forth study in our project was aimed at more specific elements of cognitive behavioral therapy, the cognitive restructuring techniques. The main research question was aimed at comparing the efficacy of individual techniques for reducing dysfunctional cognitions.

While the program was overall successful, there were no significant differences in terms of outcome for any of the restructuring styles, that is they were comparatively equally efficacious. Also the participant preference for a specific restructuring style did not affect the success of the program in terms of reducing symptomatology, cognitive structures and emotions.

However, after post-hoc analysis we observed that the participants who preferred logical restructuring were more than twice more likely to finish the program. In general automated web-based programs present higher than face-to-face dropout rates (Cuijpers et al., 2008) probably caused by participant anonymity and the lack of face-to-face interaction that would elicit a stronger commitment. Given this problem present in this medium, predicting the drop-out rates for each participant could help improve its' efficacy and refer patients who would dropout to other programs that could benefit them more, like online psychotherapy (via Skype or other multimedia modality). Such a screening tool would benefit the patients by recommending the most useful and efficacious treatment option for his/her problem, and also for the psychotherapists by using their resources only when they are needed.

4.2 Practical Contributions

Studies 2 and 3 in our research project focused on developing, testing and enhancing the efficacy of the automated self-directed psychotherapeutic system based on Ellis' model of emotional disturbance.

In study 2 we measured the efficacy of the system by enrolling participants in a wait-list controlled experiment in order to measure the effect of the intervention on

the general population. The results showed that the online platform was efficient in reducing some symptomatology and enhancing dysfunctional cognitions with some limitations. Mainly, because our participant pool was represented by general population, the level of starting disturbance was relatively low. We chose general population to reduce the risks of using a not yet validated technique on clinically affected individuals, risks that could not be prevented otherwise (short of adding face-to-face interaction with a psychotherapist – that would have made it more difficult to discern the effects of the automated program).

The next study (Study 3) measured the perceived therapeutic relationship in the online system, comparing it to the therapeutic relationship in a classical face-to-face session. A third group was presented with a slightly enhanced version of the online system, where we tried to improve on perceived therapeutic relationship with the help of an animated avatar.

Our results showed that while the alliance component of the therapeutic relationship cannot be successfully emulated in a web-based automated intervention, empathy was successfully increased by the avatar addition, so much as to reach levels similar to face-to-face therapy. This result shows that simple modifications to existing protocols in web-based interventions can improve significantly the patients' perceived empathy and thus get closer to the golden standard of therapeutic relationship, the individual face-to-face session format.

In conclusion, the main purpose of developments in online delivery of psychotherapeutic solutions is to complement face-to-face interventions by using the available limited resources (therapist time) as perniciously as possible, while at the same time reaching the most number of consumers who would benefit from these services. We believe that as the technology improves and more intelligent programs are available, and more efficient screening techniques are developed, both practitioners and the general public will greatly benefit from including the internet-delivered programs in the repertoire of practicing clinicians.

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