BABEŞ-BOLYAI UNIVERSITY, CLUJ-NAPOCA

FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES

DOCTORAL SCHOOL „EVIDENCE-BASED PSYCHOLOGICAL ASSESSMENT AND INTERVENTIONS”

PH.D. THESIS

- ABSTRACT -

EMOTION REGULATION IN PSYCHOPATHOLOGY: A CRITICAL ANALYSIS OF EMPIRICAL EVIDENCE, COGNITIVE MECHANISMS, AND CLINICAL IMPLICATIONS

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CLUJ-NAPOCA

2013

ACKNOWLEDGMENTS

I would like to thank my scientific advisor, Professor Daniel David, Ph.D., for his guidance and constructive feedback that he offered me throughout my entire Ph.D. program, as well as for the vision that he inspired me on what scientific research in clinical psychology implies. Also, I would like to thank all the members of the Department of Clinical Psychology and Psychotherapy for their suggestions which had a considerable contribution in improving the quality of this thesis. Associated Professor Aurora Szentagotai, Ph.D., offered valuable comments on the thesis for which I'm grateful. I also address my gratitude towards all the colleagues from the Graduate School, for their understanding, support and friendship they offered me. Finally, I would like to thank my family and Diana Cândea for their unconditional moral support that they have given me throughout the entire doctoral program.

*Notes.*_____

(1). This work was possible with the financial support of the Sectorial Operational Programme for Human Resources Development 2007-2013, co-financed by the European Social Fund, under the project number POSDRU/107/1.5/S/76841 with the title „Modern Doctoral Studies: Internationalization and Interdisciplinarity".

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CHAPTER I. INTRODUCTION

Today's interest in emotional regulation processes started in the field of basic experimental research, but it rapidly extended and the theory was integrated in the fields of developmental psychology, clinical psychology and even organizational psychology. The main questions that the research in this field is trying to answer are related to: "how people try to change the emotions they are experiencing?", "which are the best ways for regulating a specific emotion or mood?" and "how emotion regulation processes are related to psychological disorders and well-being?". A concise and commonly accepted definition of emotion regulation describes this concept as "*[…] the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions*" (Gross, 1998b), p. 275).

In the field of clinical psychology, emotion regulation has been proposed as a paradigm for integrating (and understanding) several mechanism related to mental disorders (e.g., suppression, rumination, avoidance) and some authors (Hofmann & Asmundson, 2008) have proposed it as a paradigm for integrating different strategies from Cognitive-Behavioral Therapy (CBT) for treating mental disorders (e.g., cognitive restructuring, acceptance/mindfulness strategies).

This thesis will be anchored in this emotion regulation paradigm (and its applications in the clinical field) but it will be adopting rather a critical perspective over both its theoretical models as well as the current status of empirical findings. It will also try to investigate if the concepts derived from this paradigm could add new explanatory value in addition to other concepts that have been already established in the CBT tradition.

1.1. THEORETICAL FOUNDATIONS AND REVIEW OF THE LITERATURE

1.1.1. The process model of emotion regulation and emotion regulation strategies

The process model of emotion regulation is based on the appraisal theories of emotion (Gross & Barrett, 2011). The key element of these theories is that faced with an event (be it external or internal), one's emotional responses are mediated by the cognitive evaluations (appraisals) that he or she makes to that event. This assumption applies to positive and negative events, as well as positive and negative emotions, but the research in the appraisal tradition has been more focused on the negative side. One such theory of appraisal is Lazarus' theory (Lazarus, 1991; Lazarus & Folkman, 1984) which identifies two primary components of cognitive evaluations: primary and secondary appraisals. The primary appraisal is related to the motivational relevance ("Is this event important for me?"), motivational congruence ("Is this event in accordance to my goals?") as well as to the ego-involvement ("Is this event menacing my personal identity?") of a particular event. The secondary appraisal is related to the responsibility for the event ("Am I or others to blame for what happened?"), coping resources ("If there's a threat, can I respond to it?"), and the expectations about the future ("What are the consequences of this event?"; Lazarus, 1991).

Facing an event that is triggering an emotional response, an individual has several ways trough which he could alter the unfolding emotion (Gross, 1998; Gross & Thompson, 2007; see Figure 1). First he could select the situation – *situation selection* – he is confronting (e.g., through avoidance) or he could modify certain aspect of that situation – *situation modification* – so that, in terms of appraisal components, it could increase or reduce motivational relevance and/or congruence, by changing the situation itself. Another option would be to change his attentional focus on a different aspect – *attentional deployment* – of that situation (e.g., through distraction and/or concentration). Appraisal(s) are the last line of antecedents that could be changed – *cognitive change* – with the same purpose of altering

emotional experience as it is unfolding (e.g., through reappraisal and/or reframing). Finally, even after the emotional responses have been unfolded, the individual could still modulate these responses, in the sense of blocking or reducing their expression, or even facilitating it.

Both the concept of emotion regulation and the above described model have received many critiques. Some authors have stated (Kappas, 2011; Mesquita & Frijda, 2011), as anticipated above, that it is hard to distinguish between the naturally occurring consequences or components of an emotion and the regulatory process *per se*. These authors bring forward the regulatory role played in first place by emotions, and that many so called emotion regulatory processes can be confounded with emotion processes. To give a brief example (based on Kappas, 2011), the fact that one removes a threatening stimulus could be regarded as a behavioral consequence of the emotion generated through the appraisal of the stimuli and not as a distinct process aimed at regulating the emotion. Some other authors (Zinbarg & Mineka, 2007) are precautious about whether the concept of emotion regulation brings new explanatory power above other constructs that are already well established in older models and theories. They advance the idea that emotion regulation is just a new label for those constructs (at least in the case of some psychological disorders such as anxiety disorders).

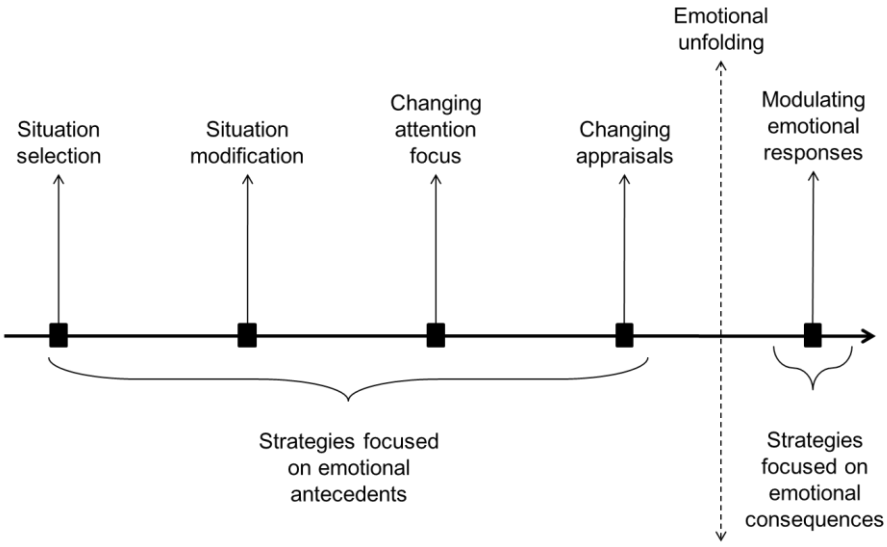

Figure 1. The process model of emotion regulation (adapted after Gross, 1998; Gross &Thompson, 2007). The figure depicts points in the emotion generation process at which regulation could intervene.

Moving forward, the concept of emotion regulation and the process model have been proposed as an integrative framework for several psychological processes that could change, decrease, extinguish, or increase one's emotional experience(s) and its behavioral and psychophysiological concomitants. The literature is abundant in so called *emotion regulation strategies*, which are behavioral and mental actions trough which one could attempt to modify the unfolding emotion at each point in the generation process (i.e., situation selection, situation modification, attentional deployment cognitive change, response modulation). For example, one could try by reappraisal or by reframing to change the initial cognitive mediators of the emotion (i.e., knowledge and appraisals related to a situation). Without being an exhaustive list, here are some examples of emotion regulation strategies that have been manipulated in laboratory studies: reappraisal, suppression (Gross, 1998a), distraction (McRae et al., 2010), detachment (Kalisch et al., 2005), humor (Samson & Gross, 2012), rumination, mindfulness (Kuehner, Huffziger, & Liebsch, 2009), acceptance (Hofmann, Heering, Sawyer, & Asnaani, 2009), and distancing (Koenigsberg et al., 2010).

1.1.2. Implications for psychopathology and psychotherapy

It is estimated that up to 75% of mental disorders included in the *Diagnostic and Statistical Manual of Mental Disorders* [4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association (APA), 2000] are presented with problems related to emotion and emotion regulation (Kring & Werner, 2004; Werner & Gross, 2009). Although such a statistic doesn't say anything about the etiologic role that emotion regulation might play in these disorders, as diagnostic criteria describe rather symptoms than mechanisms, it points that emotion regulation is an important/relevant topic for clinical psychology. The role it might play, either as an etiological/pathogenic factor or as a symptom, should be clarified by empirical studies. Since form the beginning (Gross & Muñoz, 1995), emotion regulation has been proposed as a framework for understanding mental disorders, especially mood disorders, such as depression. It was proposed that emotion regulation, as a construct, might be useful to understand, diagnose, and treat such mental health problems. In this perspective, emotion regulation strategies have been proposed as possible diagnostic features, as a predictors of mental disorders, as a mediators of the treatment, or even as outcomes of the treatment (Rottenberg & Gross, 2007). These roles were thought in a pragmatic rather than epistemic perspective, that is, the therapist or the scientist could assess emotion regulation processes depending on treatment plan or study design. Although some of these roles could be compatible between them, for example, being a predictor of the disorder and also a mediator of change (i.e., from an epistemic perspective this would be assumptions for a mechanism), we find that such a pragmatic approach might undermine the development of a coherent theory. This is why in this thesis we will take an epistemic approach and ask if emotion regulation processes/strategies could be seen as a mechanism or as symptoms of mental disorders. Also, if they prove that might play the role of mechanisms, we will ask if they bring new explanatory power beyond other constructs that have been established in the clinical field.

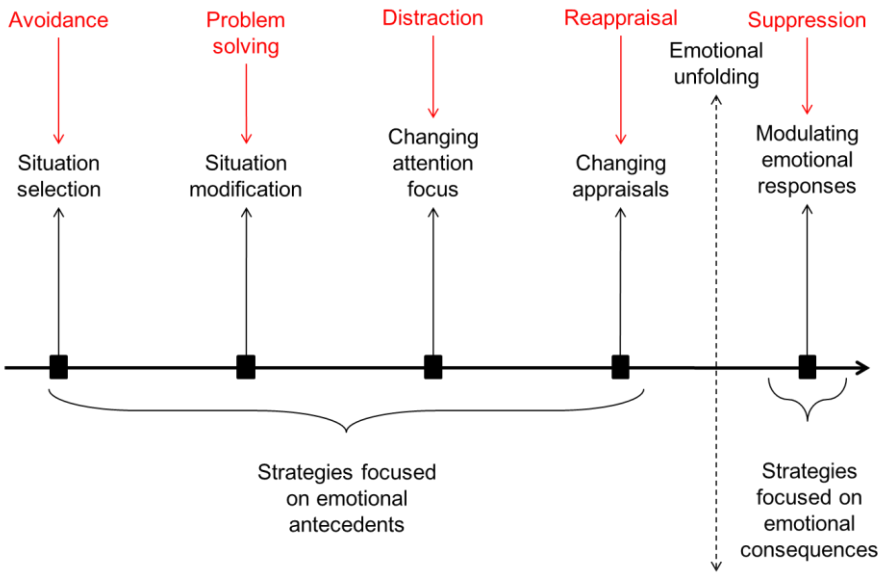

Figure 2. Emotion regulation strategies in the process model. The figure depicts points in the emotion generation process at which specific emotion regulation strategies intervene.

Several authors have use the emotion regulation paradigm as framework for integrating different treatment strategies and protocols, or for understanding and explaining psychopathological processes across disorders (Fairholme, Boisseau, Ellard, Ehrenreich, & Barlow, 2009; Mennin & Fresco, 2009).

These approaches are not new treatments *per se*, and are rather grounded in the CBT approach to treating mental disorders, using similar techniques and strategies. Yet, they propose new ways of conceptualizing the treatment for different forms of psychopathology (e.g., mood and anxiety spectrum, or a specific disorder such as generalized anxiety disorder) as emotion regulation disorders. Both the unified protocol (Fairholme, et al., 2009) and the Emotion Regulation Therapy (ERT; Mennin & Fresco, 2009) assume that the problems they are approaching are caused mainly not by intense emotional experiences, but rather by deficits in their regulation (i.e., dysfunctional use of regulatory strategies). These approaches map on the process model of emotion regulation and try to identify which dysfunctional strategies are used by the patients. Then, the treatment is tailored on the so called emotion regulation difficulties, and the patient is thought, asked to exercise and try to apply new, more adaptive, strategies. The general architecture is the same as for any psychological intervention: diagnostic, conceptualization, psycho-education, and intervention. Yet, in the case of the unified protocol at least (Fairholme, et al., 2009), the classic diagnostic is doubled by a trans-diagnostic approach, in which specific measures assess deficits in emotion regulation and the treatment plan will be then developed to approach these deficits. In other words, the treatment plan is not build based on the disorder the patient is confronted with, but based on the dysfunctional emotion regulation strategies identified.

A similar approach is taken in the case of generalized anxiety disorder (GAD) by ERT (Mennin & Fresco, 2009). Based on studies that show that emotion regulation strategies (emotion dysregulation) have distinct contributions in anxiety and mood disorders (Mennin, Heimberg, Fresco, & Ritter, 2008; Mennin, McLaughlin, & Flanagan, 2009) the treatment protocol tries, in different phases, to replace dysfunctional regulation strategies common in GAD with more adaptive ones.

The same emotion regulation model (the process model; (Gross, 1998b) was use by Hofmann and Asmundson (2008) to explain how the central strategies in classic CBT approaches (i.e., cognitive restructuring) and newer developments [i.e., acceptance strategies coming from Acceptance and Commitment Therapy (ACT; (Hayes, 2004; Hayes, Luoma, Bond, Masuda, & Lillis, 2006)] work at theoretical level. These authors state that cognitive restructuring is a technique facilitating reappraisal of negative life events (an antecedent-focused strategy in the process model), while acceptance works by decreasing the use of dysfunctional strategies targeting the regulation of emotional responses (e.g., suppression; consequences-focused strategies).

1.1.3. State of the art

To give structure to our review of the literature, we will organize it in three lines of research, based on the methodology they made use of. The first line is comprised of experimental studies related to the efficacy of different emotion regulation strategies as observed in laboratory studies, the second one is related to data coming from correlational (cross-sectional and longitudinal) research, and the third one consisting of data steaming out of clinical research testing the efficacy or effectiveness of different psychological interventions. The review of the literature will make use of references to the important reviews and meta-analytical studies that have been published so far.

Experimental laboratory studies

Three meta-analytical studies have synthetized (at least in part) the efficacy of different emotion regulation strategies in experimental settings (Augustine & Hemenover, 2009; Kohl, Rief, & Glombiewski, 2012; Webb, Miles, & Sheeran, 2012). Is true that these meta-analytical studies showed great variability in their focus of the analysis and in the conceptualizations of emotion regulations strategies, as well as the studies included, but they still offer some important information that we would like to briefly present.

Augustine and Hemenover (2009), using the affect repair framework (Parkinson & Totterdell, 1999), calculated the effect sizes of different categories of regulation strategies as well as for specific strategies, in relation to self-reported affect. The effect sizes (Cohen's *d*) were calculated as the difference between baseline (with and without a prior mood induction) and after making use of the strategies. In other words, this meta-analysis expressed the within subjects effectiveness. This type of comparison showed that inhibition (*d*= 2.02) and distraction (*d*= .95) both with large effect sizes, followed by control condition (*d*= .72) and reappraisal (*d*= .65) both with medium effect sizes, were the most effective strategies for regulating affect. Interestingly, rumination, also showed to be an effective strategy, but with small effect size (*d*= .31). Their results are somewhat unexpected, as one can see, the control condition had similar effectiveness as reappraisal (in fact, the effect size was grater for control condition), while inhibition, which is conceptually similar to suppression (i.e., acting in a contrasting manner with own emotions) was the most effective strategy. Yet, this direct comparison between strategies might be inaccurate, as the studies included in the analysis used variable methodologies and the choice of looking at the within subjects effectiveness might be misleading (differences in effectiveness might be due to different methodologies). Perhaps the calculation of effect sizes based on a direct (between subjects) comparison with the control condition might have been more appropriate to estimate the effectiveness of different strategies and reduce the possible biases coming from different methodologies in the studies included.

Kohl et al. (2012) were focused on acceptance as mean of regulation. They found that this type of strategy was effective only in the case of pain tolerance (Hedges's *g*= .43) and no difference of effectiveness emerged in relation to other subjective and psychophysiological outcomes. Is important to note that in the case of this review, acceptance strategy was compared with other strategies (reappraisal, suppression, distraction, positive imagery, etc.) and control conditions all of these taken as a whole. Also, some of the studies included manipulations that were more extensive than an instruction (and short training) in the laboratory, such as homework assignments and exercises over several days. This approach makes hard to extract relevant conclusions on how acceptance compares with other strategies, as the comparison was made with an highly heterogeneous mixture of regulation strategies, some hypothesized to be adaptive (e.g., reappraisal) and others to be maladaptive (e.g., suppression and rumination). The heterogeneity in the manipulation of acceptance makes even harder to draw conclusions, as the authors did not control for possible the effects of time spent in training participants.

Finally, Webb et al. (2012) conducted an extensive quantitative review on this subject, using the process model of emotion regulation as a reference for defining the strategies, and found that overall attention deployment strategies were ineffective (*d*= .00), cognitive change strategies had a small positive effect size (*d*= .36), and response modulation strategies had a very small effect size (*d*= .16). There were differences within each large category, so that in the case of attention deployment, distraction proved to be an effective strategy of emotional outcomes (*d*= .27), while concentration was ineffective (*d*= -.26). Within cognitive change, all types of reappraisal had a positive but small effect on subjective emotions: reappraisal of emotional response (e.g., think about the situation so that you feel calm), *d*= .23, reappraisal of emotional stimulus (e.g., think about the situation so that it doesn't look so menacing), *d*= .36, and perspective taking (e.g., think about the situation from an objective point of view), *d*= .45. Results on response modulation showed that expressive suppression was an effective strategy for emotional outcomes, *d*= .32, while suppressing the emotional experience and thoughts related to that experience both showed to be ineffective, *d*= -.04, and *d*= -.11 respectively. Indeed, there were some variations in patterns of the results on other outcomes (behavioral and psychophysiological) that are extensively presented by the authors. Yet, we

would like point out that similar to Kohl et al. (2012), the estimation of the effect size of each strategy was based on the comparison with a mixture of conditions (active strategies, both adaptive and maladaptive strategies, and control conditions).

Taking a more in depth look at these reviews, we find that they do not offer clear conclusion, at least for some of the strategies included in the analysis, because of several reasons. Some of the reviews do not take into account important strategies or do not offer direct comparisons with control group, which make in turn hard to interpret the effectiveness of specific strategies.

Cross-sectional studies

Such studies have investigated the association between different habitual emotion regulation strategies [see Gross and John (2003) for details about such a conceptualization of reappraisal and suppression] and several forms of psychopathology. The evidence coming from these studies were synthesized by (Aldao et al., 2010) in a quantitative meta-analysis of 114 studies. Their results show that there is indeed an association between trait emotion regulation strategies and psychopathology. This meta-analysis took into consideration several forms of psychopathology: depression, generalized anxiety, eating disorders and substance abuse disorders. The results showed differentiated patterns of association between emotion regulation strategies and psychological disorders. First, rumination had the strongest association with psychopathology (large effect size), followed by suppression, avoidance and problem solving (with medium to large effect sizes). The lowest associations were found for reappraisal and acceptance (with small effect sizes, the latter not reaching the significance threshold). The analysis of the associations between these strategies and each type of psychopathology (for those where data was available) revealed that rumination, suppression and avoidance were positively associated with depression, anxiety and eating disorders, in addition rumination being also associated with substance abuse disorders. Reappraisal was negatively associated with anxiety and depression, and acceptance was not associated with any psychopathological symptoms for which data was available.

These results highlight some interesting ideas. First it seems that the presence of the strategies generally considered to be ineffective, at least in the long term, such as rumination, avoidance, and suppression, could be a vulnerability factor for developing emotional and eating disorders, as well as addictions, but the presence of the strategies generally considered as having positive consequences (such as reappraisal and acceptance) are not relevant protective factors. It gets more interesting when we take into account the fact that reappraisal and acceptance strategies are considered to be the at the core of CBT approach, respectively at the core of the new developments within this framework, such as ACT (see Hofmann & Asmundson, 2008).

The few longitudinal studies providing evidence that poor emotion regulation strategies precede and predict the occurrence of emotional and behavioral disorders on a shorter or longer period of time, from 6 weeks (Calmes & Roberts, 2008) to several years (Nolen-Hoeksema, Stice, Wade, & Bohon, 2007), are accompanied by other studies that deny this power of prediction, thus the results being inconclusive. For more details and discussion see the same meta-analysis (Aldao et al., 2010).

Clinical studies

We have identified only two empirical studies that focused on training emotion regulation strategies and only one was a randomized clinical trial. Gratz and Gunderson (2006) found that a group intervention meant to improve skills for managing negative emotions added to a standard treatment increased its effectiveness for patients with borderline personality disorder with recent record of self-harming behaviors. In another study, Berking et al. (2008) showed that a group intervention for developing emotion regulation skills, which replaced an equivalent number of sessions of standard, CBT for inpatients, delivered in the

last weeks of treatment, increased the effectiveness of the psychological intervention compared with CBT only.

Some studies have shown that standard CBT protocols have an effect of the regulation strategies that patients use to regulate negative affect. For example, Scarpa and Reyes (2011) showed in a pre-/post-test study that CBT improves emotion regulation abilities of high-functioning children with ASD and their parents. A study with interesting results regarding the treatment of alcohol dependence using CBT, showed that the deficiencies in emotion regulation predict alcohol consumption both during and after the therapy (Berking et al., 2011) and the most relevant ability was that of tolerating negative emotions. However, both studies are lacking the comparison of with other already established constructs from the traditional CBT protocols such as negative automatic thoughts, dysfunctional and irrational beliefs, and thus it is hard to tell if emotion regulation deficits bring more explanatory power over them.

1.1.4. Relevance and potential impact of the research topic

As one can see in the discussions above, emotion regulation is a main-stream topic, attracting the interests of many researchers and research groups. This interest comes from the profound implications that emotion regulation might hold in understanding and treat a wide range of psychopathology symptoms. Is true that emotion regulation, as a construct, extends its possible impact beyond the clinical field, but what we will be focused on in this thesis are its clinical implications. Emotion regulation can be approached as predictor and vulnerability factor for psychopathology, mechanism of treatment, and as some researchers have suggested, as an outcome of therapeutic interventions. Yet, in our thesis we will undertake the first two approaches, as these have a greater significance for the clinical field. Also, as some of the experimental research did, we will focus on the specific components of emotion regulation strategies, as such specific analysis might help clarify in which condition regulatory strategies are (more) adaptive and for which people they work best.

Even though the concept of emotion regulation is widely used today, both theoretically and empirically is still regarded by some authors as controversial. Also, the data from the literature we have presented is far from definitive conclusions, and whether emotion regulation can be used as framework for understanding and threating mental disorders is disputed. These are additional arguments why the topic of this thesis is relevant in the current scientific context. In fact, in the original research section, we will approach some of the key gaps in this paradigm and try to offer relevant answers to questions still unanswered. Following the commitment of taking a critical perspective, we will also try to test this construct against other established constructs from the clinical literature and address the questions raised by the opponents of the emotion regulation paradigm.

As a conclusion of this short section, the topic of emotion regulation is expected to have a great impact on how mental disorders are understood and treated, but this impact is still to be proved. This this thesis is anchored in this hot-topic, but adopting a critical perspective in testing if indeed emotion regulation framework can have a significant impact on the clinical field.

1.2. CRITICAL ANALYSIS OF EMOTION REGULATION MODEL AND COMPARISON WITH CBT APPROACH

To better understand the distinct contributions of emotion regulation model (if any), let us make a comparison with the CBT model. Although CBT has developed specific models for different disorders describing how they develop and which the their mechanisms, across these models, in treating specific problems the patient are presented with, problems are

conceptualized through the cognitive ABC model, developed in the Rational Emotive Behavior Therapy (REBT; Ellis, 1962; 1994) approach.

The cognitive ABC model states that when confronted with an activating event (A), be it external or internal, one's responses/consequences at emotional, behavioral and psychophysiological levels (Cs), will be mediated by the beliefs he holds about that particular event (Bs). From this point of view, the ABC model in comparable with the process model or emotion regulation and the appraisal models of emotion, as all assume the mediation role of cognition. Yet, developments in CBT have made very specific distinctions about the types of cognitions and their role in generating subsequent consequences (David, 2012; in press). First of all, they can be or function as conscious and unconscious information processing. Also, they can take the form of general/core schemas/belief which are activated by specific events and generate automatic thoughts. An important distinction can be made on the basis of their role in generating emotional responses. Cold cognitions are constituted of descriptions (i.e., mental projections of an event) and inferences (i.e., interpretation one makes to the mental projections/descriptions of that event). Descriptions and inferences are well documented in CBT, especially in the cognitive therapy (CT) literature (Beck, 1976; Beck, 1995). Inferences that are not sustained by logical principles, by empirical evidence, or by pragmatic outcomes (e.g., selective abstracting, maximization/minimization, black or white thinking, etc.) are considered to be dysfunctional and are addressed in treatment. Descriptions and inferences could be easily integrated under the concept of knowledge used by Lazarus in he's theory (Lazarus, 1991). On the other hand, hot cognitions comprise (David, 2012) rational and irrational beliefs that a person holds about that event. Rational and irrational beliefs and their implications for mental health are documented by the REBT tradition (Ellis, 1962; 1994; Dryden & Branch, 2008). Each irrational belief has its rational counterpart: demandingness vs. non-demanding preference, awfulizing vs. non-awfulizing, low frustration tolerance vs. frustration tolerance, and global evaluation (of self, others or life) vs. unconditional acceptance (of self, others or life). Rational and irrational beliefs are close to the concept of appraisal in Lazarus' theory (1991; for more details see also David, 2012).

In the CT/REBT tradition (or more generally CBT), the therapist helps the patient identify, dispute (e.g., disputing irrational beliefs through pragmatic, empiric or logic strategies; conducting behavioral experiments to test the functionality of the beliefs, etc.) and replace dysfunctional/irrational beliefs with more adaptive/rational ones. Now that we have presented the ABC model of CBT (and the emotion regulation model has been presented in the previous chapter) is time to ask which are the differences and the common elements in addressing emotional problems. Figure 3 depicts a graphical representation of the two models.

Analyzing the figure, there are several differences that pop out. First, cognitions/beliefs are the central element of the ABC model. The literature around the types of dysfunctional beliefs that people might hold is abundant and they are well classified and structured within the model. On the other hand, the emotion regulation paradigm tells very little about which forms of reappraisal are more effective, and how the way people reappraise might alter their emotional experience or reduce the risk for developing psychopathology. Indeed, looking in the literature, one could identify various forms of reappraisal, form positive to negative or neutral reappraisal, detachment, distancing, etc. Although there were some systematizations (e.g., Webb et al., 2012) they were performed in a bottom-up fashion, meaning that the different forms of reappraisal used in empirical studies where grouped together based on their similarity but no theoretical framework was used in doing so. Also, the reappraisal instructions that were used in experimental studies could be easily accused of lacking ecological validity, as they ask patient to reappraise so that they feel better or don't feel that bad, without stating how they could think to do so (e.g., Butler et al., 2003; Gross, 1998a). However, there are some studies (Cristea, Szentagotai Tatar, Nagy, & David, 2012;

Szasz, Szentagotai, & Hofmann, 2011, 2012) that used types of reappraisal inspired by the clinical practice (i.e., how patients learn in therapy to reappraise negative life events), namely from the REBT approach, but such studies are rather the exception than the rule.

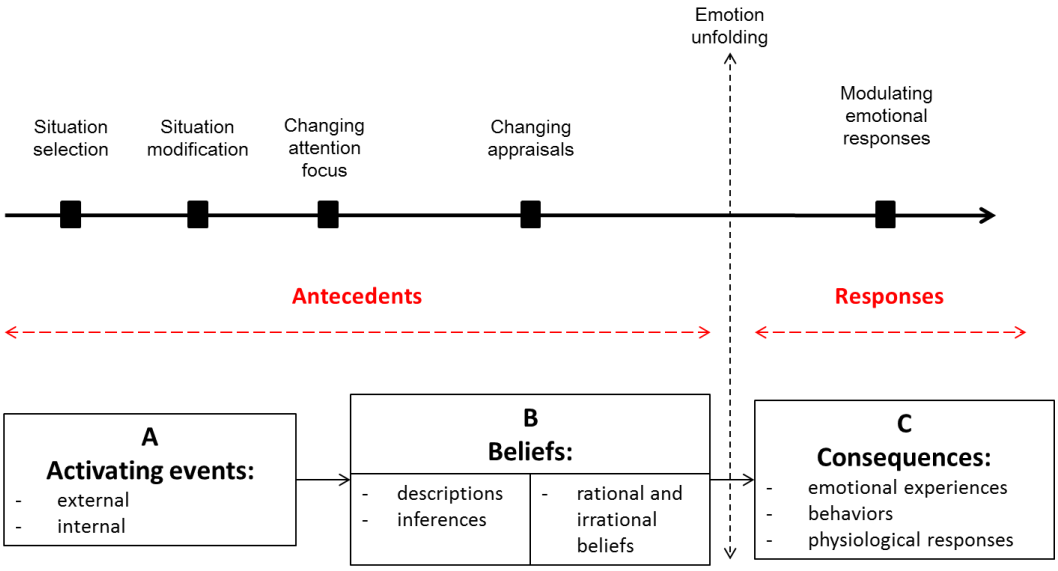

Figure 3. Emotion regulation model and ABC model. The figure depicts a comparison of the process model of emotion regulation and the CBT's ABC model.

A second difference that we would like to discuss is the fact that the emotion regulation model seems to give greater consideration to other antecedents of emotional response, beside the activating event/situation. These antecedents are situation selection/modification and attentional focus. At a first site this would be an easy conclusion, but a careful analysis of how the ABC mode is used in therapy might lead to a somewhat different conclusion. Let us take the example of the cognitive distortion labeled "thinking in black or white". A patient that presents such a distortion would be thought how in fact he generally tends to focus on the negative elements of life events he or she is confronted with and disregard the positive ones. Then, the therapist would encourage him to adopt a different, more flexible perspective on life event and also look at "the filled side of the glass". Although this is generally done by disputing negative thought, it could also be regarded, at least in part, as a strategy for encouraging attentional deployment. Unfortunately, there are no studies to our knowledge to test such an effect.

1.3. RESEARCH QUESTIONS

At the end of the introductory part, we would like to bring to front the main questions that will be addressed by the thesis. Some of them were the starting questions of the thesis, based on the gaps identified in the literature, while others have emerged along the way, as results in the first studies raised new questions that needed investigation.

There is a discrepancy between the results of experimental research (as synthetized by several meta-analytical studies) and results coming from cross-sectional studies (also reviewed in one large meta-analysis). Experimental studies show that strategies thoughts to be adaptive (namely reappraisal, and to a certain extent acceptance) are effective strategies, while results are inconclusive for strategies considered to be maladaptive (namely rumination and suppression). Cross-sectional results point the inverse pattern, meaning that there is a strong link between same maladaptive strategies and psychopathology, but such a link is very weak (or absent) for the adaptive strategies. We pointed out several important limitations of

current studies in the emotion regulation paradigm, such as lack of ecological validity and training for the instructions. We decided to address these limitations of previous research and the first question is: "Are reappraisal and acceptance effective emotion regulation strategies in experimental studies?".

Next, we pointed that there are few studies that have looked if emotion regulation strategies change during psychotherapeutic intervention. Also, data is lacking in regard to whether regulation strategies could be considered as a possible mechanism of change in psychotherapy. Thus, the second question that we wanted to address is: "Are changes in emotion regulation strategies predictors of changes in the outcomes of psychotherapeutic interventions?".

The next questions unfolded after the results of the first studies. Also, these questions were tailored around the construct of reappraisal, as we decided to focus on this strategy in the last two studies. These final studies tackled the idea that although reappraisal showed to be effective in experimental studies and is regarded as a central strategy in the CBT framework, cross-sectional studies (and our results in Study 3 which looked at emotion regulation strategies as possible mechanism in CBT) showed a modest association (or even lack of such an association) with psychopathology. The next two questions were: "Are there more specific components of reappraisal that might help understand its association with distress and psychopathological symptoms?" and "Is the conceptualization of reappraisal as an ability rather than a habitual strategy, more helpful in understanding its link to psychopathology?".

CHAPTER II. RESEARCH AIMS AND GENERAL METHODOLOGY

2.1. RESEARCH AIMS

In the following lines we will state our aims. In total, there are five research aims for the entire thesis. They are all stated in the general terms of the constructs they are referring to, and will be operationalized (and inserted in a more specific context), in the studies in which they will be tested/investigated.

1. *Compare the efficacy of reappraisal and acceptance as emotion regulation strategies manipulated in experimental studies, based on a clinical conceptualization of the strategies and with direct comparisons with a control group or condition.*
2. *Asses the predictive value of emotion regulation strategies on psychopathology, as compared to established constructs in CBT, such as dysfunctional/irrational beliefs.*
3. *Assess the role of emotion regulation strategies as possible mechanism of change in cognitive-behavioral treatments.*
4. *Compare the efficacy of reappraisal targeting a positive change of the inferences with reappraisal targeting a reduction in motivational relevance.*
5. *Assess the association of reappraisal ability as contrasted with habitual use of reappraisal in predicting anxiety and mood disorders.*

2.2. GENERAL METHODOLOGY

We present now the research methodology that was used to approach these aims along the five studies in this thesis. A meta-analytical approach was adopted for Study 1 as although there were several reviews of the literature on the efficacy/effectiveness of emotion regulation strategies in experimental studies, none of them had offered clear conclusions regarding how effective are reappraisal and acceptance and how they compare to one another. In this meta-analysis, we compared these strategies with the control group/condition, with each-other, as

well as with other emotion regulation strategies that were manipulated in the studies included in the analysis. We took into consideration multiple outcomes: self-reported affect, psychophysiological, behavioral, cognitive and attitudinal measures.

As we found while reviewing the literature that most of the studies manipulating reappraisal and/or acceptance used artificial regulation instructions, we designed a new study (Study 2) for comparing these strategies. This time we used instructions inspired by clinical practice, together with consistent training in using the strategy. Also, to take a deeper look at the mechanisms of acceptance, we choose to compare acceptance (and reappraisal) with a similar process, focused on one's own emotions and thoughts, but without the instruction of distancing from the emotional experience (i.e., self-focused processing).

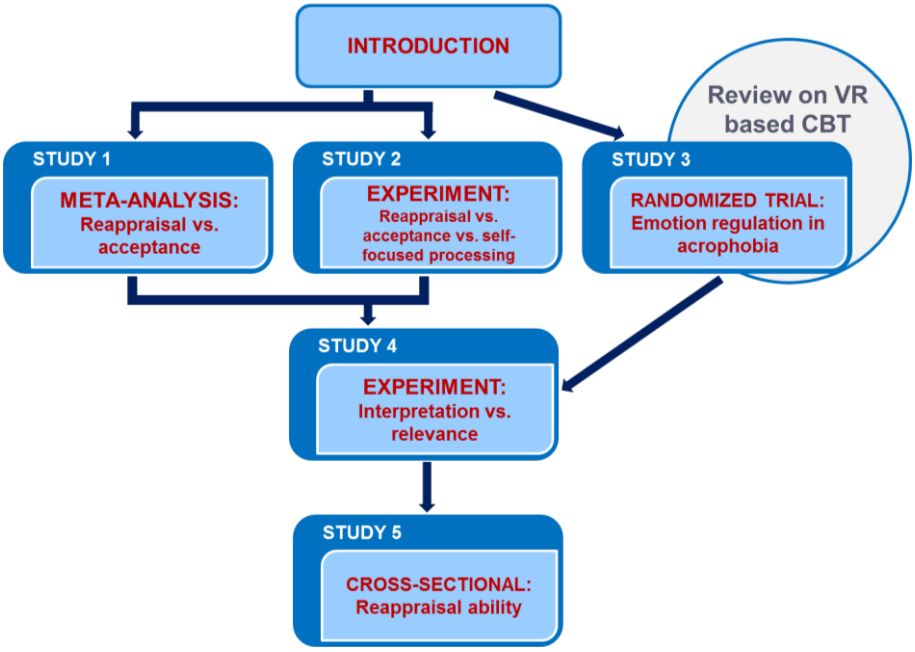

Figure 1. Graphical representation of the overall structure of the thesis. Each study is briefly described in terms of methodology and main topic.

Study 3 is a randomized trial on the efficacy of virtual reality based CBT for acrophobia. In this study we tackled the second and third aim, related to the role of emotion regulation strategies as predictors of psychopathology and mechanisms of change in psychotherapy. Also, the documentation part for Study 3 included a review of the studies on the use of virtual reality in psychotherapy for anxiety disorders, review which helped us in developing the experimental design. The study compared the effectiveness of classic exposure technique with an enhanced intervention that made use of both exposure and cognitive restructuring. No study in the published literature on virtual-reality based CBT had investigated the effect of this combined intervention. We also took into account the type of virtual environment (high vs. low immersion) which lead to a bi-factorial design: two types of interventions * two types virtual environments.

In Study 4 we compared a classical/commonly used instruction for reappraisal, asking participants to change how they think about a series of negative stimuli, with two instructions derived from Lazarus' appraisal theory (1991), the first one targeting the interpretations (inferences) related to the negative stimuli, and the second one targeting a reduction in the motivational relevance of the same stimuli. We also used a control group (with no regulation instruction) to facilitate the interpretation of the results. A qualitative analysis was performed to ensure that the participants managed to follow the emotion regulation instructions. The

outcomes in this study were self-reported affect, negative thoughts, as well as psychophysiological activity. Exploratory analysis investigated which of the two reappraisal strategies were better related to positive emotional outcomes, and if the performance in using these sub-types of reappraisal were related to depressive symptoms.

Finally, in Study 5 we tested if a reconceptualization of reappraisal as the ability to effectively use this strategy (measured by several indexes) could bring more explanatory power in relation to psychopathology. Rather than assuming a direct predictive model, we tested the moderation role of this construct in the relationship between negative life events and symptomatology (depressive and anxious). Reappraisal ability was conceptualized as one's capacity to reduce negative emotions and/or to increase positive emotions when exposed to negative stimuli, by making use of reappraisal. Also, another index regarded the number of different alternative reappraisals one could generate when confronted with such stimuli. Although cross-sectional in nature, the measurement of reappraisal ability was conducted in an experimental laboratory procedure that allowed the calculation the different indexes.

CHAPTER III. ORIGINAL RESEARCH

3.1. STUDY 1. A META-ANALYSIS OF THE EFFECTIVENESS OF REAPPRAISAL AND ACCEPTANCE IN EXPERIMENTAL STUDIES: IMPLICATIONS FOR THE COGNITIVE-BEHAVIORAL FRAMEWORK[1]

Introduction

A recent meta-analysis on the association between emotion regulation strategies and psychopathology (Aldao et al., 2010) lunched the idea that there are a number of maladaptive strategies *per se* which predict psychological symptoms. Moreover, the presence of these dysfunctional strategies seems to be more important than the absence of functional strategies. This meta-analysis showed that rumination has the strongest association with psychopathology (large effect sizes) followed by suppression, avoidance and problem solving (with a medium to large effect size, the later one with a negative association), and the lowest associations with psychopathology were for reappraisal and acceptance (both with negative associations but with small effect sizes, the latter not reaching the significance threshold). The association of these strategies with each type of psychopathology (for those where data was available) revealed that rumination, suppression and avoidance were positively associated with depression, anxiety and eating disorders. In addition, rumination was associated with substances abuse. Reappraisal was negatively associated with anxiety and depression, and acceptance was associated with none of the psychopathological symptoms for which data was available. This result is interesting if we consider that reappraisal and acceptance strategies are considered to be core concepts of CBT and of new developments such as ACT; (Hofmann & Asmundson, 2008).

There are three meta-analytical studies that tried to synthetize the results of experimental research (Augustine & Hemenover, 2009; Kohl et al., 2012; Webb et al., 2012). Indeed these reviews point (with some variations) that reappraisal and acceptance are effective on different emotional outcomes, while suppression and rumination for example might not be as maladaptive as thought before.

[1] The results of this study were presented at the the 25th Congress of the European Association for Behavioral and Cognitive Therapies (EABCT), Marrakech, Morocco, September 2013. Full reference: Matu, S-A., David, D., (2013, September). *A meta-analysis of the effectiveness of reappraisal and acceptance in experimental studies: Implications for the cognitive-behavioral framework*. Poster session presented at the 25th Congress of the European Association for Behavioral and Cognitive Therapies (EABCT), Marrakech, Morocco.

Augustine and Hemenover (2009) focused on a broader concept (affect repair) and included also studies whom implied regulation strategies that were extending beyond an experimental manipulation in the laboratory (e.g., sleep, pleasant activities). They also used a different conceptualization from that of current clinical models, but also from the emotion regulation model. Webb et al. (2012) approached both reappraisal and acceptance strategies under the larger umbrella of cognitive change. Although they offered separate effect sizes for the specific categories, acceptance and mindfulness strategies were grouped under reappraisal targeting the emotional response itself. This is somewhat different from the theoretical and clinical conceptualizations (both mindfulness and acceptance imply non-judgmental awareness, which is quite distinct form reappraisal, although data to prove this theoretical distinction is lacking). Kohl et al. (2012) took into account experimental and quasi-experimental studies on the effectiveness of acceptance as a strategy for emotion regulation and showed that this strategy is more effective than others (taken together, including suppression, rumination, reappraisal, and even control conditions) in terms of pain control, but not significant differences in effect sizes emerged for other relevant outcomes (such as negative emotions).

Results coming from these meta-analytical studies showed a puzzling discrepancy: reappraisal and to a certain extent acceptance, seem to be associated with positive outcomes in laboratory studies, being effective in regulating negative mood, but in cross-sectional studies, where the positive outcome is the lack of psychopathology, they are modestly or unrelated to such outcomes. Yet, as we have discussed in details in the state of the art section, the meta-analytical reviews of experimental research have several limitations that make hard to extract definite conclusions: they focus on different strategies, make use of different conceptualizations of the strategies, or do not make direct comparisons with the control group/condition (the comparison for estimating the effect sizes is based on a mixture of strategies and control conditions, or based on a within subject comparison of scores before and after the introduction of the strategy). Thus, we decided to run a new meta-analysis, focusing on reappraisal and acceptance, and trying to overcome the limitations of previous synthesis. The goals of our meta-analysis are:

1. *Estimate the effect size of reappraisal and acceptance, based on a comparison with the control group or control condition (true effectiveness);*
2. *Comparing the efficiency of reappraisal and acceptance as emotion regulation strategies in experimental studies (relative effectiveness);*
3. *Comparing the efficiency of reappraisal and acceptance with the emotion regulation strategies identified as dysfunctional (i.e., rumination, suppression, avoidance);*
4. *Testing for moderators that could explain the differential effectiveness of these strategies.*

Method

Studies identification

Potential relevant studies have been identified in electronic databases PsychInfo® and PubMed® using the keywords *reappraisal* or *acceptance* and *emotional regulation* in title and/or abstract. Other articles were identified in the references of the already published meta-analyses at the time of the studies identification (Augustine & Hemenover, 2009; Kohl et al., 2012).

Studies selection

The selection criteria for the studies that were included in the analysis were:

1. to be published in English;
2. to be published in peer review journals;

3. to experimentally manipulate reappraisal and/or acceptance in a laboratory study; we excluded non-experimental studies in which the assessment of the strategies used by the participants was made after the induction task, with no prior instruction;
4. to compare the effectiveness of reappraisal and/or acceptance with another emotion regulation strategies, such as rumination, suppression or avoidance, or with a control group; we did not include studies that investigated the effectiveness of reappraisal or acceptance only compared to a control condition (within subjects), but we included in the analysis studies that used such a condition and made also comparisons with other strategies;
5. to provide sufficient data to calculate effect size indicators;

A total of 722 studies were identified in the above mentioned sources and 413 remained after excluding duplicates. 309 remained after excluding those who did not qualify regarding the language and type of publication. 190 studies were excluded because of their correlational nature and other 77 because they did not compare reappraisal and/or acceptance with another emotion regulation strategy or control group. Forty two have been comprehensively read and evaluated in detail for eligibility. Of these, 17 were excluded because reappraisal or acceptance was not experimentally manipulated. Twenty five studies were included in the final analysis. Figure 1 illustrates in a PRISMA Flow Chart the selection process of the studies included or excluded from the analysis.

Coding procedure

For the 25 studies that met our inclusion criteria, we coded the variables that were later introduced in the analysis: data for the identification of each study, the outcomes of interest (coded in five main categories): self-reported emotions, physiological reactivity, behavioral responses (e.g., the time spent in a task), cognitive responses (e.g., the results of a memory task) and attitudinal responses (e.g., the interest in repeating the task once again), the instrument by which the outcome was measured, the number of subjects, the type of emotional induction, the study design from which data were extracted to calculate the effect sizes, sex and age of the sample, the clinical status of the sample and, where there was a reappraisal condition.

We calculated effect sizes for seven types of comparisons: reappraisal vs. control (N= 12), reappraisal vs. acceptance (N= 5), acceptance vs. control (N= 5), reappraisal vs. suppression (N= 14), reappraisal vs. rumination (N= 1), acceptance vs. suppression (N= 8), acceptance vs. rumination (N= 2). As for the comparison between reappraisal and rumination, and the comparison between acceptance and rumination there were only 1 and 2 studies respectively, these comparisons were not included in the analysis described below.

For studies in which there was no separate control group but the data available permitted the estimation of the effect size for the comparison with a control condition (within subjects), we also calculated the effect size and noted as such in the column moderator for comparison type.

Data analysis

Data analysis was carried out in two steps: (1) estimate the effect size indicators, confidence intervals and heterogeneity indicators for each of the 5 comparisons (overall, for all the outcomes taken into account), (2) estimate the effect size for each comparison on each type of outcome. After each of these steps we performed moderation analysis, testing the role of *a priori* moderators. Tests for moderator were done where significant heterogeneity of data was found, and was conducted for both overall effect sizes, and for specific outcomes effect sizes. Where moderators did not help us explain the heterogeneity of data, we explored possible outliers, but this procedure was done only for the overall effect size.

Data analysis was done based on the random distribution model of effects size (Hunter & Schmidt, 2004). The index that we used to assess publication bias was the Fail-safe N,

which indicates the number of studies with a zero effect size that would be needed to make the results in our analysis non-significant. Data were coded and analyzed using Comprehensive Meta-Analysis software, version 2.2 (Borenstein, Hedges, Higgins, & Rothstein, 2005). In the interpretation of the results we followed Cohen's (1998) recommendation, so that an effect size between .00 and .20 was regarded as trivial, an effect size between .20 and .50 was regarded as small, an effect size between .50 and .80 was regarded as medium, and an effect size greater than .80 was regarded as large.

Based on the 25 studies we extracted a total of 267 effect sizes for all 5 pairs of strategies included in the analysis, for all the outcomes taken into consideration.

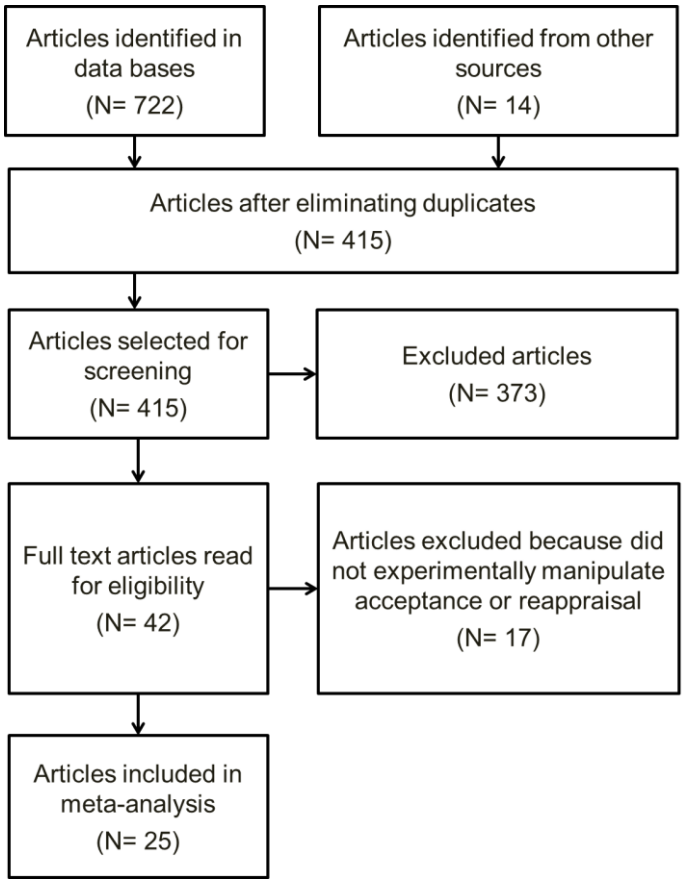

Figure 1. PRISMA Flow Chart of the studies included in the meta-analysis. The figure depicts the number of studies at each point in the selection process.

Results

Reappraisal vs. control

The effect size for the comparison between reappraisal and control group was small $d = .406$, 95% CI [.199, .612], Q(11)= 52.698, $p < .01$, favoring reappraisal. Calculated Fail-safe N was 184, which is less than the recommended threshold, taking into account the number of studies included in this analysis, in this case 70). As there was significant heterogeneity in the data, we conducted moderation analysis for the overall comparison between reappraisal and control. The type of reappraisal (Q(4)= 3.907, $p = .419$) and the study design (Q(1)= 2.359, $p = .125$) did not moderate the effect sizes for the comparison of reappraisal with the control condition. No study included in the analysis used a clinical sample for this comparison.

Acceptance vs. control

The overall effect size for the comparison between acceptance and control group (N= 5) was small and non-significant: $d = .303$, 95% CI [-.206, .813], Q(4)= 33.049, $p < 0.01$.

Reappraisal vs. acceptance

For the overall comparison between reappraisal and acceptance (N= 5) we obtained a positive, medium effect size, *d*= .68 in favor of reappraisal; 95% CI [.341, 1.027], with a significant test of heterogeneity Q(4)= 19.078, *p*< 0.01. Fail-safe N calculation showed that 80 studies with an effect size equal to 0 are needed to make this comparison non-significant.

To explain the heterogeneity obtained on the overall comparison between the two strategies, we tested the moderating effect of pre-established variables. None of them did moderate the comparative effectiveness between reappraisal and acceptance: type of the reappraisal instruction, Q(2)= .270, *p*= .874; study design Q(1)= 1.479, *p*= .024; there were no studies that included clinical samples for this comparison.

Reappraisal vs. suppression

The overall effect size for the comparison between reappraisal and suppression (N= 14) was: *d*= .656, 95% CI [.461, .851], Q(14)= 53.230, *p*< 0.01, again favoring reappraisal. The Fail-safe N value was 554. In an attempt to explain the heterogeneity we conducted moderation analysis using variables set *a priori*. The study design (Q(1)= .761, *p*= .380), the clinical status of the sample (Q(1)= .712, *p*= .399) and the type of reappraisal (Q(4)= 3.343, *p*= .502) did not moderate the effect sizes for the comparison between reappraisal and suppression.

Acceptance vs. suppression

Surprisingly, the effect size value for the overall comparison between acceptance and suppression (N=8) was negative, but non-significant: *d*= -.07, 95% CI [-.204, .190], Q(7)= 15.896, *p*= .026.

Discussion

The results of our analysis are similar to the one of previous meta-analytical studies in the case of reappraisal. We found evidence that reappraisal is an adaptive strategy, both compared with control group, as well as compared to suppression. Also, reappraisal, used in experimental studies, seems to be more effective than acceptance strategies. This were also the conclusions of Webb et al. (2012) and Augustine and Hemenover (2009). Yet, in the last case, the authors found that the control condition was more effective than reappraisal, but this comparison was based only on within subjects comparisons. In our case we took into account direct comparisons with distinct control groups, and this approach showed that reappraisal is more effective. In the case of acceptance strategies, results are somewhat similar to what Kohl et al. (2012) have found, namely that acceptance is not more effective than other strategies in relation to emotional responses. In our study, we made distinct comparisons with the control condition as well as with suppression, and acceptance did not show overall positive effect sizes. On the other hand Webb et al. (2012) found that acceptance was superior to other strategies (a mix of control groups/conditions and other strategies. Yet, this mixed comparison, and also, the fact that they conceptualizes acceptance as a form of reappraisal, and thus included under this category studies that manipulated reappraisal of emotional responses, might have enhanced the effectiveness of this strategy. For reappraisal, for all the comparisons made, we consistently obtained medium effect sizes. Reappraisal is superior to suppression and control group , and the efficiency of this strategy does not seem to depend on the type of design used, the clinical status of the subjects introduced in the experiment and the type of assessment used (at least for those found in the studies that passed the selection criteria).

3.2 STUDY 2. AN EXPERIMENTAL COMPARISON OF REAPPRAISAL, ACCEPTANCE, AND SELF-FOCUSED PROCESSING[2,3,4]

Introduction

What data shows up until now, is that cross-sectional studies (Aldao et al., 2010) on the habitual use of emotion regulation strategies believed to be adaptive (i.e., reappraisal and acceptance, derived from the CBT framework) showed a small negative association, or no association, with mental disorders. On the other hand, strategies that were belied to be maladaptive (such as rumination, suppression, and avoidance) showed strong or medium associations with symptomatology. The authors found the strongest association for rumination (with a large effect size), while suppression and avoidance had associations in the range of medium effect sizes.

Our own meta-analysis on experimental data showed similar results for reappraisal and acceptance, but this time in relation to state distress that participants experience during mood induction procedures. Our results were similar to (Webb et al., 2012) in relation to reappraisal, but we failed to find a positive effect for acceptance (conceptualized as reappraisal of emotional response in their study).

What particularly captured our attention within these results was the discrepancy between rumination (which had the strongest link with psychopathology in cross-sectional studies and showed mixed data in experimental studies) and acceptance (with no association what so ever with psychopathology, and little support from experimental studies). We found this result as being intriguing, as both strategies have a common core, namely focusing on one's own thoughts and emotional experience. Indeed, acceptance also involves a non-evaluative component, in which emotions and sensations are experienced as they are, without any positive or negative valence (Segal, Williams, & Teasdale, 2002).

Factorial analysis conducted on the Ruminative Responses Scale (RRS; (Nolen-Hoeksema, Larson, & Grayson, 1999), one of the most commonly used measure of rumination, identified two components of ruminative thinking (Treynor et al., 2003). The first component was called "reflective pondering" and was described as the adaptive part of rumination, which involves an internal focus on one's condition, including thoughts and emotions, with the purpose of finding a solution for exiting depressive mood (Treynor et al., 2003). This component is also involved in acceptance, at least in terms of self-focus. The second component of rumination identified in the factorial analysis was a dysfunctional one,

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[2] Part of data in this study was published in Anxiety Stress & Coping: An International Journal (Impact Factor: 2.108). Full reference: Cristea, I. A., Matu, S., Szentagotai-Tatar, A., & David, D. (2012). The other side of rumination: reflective pondering as a strategy for regulating emotions in social situations. *Anxiety Stress Coping: An International Journal, 26*(5), 584-594. doi: 10.1080/10615806.2012.725469. Authors' contributions according to the author's note: I. Cristea and S. Matu contributed equally to the work. I. Cristea contributed to the academic writing of the manuscript and data interpretation, S. Matu contributed to the design and study implementation, A. Szentagotai Tatar and D. David contributed to the design of the study and the data interpretation.

[3] Results were also presented at the 25th Congress of the European Association for Behavioral and Cognitive Therapies (EABCT), Marrakech, Morocco, September 2013. Full reference: Cristea, I. A., Matu, S., Szentagotai-Tătar, A. & David, D., (2013, September). *The other side of rumination: reflective pondering as a strategy for regulating emotions in social situations*. Oral presentation at the 25th Congress of the European Association for Behavioral and Cognitive Therapies (EABCT), Marrakech, Morocco.

[4] Part of the data in this study was collected for the master thesis of Silviu-Andrei Matu. The study presented here consist of a large extension of the sample (>58% were new participants), data-analysis was redone using new analytical strategies and interpretation of results was done through the perspective of updated theories.

called “brooding”, which was considered to reflect a passive attitude towards one inability to reach a desired standard (Treynor et al., 2003).

A second point that we wanted to address in this study is related to the ecological validity of experimental manipulations of strategies and the training in using strategies such as acceptance and reappraisal. Is possible that acceptance strategies require much more training before one could make full use of such strategies. Also, in the case of reappraisal, we found medium effect sizes for its efficacy in relation to acceptance, and only small effect sizes in relation to the control group. This modest result in the comparison with control group might be also due to the way in which reappraisal has been manipulated in experimental research, as many of the instructions for reappraisal do not offer clear directions on how one could think about negative stimuli.

We decided to run a new study that compares acceptance, reappraisal and self-focused processing (reflective pondering) that would allow us to distillate among the different sub-components of acceptance (by comparing it with self-focused processing) and also, that overcomes the limitations of previous studies, in terms of ecological validity in manipulation of reappraisal and acceptance as well as training in using the strategies. In doing so, we derived our instructions from the clinical approaches within the CBT framework.

Method

Participants

A total of 103 participants took part in the study, of whom 86 were females and 17 were males. All were undergraduate students and were reworded with a course credit. Age ranged between 18 and 35 years (M= 20.93, S*D*= 2.61).

Measures

Changes in state negative emotions. We used the Positive and Negative Affect Schedule - Expanded Form (PANAS-X) (Watson & Clark, 1994/1999) for measuring state emotional changes during the experimental procedure.

State anxiety. Endler Multidimensional Anxiety Scales-State (EMAS-S) (Endler, Edwards & Vitelli, 1991) was used for measuring changes in state anxiety

Mood induction vignettes

We used a guided imagery procedure for negative mood induction. Quantitative reviews (Mayers, Allen & Beauregard, 1995; Westerman, Spies, Stahl, & Hesse, 1996) have indicated that this is a reliable procedure for inducing transitory negative emotional states, comparable to other procedures used in experimental research. Imaginative induction was based on a series of social scenarios/vignettes that we developed for this study. We selected 10 such scenarios/vignettes from an initial pool of 15 short scenarios (with a length of 2 to 4 phrases each) describing social situations in which one is being evaluated by others (such as being evaluated by a committee while performing a mistake during an important presentation).

Procedure

Participants in the reappraisal condition were thought how to use functional negative reappraisal (Cristea et al., 2012), similar to what patients are thought in REBT protocols. Using this framework, participants were thought to reappraise the scenarios in a more rational/less irrational manner, which does not exclude their negative character, but points that negative situations are tolerable and not as bad as one might think when confronted with them.

Participants in the acceptance condition were trained in using this strategy based on clinical protocols from ACT (Hayes et al., 1999). Specifically they were instructed to increase their awareness towards own thought and emotions and experience them by adopting a non-evaluative attitude to whatever this experience might feel like.

In the self-focused processing (reflective pondering condition) they were also instructed to focus on the own thought and emotion, whatever these might be, and think at their possible consequences and implications as well as those of the situation that generated them. The instruction did not point to any positive or negative aspect of the situation, thoughts or emotions, following the research on reflective pondering (Treynor et al., 2003). Figure 1 depicts graphical representation of the overall experimental procedure.

Results

Comparisons with control condition

To compare how the three emotion strategies performed as contrasted with the no instruction condition, we first computed change scores for each of the three groups, for both conditions (T1 – T2 for no instruction condition, and T3 – T4 for regulation condition) on all of the three outcomes. We then used this change scores in a repeated measures ANOVA.

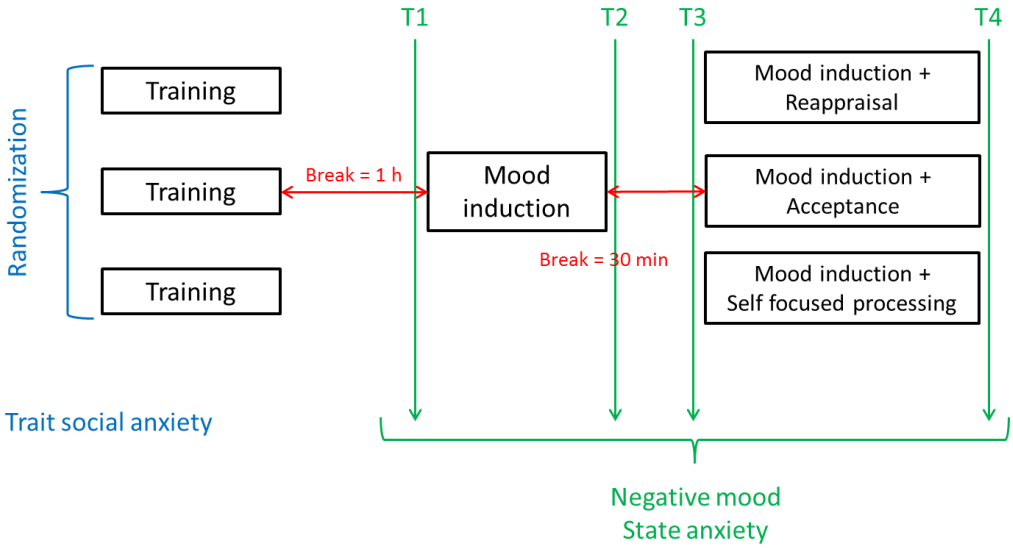

Figure 1. Graphical representation of the experimental procedure.

The results showed that all strategies were effective in reducing negative mood, with a significant time effect F(1, 100)= 8.38, p= .005, but no significant interaction effect of time and condition, F(2, 100)= .83, p= .417. Also, we found a significant effect of time for the cognitive component of anxiety, F(1, 100)= 6.06, p= .015, but no significant interaction effect, F(2, 100)= .17, p= .843. In the case of the emotional component of anxiety, we found no significant effect for time, F(1, 100)= 3.08, p= .082, and no significant interaction effect, F(2, 100)= .452, p= .638. Significant effects are depicted in Figure 2.

Comparison between strategies

To compare the specific effectiveness of the three strategies, as no significant differences emerged at T3, we computed three ANOVAs at T4, for all the three outcomes. All comparisons showed significant differences between groups. Post hoc test (Sidak) showed that acceptance was more effective than self-focused processing on all outcomes: negative mood, p= .009, cognitive component of anxiety, p= .015, and emotional component of anxiety, p= .006. No significant difference emerged between reappraisal and acceptance, but a significant difference was found between reappraisal and self-focused processing on the emotional component of anxiety, p= .033.

Discussion

Our results have shown that all strategies were effective in regulating negative affect and state anxiety (with its two sub-components), as compared to the control conditions. These results point that self-focused processing is indeed adaptive, and also, point that training in

using acceptance makes it an efficient strategy, as effective as reappraisal. Moreover, it seems that the non-evaluative component of acceptance increases its effectiveness, as compared to sole awareness towards and emotions.

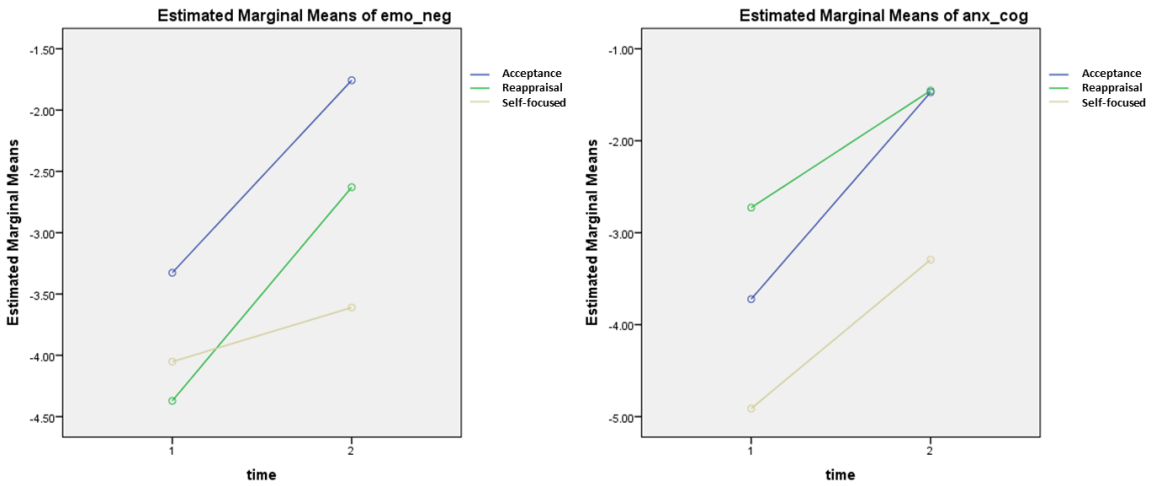

Figure 2. Changes in negative emotion (left) and cognitive component of anxiety (right), between the mood induction condition and mood induction + regulation condition. Points on the chart depict change scores between T1 and T2 for mood induction alone, and T3 and T4 for mood induction + regulation condition. Interaction effects were not significant.

Some previous research have tested the hypothesis that negative mood emerges as an interaction between process ("how") and content ("what"), ruminative style acting on the first component (Ciesla & Roberts, 2007; Robinson & Alloy, 2003). Thus is possible that one does not necessary experience negative affect unless dysfunctional processes act on a negative content. Using this theoretical framework, our findings regarding the similar effectiveness of all three strategies could be interpreted as acceptance and self-focused processing promoting adaptive processes ("how" component), while reappraisal acting on the negative content (the "what" sub-component).

Our study had several limitations that we have to acknowledge. First, we used only self-reported measure to assess the effectiveness of the strategies, which makes our results vulnerable to experimental demand, and conclusions are not applicable to other types of emotional responses, such as psychophysiological and behavioral measures. Also, although we used a comprehensive training in teaching participants how to use the strategies, we did not assess the degree to which they did use the strategies during the mood induction + regulation task.

3.3. STUDY 3. EMOTION REGULATION AS PREDICTOR OF OUTCOMES IN VIRTUAL REALITY BASED CBT FOR ACROPHOBIA[5]

Introduction

Although adaptive emotion regulation has been proposed as an important factor for one's mental health and theorists have used the emotion regulation model to conceptualize

[5] Part of theoretical review on the use of virtual reality in cognitive-behavioral therapy (CBT) that was done for this study was published in International Journal of Cognitive Therapy (Impact Factor: 1.540). All authors had similar contributions. Full reference: David, D., Matu, S. A., & David, O. A. (2013). New Directions in Virtual Reality-Based Therapy for Anxiety Disorders. *International Journal of Cognitive Therapy*, *6*(2), 114-137. doi: 10.1521/ijct.2013.6.2.114

psychopathology and its treatment (Hofmann & Asmundson, 2008; Werner, & Gross, 2009), few studies to date have investigated changes in emotion regulation as mechanisms of effective treatment. Development of effective emotion regulation strategies are targeted by several treatment protocols (e.g., Fairholme et al., 2009; Mennin et al., 2009), but there is a gap in evidence proving that the strategies targeted by these interventions are also the mechanisms of change (see for such an example Berking et al., 2011).

This study will focus on the role played by emotion regulation strategies but also try to extend the paradigm to other psychopathologies that have been less explored. Some recent theoretical developments and empirical findings suggest that emotion regulation strategies might have a distinct contribution to the understanding of anxiety disorders, including specific phobias (Amstadter, 2008; Cisler, Olatunji, Feldner, & Forsyth, 2010). For example, one study showed that regulatory strategies moderate the relation between disgust proneness and both phobic and obsessive symptoms (Cisler, Olatunji, & Lohr, 2009). The theoretical argument is that people whom develop phobic symptoms use dysfunctional regulatory strategies in relation to their anxiety (e.g., avoidance, but also suppression and distraction), and in turn, these strategies conduct either to an escalation of fear or prevent the habituation to the stimulus or situation (Olatunji et al., 2007). If this hypothesis is true, then one should find at the end of the treatment changes in the emotion regulation strategies that patients are using when confronted with the feared situations, and such changes should also predict the changes in symptomatology.

This choice of focusing on specific phobias also opens new opportunities to investigate other relevant and related ideas. Recent developments coming from technological applications in psychology and psychotherapy have indicated that virtual reality (VR) based psychotherapy has a similar efficacy as classic interventions (Powers & Emmelkamp, 2008; Opriş et al., 2012) in the case of many anxiety disorders. We carefully reviewed the literature on this topic (David, Matu, & David, 2013), and at least two of the conclusions that we have reached worth being discussed here. First, VR technology has not been used to investigate the effectiveness of emotion regulation strategies, even though its integration in the experimental paradigm would help overcome many of the limitations related to the artificial mood induction procedures and thus offer a more reliable and ecological test for the efficacy or effectiveness of different emotion regulation strategies. Also, following the same line, VR could be used not only to assess the adaptative nature of a strategy, but also to train the patient how to use that strategy in a context that resembles real life environment. Second, and perhaps even more important, is the fact that none of the studies that used VR in a CBT paradigm for treating anxiety disorders had integrated cognitive restructuring techniques in the treatment protocol. We find that this state of facts is missing one of the main advantages that VR technology could bring into psychotherapy, that of allowing the client and the therapist to identify, challenge and restructure irrational/dysfunctional beliefs related to the feared stimuli in an "online"/as they emerge fashion, in a similar context to the one in real life (Szentagotai, Opriş, & David, 2011). Just thinking of it, it becomes easy to understand why cognitive restructuring might not be suitable in *in vivo* exposure, as many times exposure has to be done in places that do not offer privacy and also, conducting restructuring after returning to the clinician's office brings up the problem that the process has to rely on the thoughts that the patient is remembering that he has experienced.

Starting from these arguments, we decided to investigate (1) if a treatment that has been proved to be effective for anxiety disorders (i.e., VR-based CBT) is modifying maladaptive emotion regulation strategies and is building more adaptive strategies, (2) if such changes in regulatory strategies are predictors of the treatment's outcomes. Also, we decided to (3) test if adding a new (to be read never used) component to the exposure treatment, that is cognitive restructuring, will increase the efficacy of the treatment. Adding cognitive

restructuring also allowed us to test a supplementary hypothesis from the literature, namely the fact that cognitive restructuring, conceptualized as a central technique in CBT, is enhancing reappraisal as a regulatory strategy.

We decided to focus on a particular disorder, namely acrophobia. This decision was based on several arguments. First, it is a highly prevalent specific phobia (Stinson et al., 2007) and meta-analytical data indicates that VR-based CBT for this disorder is effective (Parsons & Rizzo, 2008).

Method

Participants

Participants were recruited from the academic community at Babeș-Bolyai University, in Cluj-Napoca, though online advertisements. Those interested in participating in the study were required to fill online the Acrophobia Questionnaire (AQ; (Cohen, 1977), as a screening measure. A total of 92 individuals completed the screening questionnaire. Inclusion criteria were based on previous studies using AQ as measure of height anxiety. Participants were considered to be eligible if they had a score that was higher than the mean score in the validation study of the scale (which used a clinical sample confirmed by a formal diagnosis; (Cohen, 1977) minus 1 SD on at least one of the two sub-scales: heights anxiety (a score higher then 35) and heights avoidance (a score higher then 10). This strategy of recruitment yielded a number of 44 subjects that were declared eligible and invited to participate in the study. Out of this number just 39 subjects (34 females; mean age= 23.36, S*D*= 3.46) did make an appointment to the laboratory and were randomized to one of the four treatment conditions. Six participants dropped out after the initial assessment and one participant dropped out after experiencing cyber sickness during the first minutes of the intervention in virtual reality. Psychology students that enrolled to participate in the study were compensated with a course credit.

Measures

Primary outcomes

Acrophobic symptoms. The Acrophobia Questionnaires (Cohen, 1977)was used both as a screening measure as well as an outcome measure for the severity of symptoms. AQ includes two subscales: one measuring anxiety towards and another measuring avoidance of heights.

Behavioral avoidance. The Behavioral Avoidance Test (BAT) is commonly used to measure for the level of fear of heights (Abelson & Curtis, 1989). In the current study, participants were asked to climb the 80 steps of a water tower placed in a public place in Cluj-Napoca. Subjects were invited to climb 5 steps in a row and then stop for a few moments. After each 5 stairs, the Subjective Units of Distress Scale (SUDS; Wolpe & Lang, 1964) was administered.

. **Psychosomatic symptoms related to anxiety.** The Body Sensations Questionnaire (BSQ; (Chambless, Caputo, Bright, & Gallagher, 1984) was a scale developed to measure psychosomatic symptoms associated with fear and panic attacks in agoraphobia, but was later used also in the case of other anxiety disorders, including acrophobia (Coelho & Wallis, 2010).

Secondary outcomes

General distress. The Profile of Affective Distress is a (PAD; Opriș & Macavei, 2007) is a 38 items measure of functional (e.g., concern, sadness) and dysfunctional negative emotions (e.g., anxiety, depressed mood) that also includes a positive emotions subscale (13 items; (Cristea et al., 2012).

Depressive symptoms. To measure depressive symptoms, we used the Beck Depression Inventory – II (BDI-II; Beck, Rush, Shaw, & Emery, 1979).

Mechanisms of change – specific to heights

Beliefs about heights. The Heights Interpretation Questionnaire (HIQ; Steinman & Teachman, 2011) is a 16-item self-report questionnaire designed to measure height-relevant interpretations. Fillers are asked to read and imagine themselves in two height-relevant scenarios (climbing a ladder and standing on a balcony – both common feared situations for height phobic individuals) that are designed to be somewhat ambiguous in terms of how dangerous the heights are. Next, respondents are asked to rate the likelihood of making eight height specific interpretations related for each scenario (e.g., "You will fall") on a scale from 1 (not likely) to 5 (very likely). We also used the specific interpretation from the HIQ, to which we added three more negative thoughts that height phobics might have in height related situation, which made reference to low frustration tolerance, awfulizing, and hopelessness, and we asked the participants to rate the degree to which they experienced such thoughts during the BAT assessment. The internal consistency for this derived scale was .92. To differentiate it from the HIQ, we will call it the Heights Thoughts Questionnaire (HTQ).

Emotion regulation in the context of heights. To assess the emotion regulation strategies that participants are using while confronted with heights related situations we modified the items from the Emotion Regulation Questionnaire (Gross & John, 2003) and rephrased the instruction so that required fillers to report the regulation strategies they used while were performing the BAT. In the end we had 5 items measuring reappraisal (Cronbach's alpha= .85) and 5 items measuring suppression (Cronbach's alpha= .79).

Mechanisms of change – general

Rational and irrational beliefs. To measure the rational and irrational beliefs, the participants were asked to fill the Attitudes and Belief Scale-II (ABS-II; DiGiuseppe, Leaf, Exner, & Robin, 1988).

Habitual use of reappraisal. We measure the habitual/trait use of reappraisal as emotion regulation strategy with the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). This is a ten 10 items scale that measures the degree to which respondents make regular use of reappraisal (6 items) and suppression (4 items) to regulate emotions in daily life.

Design

The comparison of exposure and exposure + cognitive restructuring between two types of VR environments resulted in a bi-factorial design with four groups: (1) exposure in HMD, (2) exposure in CAVE, (3) exposure + cognitive restructuring in HMD, and (4) exposure + cognitive restructuring in CAVE. Participants were randomly allocated within these four groups at the time they arrived at the research unit for the initial assessment phase.

Procedure

Treatment

Initial assessment. After being presented with the specific requirements of the study, as well as provided with safety information related to the use of virtual reality, participants were answered to their questions and given to sign the informed consent. The session continued with psychoeducation about fear of heights and the associated symptoms, how this anxiety problem develops, and the role played by avoidance behavior in its maintenance an exacerbation. Then the psychotherapist made a general (using the stress vulnerability model) and a specific conceptualization (using CBT model) of the patient's problem, after which they were provided information about the intervention that they will receive and the principles on which it is built on. The specific conceptualization was dependent on the treatment branch they were allocated to, so that for patients whom allocated to the groups receiving cognitive restructuring in addition to exposure treatment, the specific conceptualization included a description and discussion on the role that beliefs and negative thoughts that they hold about heights and experience while confronting which such situations might play in triggering

anxiety symptoms. At the end of this part, the BAT was conducted while climbing the stairs of a tower of approximately 16 meters in height.

Treatment session. Before being placed in the virtual environment the subjects were informed about the possibilities of experiencing cyber sickness and having a break during exposure if they would feel such symptoms. Afterwards, subjects undergo a short familiarization with the VR environment in a neutral scenario. Participants were instructed not to suppress their fear or anxiety, were told to try confronting the situation, and focus on the most anxious inducing elements of the environment. Participants in the two groups that received cognitive restructuring were remained about the role that thoughts might play in the triggering of their anxiety symptoms, were asked to monitor their thoughts and beliefs during the exposure, and were informed that at the end of each exposure session, they well be disengaged from the VR environment and cognitive restructuring will occur. The actual exposure session involved the confrontation with four distinct levels of heights, ordered in a gradual manner, in one of the two virtual environments (HMD or CAVE). Anxiety levels were assessed using SUDS, every two minutes after entering the virtual environment. In the exposure + restructuring conditions, this was followed by cognitive restructuring, using the ABC cognitive model from CBT. Irrational/dysfunctional thoughts were identified and disputed using logical, empirical or pragmatic strategies, and the patient and therapist worked together to identify more rational/functional ways of thinking while confronted with heights situations.

Final assessment. The third and final meeting lasted approximately one hour. Participants were asked to complete again the Acrophobia Questionnaire and some measures related to treatment satisfaction and therapeutic alliance. The participants also completed once again the BAT, the heights related thoughts questionnaire, as well as the questionnaire measuring the regulation strategies they used while conducting the BAT.

Results

Treatment efficacy

In the first step we conducted several univariated mixt within-between analyses, with time of assessment as within factor and type of environment * type of treatment as between factors, for each of the main and secondary outcomes. We found a significant effect of time for anxiety towards heights $F(1, 26)= 12.99$,$p= .001$, partial $\eta 2= .33$, while for heights avoidance we found a significant effect of time, $F(1, 26)= 66.72$, $p< .001$, $\eta 2= .72$, as well as for the interaction of time and the two between subject factors (type of environment and type of treatment), $F(1, 26)= 6.71$, $p= .015$, $\eta 2= .20$. For behavioral avoidance, we found a significant effect of time, $F(1, 26)= 8.72$, $p= .007$, $\eta 2= .25$, and a significant effect for the interaction between time and treatment, $F(1, 26)= 4.42$, $p= .045$, $\eta 2= .145$. Finally, in the case of body sensations related to fear we also found a significant effect of time, $F(1, 26)= 10.10$, $p=.004$, $\eta 2= .31$. All other differences do to conditions, and interactions were not significant. These results suggest that treatments were effective in reducing all primary outcomes, with isolated differences between them in the case of avoidance (both self-reported and measured with the BAT). Significant interaction effects are depicted in Figures 1 and 2.

No significant effect of time, virtual environment and treatment condition did not emerge in the case of secondary outcomes, all *p*s>.05.

Moving to the proposed mechanisms of change, we found a significant effect of time in the case of height interpretations (HIQ), $F(1, 26)= 15.96$, $p< .001$, $\eta 2= .38$. We also found a significant effect of time in the case of the negative interpretations and thoughts that the participants experienced during the behavioral assessment, $F(1, 26)= 11.41$, $p<. 001$, $\eta 2= .29$. In the case of suppression that the participants used to regulate their emotion while performing the behavioral assessment we also found a significant effect of time, $F(1, 26)= 7.01$, $p= .014$, $\eta 2= .23$. In the case of reappraisal as regulation strategy used in the same

context, we did not found any significant effect. Also, all other treatment condition, virtual environment, or interaction effects were not significant. Also, in the case of general mechanisms of change (irrational beliefs, and habitual use of suppression and reappraisal) all effects were not significant.

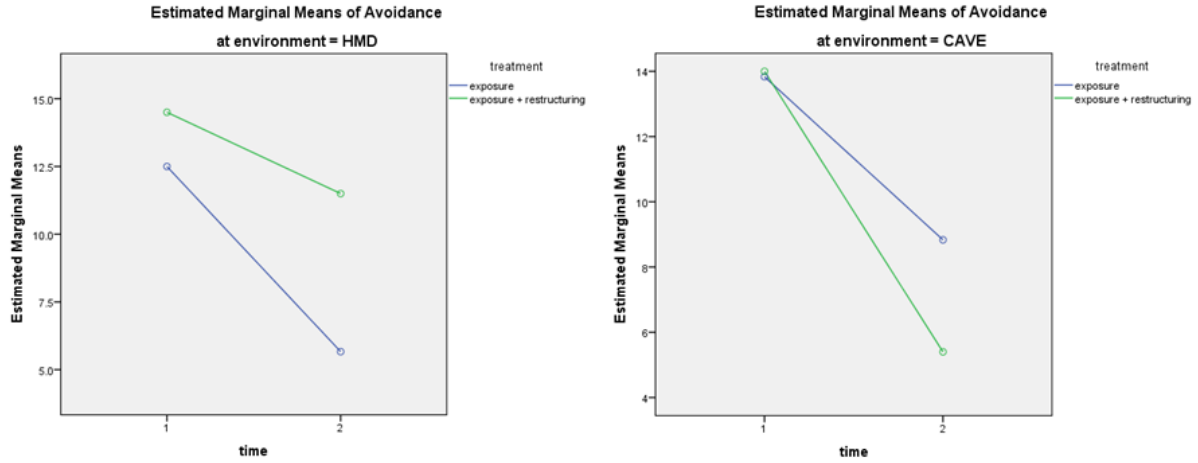

Figure 1. Effects of treatment condition across virtual environments in the case of self-reported heights avoidance.

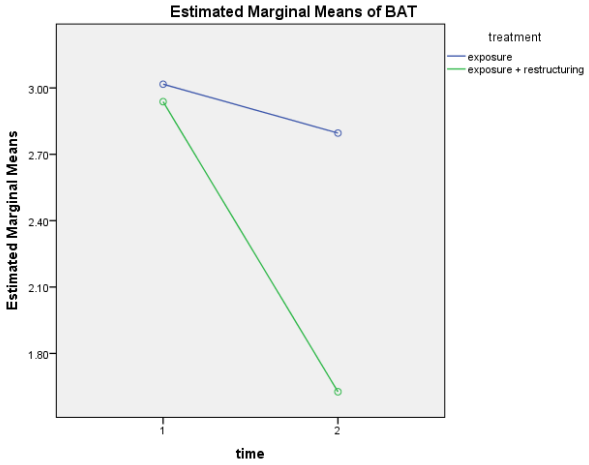

Figure 2. Effects of treatment condition for BAT scores.

Mechanisms of change

We computed several hierarchical regressions in which we sequentially added as depend variable each primary outcome that showed significant changes pre-to-post in the first step of the analysis, and the mechanisms variables as the predictor (also those whom showed significant changes), while controlling for baseline values of the outcome and the baseline value of the mechanism variable. We report here only the results for the proposed mechanisms that significantly predicted changes in outcomes. Height interpretation scores significantly predicted levels of height anxiety, R^2 change= .43, F(1, 26)= 18. 20, β= .774, p< .001, as well as heights avoidance, R^2 change= .27, F(1, 26)= 18.82, β= .644, p< .001.

Suppression reported by participants during the BAT task, which showed a significant decrease from pre- to post- assessment, was a predictor of changes in heights anxiety R^2 change= .20, F(1, 21)= .30, β= .643, p= .022 as well as heights avoidance, R^2 changes= .114, F(1, 21)= 13.99, β= .515, p< .001.

Discussion

Results indicated that the intervention was effective in reducing acrophobia symptoms, behavioral avoidance, as well as and somatic symptoms related to heights. None of the secondary outcomes was altered by the intervention. Looking at the differences between the four conditions, no differences were found for self-reported heights anxiety between any of the condition (no significant interaction effect). Yet, in the case of self-reported avoidance, cognitive restructuring added to exposure was more effective in CAVE environment as compared to simple exposure, while in the case of HMD, simple exposure was more effective than the combination between exposure and cognitive restructuring.

For behavioral avoidance, as measured by the BAT, we found that the CAVE environment was more effective, and this might also be related to the level of immersion experienced by patients. Is true that studies looking at the relationship between immersion and the effectiveness of VR exposure treatments show that immersion is related to levels of anxiety experienced during exposure, but is not related to the effectiveness of treatment (Price & Anderson, 2007). Yet, there are some recent studies showing that some components of presence might be predictive for outcomes of therapeutic intervention using VR exposure techniques (Price, Mehta, Tone, & Anderson, 2011).

Moving to the mechanisms, we found that the treatment was effective in reducing negative beliefs about heights and use the use of suppression when confronted with situations related to heights, but no difference was found in the use of reappraisal. Changes in negative beliefs about heights and use of suppression were also associated with change in symptomatology, indicating that both might play the role of a mechanism of change. This is one of the first studies investigating emotion regulation as a mechanism of change in psychotherapy and is the first study that assessed the efficacy of VR-based psychotherapy of anxiety disorders incorporating cognitive restructuring in the treatment protocol.

3.4. STUDY 4. ALTERNATIVE INTERPRETATIONS VS. ALTERNATIVE REAPPRAISALS: DIFFERENCES BETWEEN POSITIVE INTERPRETATIONS AND DECREASING MOTIVATIONAL RELEVANCE

Introduction

Looking over the literature, just few studies have looked at how do people reappraise and which are the more effective ways to do so (Cristea et al., 2012; McRae et al., 2012a). Several confusions or misunderstandings are present in the literature. For example, acceptance is sometimes regarded as a form of reappraisal, although theoretical assumptions are different. Also, distancing is promoted as an effective emotion regulation strategy although is highly non-ecological, and no clear distinction between interpretations/knowledge and appraisals (Lazarus, 1993) is made in experimental studies (Lang, Blackwell, Harmer, Davison, & Holmes, 2012; McRae et al., 2012a; Webb et al., 2012) even though, as we have discussed in the introductory part, this distinction is at the core of the cognitive mediation model of emotion. There are few other studies that tried to look at the comparative effects of different forms of reappraisals (McRae et al., 2012a) but these studies make their distinctions based on the goal/target of the reappraisal process (e.g., reducing negative emotions, or changing the meaning of the situation), rather than exploring the process itself. In this study, we try to overcome these shortcomings by adopting a theoretically informed approach to appraisal (and reappraisal), following Lazarus' theory (Lazarus, 1993).

To do so, we developed and experimental task in which we instructed participants to generate different forms of reappraisals (used in this context with the general meaning, also adopted by emotion regulation studies), that make reference to specific appraisals of an event, or to the interpretation/knowledge of that specific event (both form Lazarus' theory).

Appraisals are related to one's motivational relevance and congruence, while interpretations are related to the internal representation of a specific event. No matter the nature of an event, it could generate an emotion only through appraisals processes. What is important to have in mind, is that a change in the interpretation, might also lead to a change in the emotional response, but this will be followed by new appraisal. In the same example, the student might think "I did not study enough, but I still can pass the exam because I followed classes and I have the minimum necessary knowledge to do so". This new interpretation might be appraised as "I will pass this exam with a small grade but this will not interfere with my plans to get the job that I want, and that not so bad". We also extend this idea by taking into account not only *how*, but also *how many* such alternatives one could identify, by asking our participants to try to generate as many alternatives they could find during the mood induction + regulation task. Finally, we wanted to see how such an instruction would compare with a control group, as well as with a "classical" form of reappraisal, that does not offer information on how to change the view of a negative situation or event. To make it more comparable, the "classical" for of reappraisal that we used, was focused on changing the perspective over the situation into a more positive or less negative one, rather than pointing the emotional goal (reducing negative or decreasing positive).

Our hypotheses for this study were:

1. All three types of regulations will reduce negative emotions as compared with the control group;
2. All three types of regulation will reduce physiological activation as compared with the control group;
3. The "classic" form of reappraisal and the instruction to change the significances of the negative stimuli with more positive or less negative ones will reduce the level of negative automatic thoughts;
4. Both the number of alternatives that participants generate to change the significances of the stimuli into more positive or less negative ones and the number of alternative they identify that reduce the motivational relevance will predict the level of distress that participants are experiencing during the mood induction and mood induction + regulation task.

Finally, we had one additional exploratory objective, namely to check if the performance of subjects in generating a larger number of alternatives could be related in a predictive way, to the level of depressive symptomatology one is experiencing. In doing so, we took into account the believability ratings of the alternatives that participants generated.

Method

Participants

One hundred thirty participants (119 females) took part in this study, aged between 19 and 49 years (M= 22.94, S*D*= 5.28). All participants were undergraduate students at Babeş-Bolyai University, Cluj-Napoca, and participated in the study for a course credit. After signing the inform consent they were randomly allocated to one of the four experimental conditions: (1) control group, (2) "classic" reappraisal, (3) generate alternative interpretations to change significance in a more positive one, and (4) generate alternative reappraisals that reduce motivational relevance.

Measures

Mood. To measure general mood of the participants, as well as mood changes during the experimental procedure, we used The Positive and Negative Affect Schedule (PANAS, (Watson, Clark, & Tellegen, 1988).

Imaginative ability. Because our mood induction task required participants to imagine a series of vignettes/scenarios designed to induce negative mood, we wanted to control for their general imaginative ability. To measure this variable, we used a shortened

version of the Betts Questionnaire upon Mental Imagery (Bets, 1909; Sheehan, 1967).

Imaginative vividness. After imagining each of the vignettes/scenarios included in the mood induction task, we asked our participants to rate on a scale form 1 (not at all) to 9 (to a great extent), how well they managed to imagine the last scenario. This was also used as a control variable.

Relevance and congruence of the mood induction vignettes. Although we pre-tested the vignettes that were used in the mood induction task, they were not fully standardized. To control for possible differences in appraisals of these vignettes/scenarios, after the ratings related to imaginative vividness, we also asked participants to rate the level of congruence, and relevance that each vignette had to them, on a scale from 1 to 7 (the larger scores indicating higher congruence or relevance).

Thoughts and types of reappraisals used to regulate negative mood. After imagining each vignette/scenario, and rated the vividness, relevance, and congruence, participants were asked to write down using the computer keyboard the thoughts they had during the imaginative part and how they related to each particular vignette.

Thoughts and reappraisal believability. After reporting the thoughts they experienced while imagined each scenario, participants were asked to give a global rating to assesses the personal believability of the thoughts they had just reported, using a scale from 1 to 7, similar (higher values meaning higher believability). We used these ratings to and generated a positive interpretations * credibility index and a relevance reduction * credibility index.

Negative automatic thoughts. To measure negative thoughts that participants experienced during the experimental procedure, we used a modified version of The Automatic Thoughts Questionnaire – Short Version (ATQ; (Hollon & Kendall, 1980; Netemeyer et al., 2002). We modified this scale first by asking participants to rate the degree to which they had experienced each thought during the mood induction or mood induction + regulation procedure, and by asking them to rate also the degree to which they believed in each of the thoughts they experienced as being true.

Rational and irrational beliefs. To measure the rational and irrational beliefs, the participants were asked to fill the Attitudes and Belief Scale-II (ABS-II; DiGiuseppe, Leaf, Exner, & Robin,1988).

Habitual use of reappraisal. We measure the habitual/trait use of reappraisal as emotion regulation strategy with the Emotion Regulation Questionnaire (Gross & John, 2003).

Depressive symptoms. To measure depressive symptoms, we used the Beck Depression Inventory – II (BDI-II; Beck, Rush, Shaw, & Emery, 1979).

Instruments

Mood induction vignettes. For the emotion induction task we used a guided imagery procedure, asking participants to read and try to imagine as vividly as possible a series of vignettes/scenarios that were built to induce negative emotions. This type of procedure has been shown to be highly effective for mood induction, especially in the case of negative mood (Gerrards-Hesse, Spies, & Hesse, 1994); Mayer, Allen, &Beauregard, 1995; (Westermann, Spies, Stahl, & Hesse, 1996). The scenarios used for this study were selected from a larger pool that included those used in Study 2, as well as a supplementary set of scenarios taken from other works with the written permission of the authors (Cristea et al., 2012). For each scenario, a single 1-2 lines phrase was written to synthetize the significance of each scenario, expressing how that scenario should be understood or read. These syntheses for each vignette/scenario were all negative and did not go further than describing what happened in each of the vignettes/scenarios.

Emotion regulation instructions

Participants were randomized in one of the following 4 groups: (1) watch condition with the sole instruction to read and try to imagine as vividly as possible each vignette; (2) "classic" reappraisal condition in which they were asked to imagine each vignette as vividly as possible and while imagining, to find ways of thinking about the situation so that it appears less negative or more positive; (3) alternative interpretation that change the meaning in to a more positive or less negative one, in which they were also asked to read and try to imagine as vividly as possible each vignette but while imagining to try finding as many alternatives of thinking about the situation so that the situation does not change, but the significance associated to it (presented once with the vignette) changes in a more positive or less negative one; (4) alternative reappraisals that reduce motivational relevance, in which the participants were asked to imagine as vividly as possible each vignette, and while imagining to finding as many ways of thinking about each situation so that every new way of thinking does not change the situation, does not change the significance, but reduces how relevant is each situation for their own goals in such a context.

Procedure

Participants received spoken and written instructions (on a computer screen) related to the mood induction task. They were told that during the experiment they will see several short scenarios that will appear written on the computer screen and their task will be to imagine as vividly as possible each of these scenarios, as they were the main character involved in each of them. The specific instructions to "watch", or regulate their emotions was introduced at this point in accordance with the group they were randomly allocated. The order of the vignettes/scenarios was randomized and each vignette/scenario appeared on the computer screen for 2 minutes. They were left unlimited time to answer the question that followed each scenario. At the end of all 5 vignettes/scenarios, they were given to be filled the PANAS state questionnaire, and the modified version of the ATQ. Figure 1 depicts a graphical representation of the experimental procedure.

Results

Outcomes

ANOVA comparison of negative mood at the end of task, sowed a significant difference in variance between groups, $F(3, 119)=5.49$, $p= .001$, $\eta 2= .122$. Post-hoc tests (Sidak), showed significant differences between control group and the group instructed to generate alternatives aimed at changing the meaning in a more positive one, $p= .001$, and between the control group and the group instructed to generate reappraisals aiming at reducing the motivational relevance of the scenarios, $p= .036$. The difference between the control group and the one receiving the instruction two reappraise the scenarios, without specific instructions on how to do that, was not significant, $p= .097$. For comparing positive mood at post-task, we conducted an ANCOVA comparison between the groups, while controlling for baseline scores. We did not found any significant effect of group, $F(3, 117)= .39$, $p= .755$, $\eta 2= .011$, while the effect of baseline level of positive mood was significant, $F(1, 117)= .105.07$, $p< 0.001$, $\eta 2= .489$. The interaction effect was not significant, $F(3, 117)= 1.07$, $p= .362$, $\eta 2= .029$. These results for the comparisons of positive and negative mood after the task are depicted in Figure 2.

For cognitive outcomes, we compared the level of negative automatic thoughts reported by the participants on the modified version of the ATQ filled at the end of the experimental task (total score, summing both frequency and credibility of thoughts). We found a significant effect, $F(3, 68)=4.60$, $p= .005$, $\eta 2= .169$. Post-hoc tests (Sidak) showed significant differences between the control group and the group who received the classic reappraisal instruction, $p= .018$, and a significant difference between the latter group and the one receiving the instructions to identify ways for reducing motivational relevance, $p= .021$.

The group receiving the classic instruction for reappraisal experienced the lowest level of negative automatic thoughts in both comparisons.

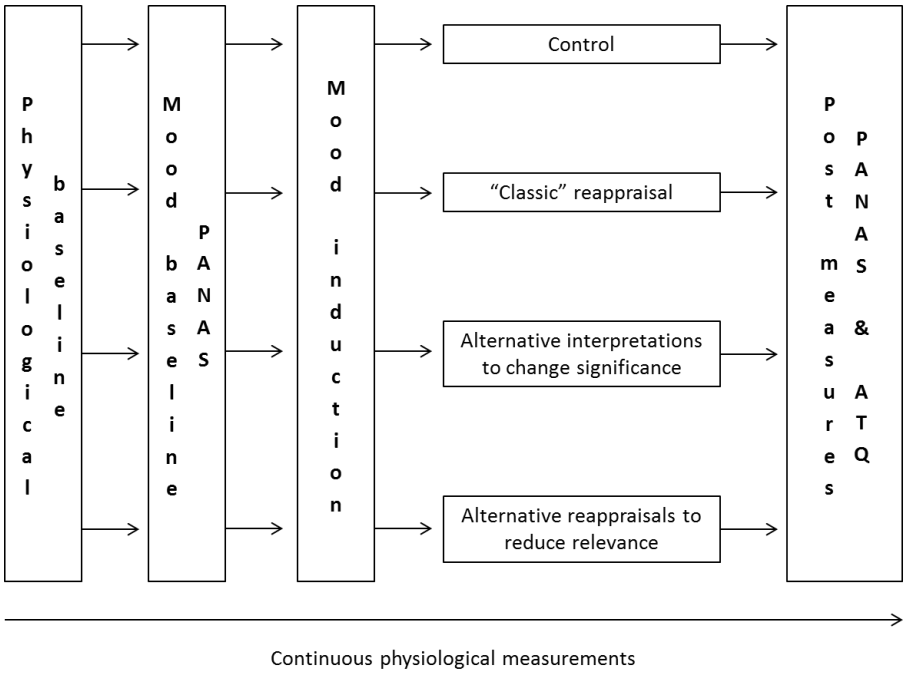

Figure 1. Graphical representation of the experimental design and variables measured during the experiment.

Relation between number of alternatives identified in each theoretical category and level of distress

In this step of the analysis we investigated if the number of alternative interpretations for changing significance and the number of alternative reappraisals reducing relevance were related to changes in mood. To do so we used the composite indexes: number of alternatives * credibility rating. As we coded both alternative interpretations and alternative reappraisals across all groups, we run this analysis over the entire sample. We computed one hierarchical regression analyses for each of these composite indexes, while, controlling for baseline mood, imaginative ability and imaginative vividness. We found a non-significant relation in the case of alternative interpretations index, R^2 change= .01, F(1, 89)=1.66, β=-.13 p=.200, but a significant relationship for the reduction in relevance index, R^2 change= .04, F(1, 89)=4.61, β=-.21 p= .034. This results indicates that the more alternatives that help reduce motivational relevance our participants generated, the more likely was that they felt less distress in the mood induction task or mood induction + regulation task.

Link with depressive symptomatology

As one can see form the correlation matrix presented in Table 1, there was no direct link between none of the two indexes and depressive symptoms. The only variable that was related to depression was general irrationality. On the other, hand, the reduction in relevance index was negatively correlated with irrational beliefs, and positively correlated with habitual use of reappraisal. Both correlations are in the expected directions. Afterwards, we computed two hierarchical regressions to test the association between our indexes and depressive symptoms, while controlling for irrational beliefs and habitual use of reappraisal. For positive interpretations index R^2 change= 01, F(1, 81)= .95, β= -.10, p= .332, while for reduction in relevance R^2 change= .03, F(1, 81)= 2.15, β= .19, p= .064. The number of the alternative positive interpretations or reappraisals that reduce motivational relevance reported by the

participants during the experimental task did not significant explanatory value for depressive symptoms.

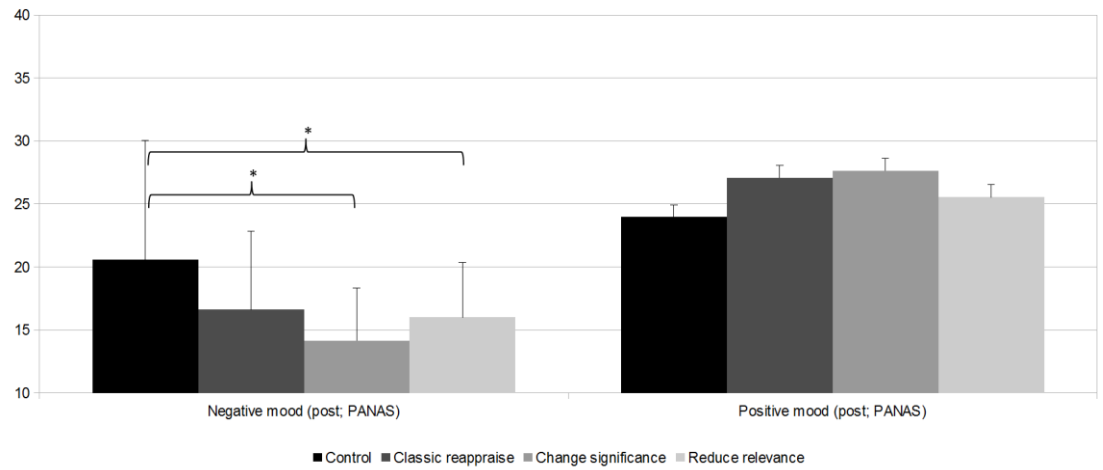

Figure 2. Between groups comparison of negative (means and standard deviation) and positive mood (estimated marginal means and standard error after controlling for baseline levels) post-induction. Differences marked with * are significant.

Table 1.
Correlation matrix between the variables included in the analysis linking positive interpretations index and reducing relevance index to depressive symptomatology.

Variables		1	2	3	4	5
Positive interpretations index	1		.217*	-.188	.175	-.153
Reducing relevance index	2			-.219*	.248*	.096
Irrational beliefs	3				-.093	.393**
Habitual use of reappraisal	4					.001
Depressive symptomatology	5					

Note: * Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Discussion

Results showed that identifying alternative positive interpretations and alternative appraisals that reduce the motivational relevance of negative life events are both adaptive emotion regulation strategies. Both instructions were more effective than the control group, while "the classical" form of reappraisal, asking the participants to reappraise without specific indications in how to do so, did not differ from control.

On the other hand, participants receiving the simple instruction to reappraise experienced a lower level of negative automatic thoughts during the experiment, which is somewhat surprising. Is possible that participants in the alternative interpretations and alternative appraisals did a more in depth processing of the scenarios, which also lead to more negative thoughts, but in the end they managed to overcome these thoughts and experience less negative emotions. A similar explanation could also be offered for positive emotions, which had the highest level in the group with the simple instruction to reappraise.

Also, we investigated if the number of alternative interpretations and reappraisals that reduce motivational generated by the participants was related to the level of negative emotions they experienced during the mood induction / mood induction + regulation task. To do so, we took into account the credibility of the alternative interpretations or reappraisals they generated. Interestingly, we did found such an association, but only in the case of reappraisals aiming at reducing motivational relevance.

We did find some significant correlations between the number of alternative for reducing motivational relevance, irrational beliefs and habitual reappraisal, suggesting that those whom have lower levels of irrational beliefs, and use more frequently reappraisal as an emotion regulation strategies were better in identifying more alternatives of this type. On the other hand, when we looked at the association between the number of alternatives generated (of each type) and depressive symptomatology, while controlling for irrational beliefs, no significant link was identified. Yet, this was an exploratory analysis, and it is possible that there are other types of interpretations or reappraisals that fit better such a relation.

3.5. STUDY 5. APPRAISAL ABILITY AND ITS RELATION TO DEPRESSIVE AND ANXIOUS SYMPTOMATOLOGY

Introduction

Although reappraisal seems to be an adaptive strategy in experimental studies (Webb et al., 2012), correlational data linking this emotion regulation strategy to psychopathology shows overall small effect sizes (Aldao et al., 2010). One possible explanation is that the presence of maladaptive strategies such as rumination and suppression is far more relevant than the presence of adaptive strategies. Yet, several other alternative hypotheses could be tested. First, the vast majority of the studies published to date have measured reappraisal as a habitual/traits construct (asking participants to rate *how frequent* they use this strategy) and did not take into account one's ability of successfully using reappraisal. Secondly, as we have seen in Study 4, there might be some discrete differences between different types of reappraisals (*how*) that one might use to regulate emotions, and these differences might have different accounts in predicting psychopathology. Moreover, has we have also seen in Study 4, one's ability to generate multiple believable alternatives (*how many*) in reappraising a negative event might be related to the level of distress he's experiencing (we found such evidence in the case of reducing motivational relevance). Yet, such differences are lost in the habitual measures of reappraisal. The second alternative hypothesis is related to the role that reappraisal might play in relation to psychopathology. Reappraisal (or the inability of using reappraisal as an adaptive strategy) might be thought of as a vulnerability that is triggered when the individual if confronted with important life stressors.

There are two studies in the literature that have examined these alternative hypotheses. In one study (McRae, Jacobs, Ray, John, & Gross, 2012b) showed that the level to which participants managed to reduce their negative mood after a reappraisal instruction in an experimental task (*how well* they managed to make use of reappraisal) was positively associated with well-being, while this relation was not found for trait/habitual use. No associations with psychopathology were reported. This was just a preliminary study but pointed out that experimental procedure might be an option for measuring the degree to which one is able to effectively use reappraisal. A second study tested the second hypothesis (the moderation hypothesis for reappraisal), also using an experimental measure reflective the ability to reduce distress using reappraisal, rather than the habitual (frequency) use (Troy, Wilhelm, Shallcross, & Mauss, 2010). These authors found that when confronted with a significant negative life event, women who were better at using this strategy felt less depressive symptoms then those who had poorer performances in the reappraisal task.

In our study we wanted to replicate these results but also, to extend them in two ways. First, we wanted to look at the relationships between reappraisal ability and other psychopathology that were shown to be related to deficits in emotion regulation. These types of disorders that we decided to focus on were general anxiety disorder (GAD) and social anxiety disorder, both of which have been shown to be linked to deficits in emotion regulation (Mennin et al., 2009). Second, we wanted to take into consideration a complementary dimension of reappraisal, that was not used in these studies, and that ewe have shown, at least to a certain degree, in Study 4, that might be the expression of effective regulation.

Method

Participants

The study included 135 participants, all undergraduate students whom participated in the study for a course credit. They were recruited through electronic advertisements Participants aged between 18 and 45 years, with a mean age of 22.24 (S*D*= 3.34). The sample was comprised of 125 females and 11 males.

Measures

Mood change. To measure changes in positive and negative emotions during the different phases of the experimental procedure we used The Positive and Negative Affect Schedule (PANAS, Watson & Clark, 1994/1999), a widely used instrument that measures the current specific emotions.

Arousal and valance. To measure the arousal an valence that the participants attributed to each stimuli presented during the experimental task we ask participants to rate stimuli on each dimension using a scale from 1 to 9, where higher scores indicated negative valence and higher arousal respectively.

Number of alternative reappraisals. In the final part of the experimental procedure we asked participants to view 5 stimuli that were not presented before and first we required them to watch each of them and write them on a distinct piece of paper how they apprise each of these stimuli. Following this step, they re-watched each of the stimuli and in a limited time-frame they were required to generate as many alternative interpretations and reappraisals to the same stimuli so that they change the meaning of each stimulus in a more positive or less negative one.

Depressive symptoms. Beck Depression Inventory-II (Beck, Rush, Shaw, & Emery, 1979) was used as a measure of current depressive symptoms.

GAD symptoms. The GADQ-IV, a revision of the GAD-Q (Roemer, Borkovec, Posa, & Borkovec, 1995) is a 9-item self-report questionnaire that assesses generalized anxiety disorder criteria. It specifically assesses the presence of excessive worry and its uncontrollability, number of excessive worry topics, associated symptoms, and distress associated with worry

Social anxiety symptoms. Liebowitz Social Anxiety Scale (LSAS; (Heimberg et al., 1999), is a 24-item scale that provides separate scores for fear (on a scale from 0 to 3, where a value 0 indicates no fear, and value of 3 indicates severe fear) and avoidance (on a similar scale ranging from never to usually) of social interactions and performance situations.

Negative life events. The Life Events Questionnaire (LEQ; Sarason, Johnson, and Siegel, 1978) is a self-report measure of positive and negative events experienced in the last year and perceived stress associated with them.

General positive and negative mood. The Profile of Affective Distress (PAD; Opriş & Macavei, 2005, 2007).was used to measure general positive and negative mood. The questionnaire measure functional negative emotions (e.g., concern, sadness), dysfunctional negative emotions score (e.g., anxiety, depressed mood) but it also includes a positive emotions subscale (13 items; Cristea et al., 2012).

Rational and irrational beliefs. To measure the rational and irrational belief the participants were asked to fill the Attitudes and Belief Scale-II (DiGiuseppe, Leaf, Exner, & Robin,1988).

Negative automatic thoughts. To measure negative thoughts that participants experienced during the experimental procedure, we used the Automatic Thoughts Questionnaire – Short Version (ATQ; Hollon & Kendall, 1980; Netemeyer et al., 2002).

Habitual use of reappraisal. We measure the habitual use of reappraisal as an emotion regulation strategy with the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003).

Procedure

Subjects watched three sets of images depicted from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2008) with 28 images each. After each image they were asked to indicate the valence (how positive or negative) and the arousal (how intense) was the emotion generated by each image, on a scale of 1 to 9. The first and the last sets included negative images, while the second set included neutral images. Figure 1 is depicting a graphical representation of this experimental sequence while Figure 2 is depicting the time course for each stimulus that was presented, across the three sets of images.

In the first and last phases of the experimental sequence, participants watched the negative pictures sets and received the instruction to either watch the pictures or to try to reappraise them. The order in which they were instructed to watch or reappraise the pictures was randomized across the first and the final phase of this experimental sequence, as well as the order of the picture sets on which they were instructed to apply the watch or regulate instructions. In the watch condition, the participants were asked to look carefully at the pictures and try to relate naturally to them, as it would normally do in real life of they were confronted with such a situation. In the reappraise condition, the participants were asked to look carefully at the pictures and to try to change their meaning in a more positive or less negative one. After viewing each set of images, the participants were asked to complete the PANAS questionnaire.

At the end of this experimental sequence, participants were asked to watch 5 new negative pictures and write down on a piece of paper what they think is happening in each of them. After that, they reviewed the same five pictures but this time they were required to generate, in a limited time frame (2 minutes) as many alternative interpretations and reappraisals for each photo so that the meaning of each of them is changed in a more positive or less negative one (this sequence is a distinct one from what is depicted in Figure 1).

Reappraisal ability indexes

To measure reappraisal ability we computed several indexes. First, we used the valence and arousal ratings during the watch negative pictures sequence and reappraise negative pictures sequence to compute to indexes related to arousal and negative valence regulation. To do so we computed change scores between the two conditions, so that higher differences between the two conditions (meaning lower arousal and valence ratings in the reappraisal condition) indicate better reappraisal ability. Second, as valence and arousal ratings might be looked as being artificial, we also took into account the changes in negative and positive emotions experienced by the participants during the same phases. To do so, we first computed changes scores between both negative and positive mood emotions at the beginning and the end of the watch negative pictures condition (time 1 and time 2 in Figure 1), and between both negative and positive emotions in the reappraise negative images condition (time 3 and time 4).

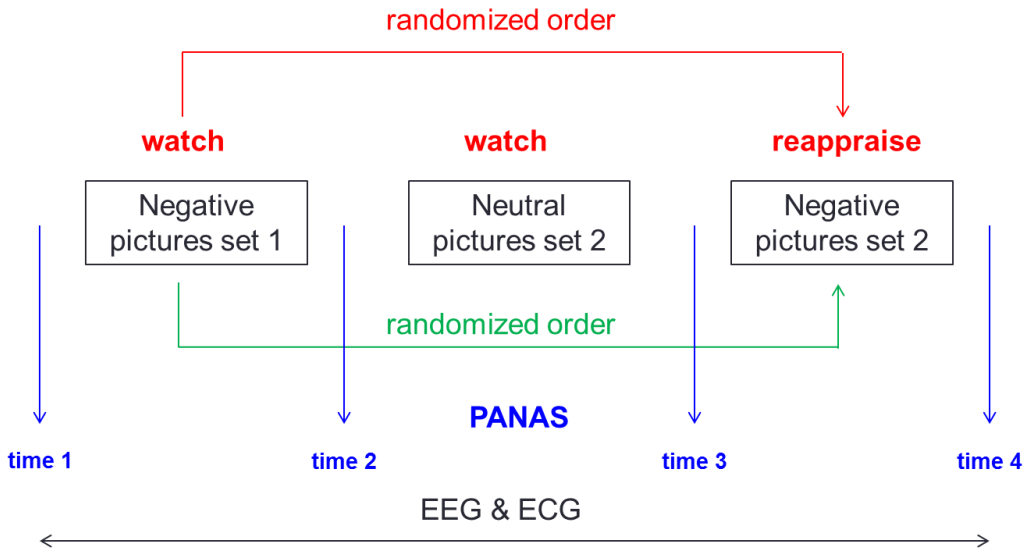

Figure 1. Graphical representation of the overall experimental sequence.

Finally, we analyses the number of the alternatives that the participants generated in the final sequences, where they first viewed five pictures and then were asked to generate as many alternative interpretations and reappraisals in a limited time frame. Two independent coders counted the number of positive or less negative interpretations and reappraisals generated by each participants (correlation between the two coders was r(135)= .84, indicating good inter-rater reliability).

Results

Correlations among reappraisal ability indexes

We looked at the correlation between each index after standardization. The correlation matrix between the indexes in offered in Table 1. As one can see, we found a high correlation between (.73) between the reduce valence and reduce arousal indexes so we decided to average them and use them further as a unique index. We also found a correlation between increase positive emotions index and generation of alternatives, but this correlation was small (.38), so we did not aggregate the two indexes. Unexpectedly, we found a small but inverse correlation between reduce valence component and reduce negative emotions component (-.17). This shows that changes in ratings regarding stimuli's valence might be quite different from changes in mood experienced by the participants between the watch and reappraise conditions.

Link between reappraisal ability and psychopathology

To assess the association between reappraisal ability and the clinical symptoms of interests, as well as associations with other cognitive constructs form the CBT tradition (such as irrational/dysfunctional beliefs and thoughts), that have been previously demonstrated to be linked to psychopathology, as well as with the habitual measure of reappraisal (reappraisal subscale from the ERQ) we first computed a correlation matrix. We found few significant associations between reappraisal ability indexes and both depressive and symptomatology. In fact just 2 small correlations were found between reduce negative emotions and social anxiety symptoms r(111)= -.19) and between increasing number of alternative and depressive symptoms, r(130)= -.24. Also, the ability of generating multiple alternatives negatively correlated with irrational beliefs, r(110)= -.28.

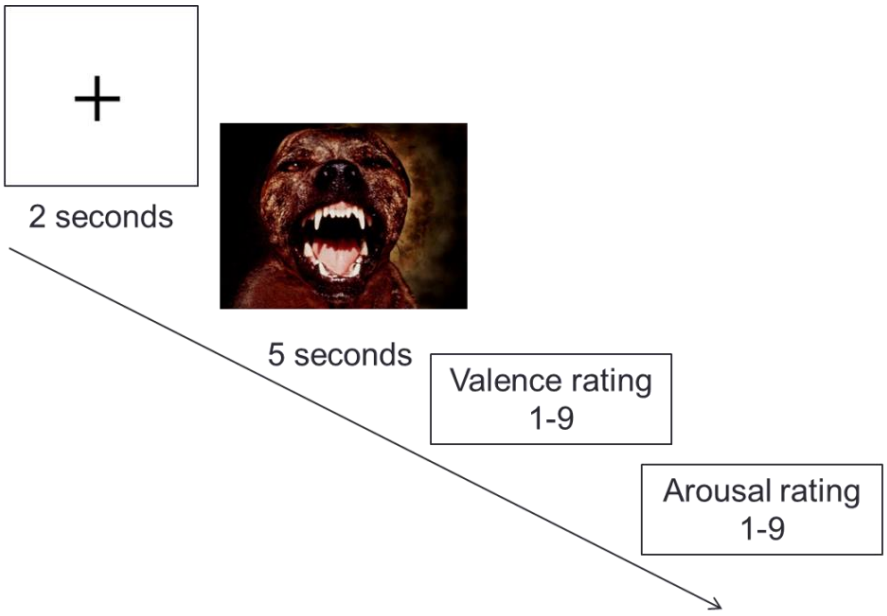

Figure 2. Graphical representation of the time course of viewing and rating each picture.

We found few evidences of moderation. In the case of depressive symptom no such effect was found. In the case of generalized anxiety symptoms we found just single moderation effect of reappraisal ability measured as the number of alternative interpretations and reappraisals generated by the participants in the final step of the experiment, R2 change= .05, F(3, 109)= 4.32, *p*= .034. Also, in the case of social anxiety symptoms, we did not find any moderation effect. As we stated in our goals, we further tested to if this effect was maintained after controlling for other variables coming from the CBT tradition, namely irrational beliefs and negative automatic thoughts. In deed the effect remained significant, even after controlling for these variables, R^2 change= .03, F(5, 109)= 8.36, *p*= .046.

Table 1.
Correlation matrix between the five indexes of reappraisal ability.

Index	No.	1	2	3	4	5
Reappraisal ability – reduce valence	1		.730**	-.173*	.028	.104
Reappraisal ability – reduce arousal	2			-.089	-.112	-.063
Reappraisal ability – reduce negative	3				-.094	-.093
Reappraisal ability – increase positive	4					.386**
Reappraisal ability – generate alternatives	5					

Note: **Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Discussion

Although we managed to experimentally manipulate reappraisal, we have identified effects of the order in which participants followed the watch and reappraisal instructions, and also for the order in which they viewed the pictures sets. This might have altered to some extent the reappraisal indexes that we have derived, and thus reducing the probability of identifying links with psychopathology. To correct (at least partially) for these effects, we standardizing the scores of the subjects within the four sub-groups resulting from the two randomization orders for both instructions and picture stets.

Looking back to the goals of the this study, we tried to see if reappraisal ability, conceptualized as how efficiently one makes use of reappraisal and how many alternatives one could generate to reinterpret or reappraise a negative life event, is related to depressive and anxious symptomatology. What was unexpected was that the fact these different conceptualizations were quite distinct. With the exceptions of reducing the valence and the arousal of an emotion generated by a negative stimulus, which were strongly correlated, all other indexes were loosely related, unrelated, or even had a small inverse relation.

The resulting indexes of reappraisal ability were poorly associated with symptomatology measures, but also with distress, positive emotions and other cognitive variables form the CBT tradition, as well as with habitual use of reappraisal.

As a direct link, we found just two small correlations between reappraisal ability conceptualized as number of alternatives one could generate when confronted with negative situations and depressive symptoms, and between reappraisal ability measured as reduction in negative mood, and symptoms of social anxiety. In the moderation analysis, we found one significant moderation effect of reappraisal ability (number of alternatives), between negative life events and symptoms of generalized anxiety disorder. This moderation effect remained significant even after controlling for irrational beliefs and negative automatic thoughts.

CHAPTER IV. GENERAL CONCLUSIONS AND IMPLICATIONS

4.1. CONCLUSIONS

This thesis might answer several important questions in the literature, related to the role that emotion regulation strategies might play in understanding and treating psychopathology. In the first study, we conducted a meta-analysis of experimental studies manipulating reappraisal and acceptance. Results of this meta-analysis have shown that reappraisal is an effective strategy, with a medium effect size, while acceptance did not show effect sizes significantly different form the control group. Such a result indicated that the conditions under which acceptance might work effectively are not fully understood.

In Study 2 we tried to better understand what are the active components of acceptance and test if clinically derived instructions for reappraisal and acceptance (together with training in using these strategies) are effective for regulating emotions. In doing so, we added as a comparison groups that was instructed to use self-focused processing, which is similar with acceptance in terms of requiring participants to focus on their own thoughts and emotions, but without the non-evaluative component. Also, in the case of reappraisal we derived our instruction from the REBT tradition and asked participants to think about the mood induction scenarios in a more rational/less irrational manner. Results have indicated that all strategies reduced anxiety and negative mood. Yet, acceptance was superior to self-focused processing in terms of all three emotional measures taken into account (negative mood, autonomic-emotional component of anxiety, and cognitive component of anxiety). These results indicate that the non-evaluative component might be one of the effective ingredients of acceptance.

In Study 3 we conducted an analysis related to mechanism of change was conducted in Study 3. We chose to target our intervention on anxiety disorders, namely in this case acrophobia. The treatment that we have developed significantly improved participants' condition related to heights, but no effects were observable in secondary outcomes (e.g., depression, distress). We also found that changes in use of suppression while confronted with heights situations significantly predicted changes in symptoms. No change was observed in relation to reappraisal, although we included two groups that benefited from a cognitive restructuring component that was added to their treatment, and we found that negative beliefs about heights did change after the treatment. Also, these changes in beliefs predicted changes

in the primary outcomes. The results of Study 3 indicated that emotions regulation strategies (in this case suppression) might be linked to psychopathology and psychotherapeutic outcomes, but we did not find such an effect for reappraisal. We then continued to explore alternative components and conceptualizations of this strategy.

In Study 4 and 5 we focused on dissecting this strategy in distinct components in terms of sub-types of reappraisals, efficiency in using the strategy, and number of alternative reappraisals (in the broader sense) one could generate to regulate negative mood. We found that certain types of reappraisals (such as reducing motivational relevance), are better linked to distress than other types (such as positive interpretations) but no direct association was found with depression (in Study 4). In Study 5 we tried to measure reappraisal as ability rather than as a habitual trait, but we found just small association with depressive and anxious symptoms. Also, we tested a moderation hypothesis of reappraisal ability between negative life events and symptoms of anxiety and depression, but we found little evidence to sustain it.

Limitations

In Study 1, we have failed to identify sources of heterogeneity for many of the comparisons between the strategies that we computed, others then outliers in our data-set. Is possible that there are other moderators for the possible effects of reappraisal and acceptance that we have failed to identify.

In Study 2, although we used clinically informed instructions for manipulating emotion regulations strategies, our tests of their effectiveness was based solely on self-reported measures of affect.

In Study 3, we conducted a randomized trial in which we investigated the efficacy of an intervention targeting reduction of symptoms of acrophobia. For this study we had a limited number of subjects, which reduces the generalizability of our results. Also, in this study we investigated if emotion regulation strategies could be regarded as possible mechanisms of change. Our analysis was based on the association between the changes in these strategies and changes in symptomatology. Although this is a first step in proving that a construct or variable indeed is a mechanism, several other characteristics have to be proved before such a causal model can be assumed (e.g., temporal mediation, correspondence between the intensity of the intervention and the magnitude of change in outcomes; see for more details (Kazdin, 2007).

In Study 5, besides limitations in terms of the ecological validity of the experimental task build to measure reappraisal ability, we used a sample of students which showed low levels of symptomatology. Indeed, we found few links for reappraisal ability in relation to symptoms of depression and anxiety disorders (generalized and social anxiety) but our results might have been affected by the sample that we used.

4.2. ORIGINAL CONTRIBUTIONS OF THE THESIS

This thesis has several original contributions that we want to acknowledge. We will group these contributions in three broad categories: (1) theoretical, (2) methodological and (3) practical/clinical.

Theoretical contributions

At theoretical level, Study 1 is the first meta-analysis that offers clear results related to the effectiveness of reappraisal and acceptance in experimental studies, by offering direct comparisons with control group/condition. Al previous meta-analytical investigations offered data related to the comparative effectiveness of these strategies with a mixture of several others. Our results pointed out that reappraisal is an effective strategy in experimental studies and that acceptance is not superior to the control condition, in terms of overall effect.

Some important theoretical contributions are related to Study 3, in which we investigated if emotion regulation strategies might act as mechanisms of change in psychotherapy. This study is one of the first studies whom inquired if emotion regulation might act as mechanisms of therapeutic change, and is the first study that investigated the role played by emotion regulation strategies in the case of this particular disorder.

This thesis included the first study (Study 4) that contrasted the effectiveness of two reappraisal instructions derived from Lazarus' theory (1991) to a classical instruction for the same emotion regulation strategy. In fact, this is one of the first studies that investigated how different sub-types of this emotion regulation strategy might alter emotional responses. Also, is one of the few studies to our knowledge that analyzed how participants actually thought about the negative stimuli in the mood induction task in order to reappraise them (the content of reappraisal), and the first study whom investigated the link between the number of alternatives generated in reappraising stimuli and the level of distress that participants experienced during mood induction task.

Methodological contributions

Methodological contributions could be synthetized in four key points. First, in Study 2 we offered a clear example of how emotion regulation strategies might be derived from clinical CBT protocols an integrated in more ecological procedure for comparing the effectiveness of different emotion regulation strategies. We focused on the REBT approach on cognitive change, and ACT approach for acceptance strategies, but similar instructions could be derived from other therapeutical protocols (e.g., CT, or DBT).

In Study 3 we have adapted a commonly used scale (ERQ; (Gross & John, 2003) for measuring the use of reappraisal and suppression in the context of heights exposure. This scale proved to have good internal consistency, while suppression sub-scale was sensitive to changes do to the psychotherapeutic intervention, as well as predictive for the treatment outcomes. Yet, future investigations are needed to establish and adjust its full psychometric properties.

Forth, Study 4 and Study 5 offered two examples on how reappraisal could be conceptualized and measured based on the number of alternatives people can adopt in trying to reduce the impact of negative stimuli or life events. Our approach was based on a combination of quantitative and qualitative measures that were used in Study 5 to calculate a new index (to be read facet) of reappraisal ability.

Practical and clinical implications

This thesis was mainly focused on fundamental research, by testing hypothesis in controlled laboratory studies. Yet, there are some practical and clinical implications that we want to point out.

A practical implication brought up by the result presented in this thesis is the fact that reappraisal is an effective strategy for regulation state negative affect (and its associated consequences). This was proposed by previous research and was confirmed in our meta-analysis (Study 1). As a general recommendation for psychological interventions (in the broad sense, moving beyond clinical protocols) that promote adaptive regulation, is that teaching clients to use reappraisal when confronted with negative life events, might help them reduce momentary distress. Is true that this strategy is modestly related to lack of psychopathology on the long run, but at least is effective for regulating transitory negative emotions. Based on the results of Study 3, it appears that reducing the motivational relevance might be more effective than focusing on the alternative positive interpretations.

In regard to clinical implications, in Study 3 we have pointed that cognitive restructuring might increase the effectiveness of VR-based psychological interventions for anxiety disorders. We showed such an effect in the case of acrophobia, and having in mind the limitations discussed previously, such a component might lead to greater reduction in

behavioral avoidance. Yet, for self-reported avoidance, cognitive restructuring seems to be more effective only when highly immersive environments are used for conducting the treatment.

4.3. IMPLICATIONS FOR FUTURE RESEARCH

As we have argued after Study 1, acceptance is promoted as an effective strategy, but both cross-sectional data, as well as experimental data (synthetized in our meta-analysis) failed to demonstrate its adaptive nature. Yet, In Study 2, which implied a comprehensive training in using the strategy, acceptance proved to be at least as effective as reappraisal. These results point to the need of a better understanding of the conditions under which this strategy, inspired from therapeutic protocols, might be effective in regulating negative effect. One of the possible hypotheses is that much more consistent training is needed to fully benefit of this strategy, as compared to what is regularly done in experimental research.

As our thesis was mainly focused on reappraisal, and thus there are several implications for future research around this construct. First, future studies should rethink if indeed cognitive restructuring techniques used in CBT protocols promote the use of reappraisal. Such a relationship is not excluded, but perhaps measures of reappraisal should be re-conceptualized so that they would take into account the specific sub-types of this generic strategy, as well as the content of the reappraisal process. Habitual use, which can be translated as how frequent one tries to change the way he thinks when feeling distressed, might not reflect important components of reappraisal. We offered some possible leads in this thesis, as for example in Study 4 we have showed that finding multiple alternatives that bring a positive re-interpretation or that reduce motivational relevance of a negative event might be effective sub-types of reappraisal.

Reappraisal ability has been proposed as a possible alternative to habitual use of reappraisal in understanding the link of this regulatory strategy to psychopathology. Yet, there is little data in the literature to sustain this idea, and the results of Study 5 brought modest support. We tested different facets of this construct, but future studies should look at how these facets are inter-related and which bring more explanatory power in relation to psychopathology. Self-report data (including qualitative analysis) should be doubled by psychophysiological data in future inquiries.

We have pointed out that suppression might be one of the mechanisms of anxiety disorders that are altered during psychological interventions. Yet, several other conditions are required to be tested to fully assess such a role for this emotion regulation strategy. Future studies should also explore other emotion regulation strategies that might have similar functions, and might help improve the effectiveness of psychotherapy. Moreover, future studies should investigate if maladaptive emotion regulations strategies are involved in the development and maintenance of anxiety disorders, outside therapeutic context.

Finally, a general recommendation for future studies is related to the interplay between adaptive and maladaptive strategies. There is consistent data that some strategies are strongly related to different types of symptoms, but there is little data (e.g., Aldao & Nolen-Hoeksema, 2013) on how this strategies interact in predicting these symptoms. Is possible that although adaptive strategies, such as reappraisal and acceptance, are not directly linked to the presence or the absence of symptoms, they might reduce the probability of one engaging in dysfunction strategies to regulate distress, and on the long term, reduce the probability of developing symptoms of mental disorders.

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