BABEŞ-BOLYAI UNIVERSITY
FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES
DEPARTMENT OF CLINICAL PSYCHOLOGY AND PSYCHOTHERAPY

Ph.D. THESIS RESUME

THE FUNCTIONS OF WORRY – THE ROLE OF POSITIVE BELIEFS ABOUT WORRY AND IRRATIONAL BELIEFS

AUTHOR: Ph.D. CANDIDATE ŞTEFAN SIMONA IOANA
SCIENTIFIC ADVISOR: PROFESSOR Ph.D. DAVID DANIEL

CLUJ-NAPOCA
2011

ACKNOWLEGEMENTS

I would like express my gratitude to my scientific advisor, Professor Daniel David, Ph.D. for the valuable input and guidance throughout my entire Ph.D. program, and to all members of the Department of Clinical Psychology and Psychotherapy, Babeş-Bolyai University, who have provided me with both scientific knowledge and support to the highest extent. I would also like to thank Associate Professor Aurora Szentagotai, Ph.D., and Professor Graham Davey, Ph.D. for their interest in my work and their useful suggestions. Last but not least, I wish to thank my family and friends for supporting all my endeavors.

*Notes.*_____

(1) This research was supported by The SECTORAL OPERATIONAL PROGRAMME HUMAN RESOURCES DEVELOPMENT, Contract POS DRU 6/1.5/S/3 – "DOCTORAL STUDIES, A MAJOR FACTOR IN THE DEVELOPMENT OF SOCIO-ECONOMIC AND HUMANISTIC STUDIES".

(2) This is to certify by Ştefan Simona-Ioana that:

(a) The resume includes the original research work of Ştefan Simona-Ioana (author) towards the Ph.D.; the research was scientifically supervised by Professor Daniel David, Ph.D.

(b) Parts of the thesis have been already been accepted for publication or submitted for publication; appropriate citations for these publications were included in the thesis. Other co-authors have been included in the publications, if they contributed to the exposition of the published text, data interpretation etc. (their contribution was clearly explained in the footnotes of the thesis);

(c) The thesis was written according to the academic writing standards (e.g., appropriate scientific acknowledgements and citations have been made in the text by the author of the thesis). All the text of the thesis and its summary was written by Ştefan Simona-Ioana who assumes the all responsibility for the academic writing.

(3) All the Tables and Figures are numbered within the corresponding chapter.

TABLE OF CONTENTS

Keywords: worry, positive beliefs about worry, the illusion of control, performance, irrational beliefs, functional/dysfunctional emotions.

CHAPTER I. THEORETICAL BACKGROUND

1.1. Introduction and Research Topic

Worry represents a mental activity defined as repetitive, relatively uncontrollable, and negatively affect-laden (Borkovec, Robinson, Pruzinsky, & DePree, 1983). Normal worry is mild, transient, and is experienced by the majority of individuals in various circumstances (Ruscio, 2002), while pathological worry has been considered the core diagnostic feature of generalized anxiety disorder (GAD) since the publication of the revised, third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R; American Psychiatric Association [APA], 1987).

Either normal or pathological, worry has both negative and positive consequences. For instance, while worry is associated with trait anxiety and depression (Davey, Hampton, Farrell, & Davidson, 1992), negative problem orientation, and avoidance coping behaviors (Dugas, Letarte, Rheaume, Freeston, & Ladouceur, 1995), it is also associated with adaptive coping strategies when controlling for trait anxiety (Davey et al., 1992). Generally, worry is considered to serve certain functions, like the experiential avoidance of internal experiences (Behar, DiMarco, Hekler, Mohlman, & Staples, 2009), and people generally believe that worry can be helpful indeed. Asking people what they think about the functions of worry reveals that both GAD patients and non-diagnosed individuals frequently hold positive beliefs about worry and its functions. This approach however, although important, remains mostly a hermeneutical one, as it enquires what functions people *believe* worry serves. Investigating the *real* functions of worry though, apart from what people consider them to be, requires a positivistic approach, which would clarify what the truth behind the positive beliefs about worry really is.

People hold various beliefs about the benefits of worry. However, it is not clear whether the supposed positive effects of worrying occur online, as the person worries, offering immediate relief, or they represent merely post-hoc rationalizations, as some authors have suggested (e.g., Borkovec, Alcaine, & Behar, 2004).

Then, if worry can be functional, enhancing motivation and problem solving attempts, like it is supposed to, it should be related to performance in challenging tasks. The findings in the field of worry and performance have been mixed; while some studies suggest that worry can be beneficial (e.g., Davey, Hampton, Farrell, & Davidson, 1992, Perkins & Corr, 2005), others highlight the cognitive interference between worry and attentional and memory processes leading to a decreased performance (e.g., Eysenck & Calvo, 1992; Stöber, 1998).

Like other cognitive processes, worry can be considered functional or dysfunctional by looking at the emotional consequences it triggers. If worry leads to dysfunctional emotional reactions (e.g., anxiety, depression), then it is itself dysfunctional. If, on the contrary, it promotes adaptive, functional (even if negative) emotional reactions (e.g., concern, regret), worry can be considered a functional cognitive process.

When investigating the functions of worry, the field of rational and irrational beliefs from the framework of REBT theory (Ellis, 1962, 1994) can offer a useful approach, as these beliefs can represent a significant moderating factor in delineating functional and dysfunctional worry. Irrational beliefs could underlie the perceived

functions of worry, in the sense that holding irrational beliefs/ absolutistic demands for certainty and control would promote worrying as a strategy for increasing certainty and the sense of control. Also, underlying irrational beliefs would be particularly useful in delineating the functional versus dysfunctional emotional reactions associated with worry. In this sense, it could be that worry, when accompanied by a high level of irrational beliefs, triggers dysfunctional negative reactions, whereas, when associated with rational beliefs, it triggers negative functional emotions.

Integrating all these elements, worry can be considered functional if it facilitates performance and if it is associated with adaptive, functional (even if negative) reactions, and not with dysfunctional emotions. Also, in situations where no action can be taken, or in situations with no clear performance indexes, worrying should serve other purposes, like emotional regulation or providing a sense of control.

1.2. Relevance of the Research in the Field of Functional and Dysfunctional Worry

The aim of the present research refers to delineating the functional/dysfunctional nature of worry by focusing on: (1) the truth behind positive beliefs about worry (i.e., the effects of worrying), (2) the relations between worry and performance, and (3) worry and functional/dysfunctional emotions.

Clarifying the relation between positive beliefs about worry and the actual positive effects of worrying, whether these effects occur on the spot, providing immediate comfort, or they only arise afterwards, as retrospective rationalizations, would help explain the mechanisms responsible for triggering and maintaining worry.

Taking performance and functional/dysfunctional emotions as reference points in establishing the functional/dysfunctional nature of worry would bring important clarifying information regarding the benefits and cutbacks of worry. As previously mentioned, provided that worry facilitates performance and it associates with functional emotions, than it is a functional process, even if worrisome thoughts are negatively affect-laden. Still, worry can be a functional process in certain circumstances (e.g., when something can be done in order to attain one's goal or prevent a negative outcome), and a dysfunctional one in other contexts (e.g., in relation to uncontrollable events). Discovering the instances where worry can be functional and dysfunctional would bring important theoretical and practical implications. For example, taking a practical perspective, we could develop techniques for helping patients delineate between circumstances where worry is functional or dysfunctional, and we would focus in therapy only on dysfunctional worrisome thoughts.

1.3. State of the Art in the Literature

1.3.1.The Concept of Worry

Worry has been defined as "a chain of thoughts and images, negatively affect-laden and relatively uncontrollable; it represents an attempt to engage in mental problem solving on an issue whose outcome is uncertain but contains the possibility of one or more negative outcomes " (Borkovec et al., 1983, p.10). As evidence suggests, worry as a cognitive activity is comprised mainly of verbal rather than imagistic contents (Borkovec & Inz, 1990; Freeston, Dugas, & Ladouceur, 1996), it resembles a narrative process in which themes are continually developed (Tallis, Davey, & Capuzzo, 1996), and it is

characterized by a perpetual attention to threat, which is continually reiterated without resolution (Gladstone & Parker, 2003).

1.3.2. Cognitive Theories of Worry and GAD

Since the concept of worry has begun to be studied in itself, several theoretical approaches have tried to describe and explain the nature of this phenomenon, both independently and in the context of GAD.

1.3.2.1. The avoidance theory of worry and GAD (Borkovec, 1994; Borkovec et al., 2004).

The avoidance theory of worry and GAD is derived from Mowrer's two-stage theory of fear (Mowrer, 1947), which posits that fear acquired by classical conditioning is followed by a conditional avoidance of fear cues, and that prevents exposure to the fear-provoking stimuli, thus leading to the maintenance of the fear process. In this respect, worry serves as a cognitive avoidance strategy which, like behavioral avoidance, preserves anxiety by impeding exposure despite repeated confrontations with the feared stimuli (Borkovec et al., 2004).

One underlying mechanism of the avoidance function of worry relates to the verbal nature of worry. The increased verbal activity during worrying can prevent the eliciting of strong emotional reactions, as studies have shown that verbally imagining feared situations elicits very little physiological response (Vrana, Cuthberg, & Lang, 1986). By shifting to worry, individuals can therefore avoid both unpleasant mental images and the somatic activation related to anxiety.

In addition to its avoidance function, worry can also be maintained as a strategy of avoiding future negative events. Indeed, people frequently hold positive beliefs about the functions of worry which can be maintained through positive and negative reinforcement (Borkovec et al., 2004).

1.3.2.2. The intolerance of uncertainty model of worry and GAD (Dugas, Gagnon, Ladouceur, & Freeston, 1998).

The model proposed by Dugas et al. (1998) emphasizes the importance of intolerance of uncertainty (IU) in the development and maintenance of GAD. Intolerance of uncertainty can be defined as a dispositional characteristic derived from personal beliefs about uncertainty; it comprises perceptions, interpretations and cognitive, emotional and behavioral responses to uncertainty (Koerner & Dugas, 2006). IU is considered to lead to worry in a direct way, via a higher sensitivity to uncertain situations and events, which are rather innocuous. High IU triggers thoughts about the presence of uncertain situations and the need to avoid them, and multiple worries so develop.

IU can also trigger worry via three other processes: positive beliefs about worry, negative problem orientation and cognitive avoidance. The IU model of worry and GAD focuses on five specific positive beliefs about worry, namely worry is helpful for problem solving, worry motivates, worry diminishes negative emotional reactions in case the feared event occurs (e.g., disappointment), worry can directly alter the course of events (superstition), and trait worry represents a personal quality (Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994). Negative problem orientation can be defined as a cognitive set comprised of dysfunctional beliefs related to problem solving: the tendency to see

problems as threats, lack of confidence and perceived control in problem solving, the tendency to become frustrated when trying to solve problems, and holding a pessimistic view of the outcome (Dugas & Koerner, 2005). Cognitive avoidance, the use of covert strategies for avoiding negative mental imagery and emotional arousal, seems to play an additional important role in the development and maintenance of worry and GAD.

1.3.2.3. The meta-cognitive model of worry and GAD (Wells, 1995, 1999).

The meta-cognitive model of worry and GAD (Wells, 1995, 1999) draws on the distinction between two types of worry: Type 1 and Type 2 worry, and on the distinctive role of these two categories. When facing threatening situations, positive beliefs about worry are engendered (i.e., worry facilitates coping, worry motivates) and Type 1 worry arises. Type 1 worry is formed of worrisome thoughts related to the feared situation and the possible ways of dealing with it, what we normally regard as typical worry. Type 1 worry is a fairly common process and it is not pathological in itself.

According to the meta-cognitive model of GAD, it is Type 2 worry that is indeed problematic. Type 2 worry, or meta-worry, is triggered by negative beliefs about worry and consists of worrisome thoughts related to one's worry. Once these negative beliefs become activated, they foster Type 2 worry, or worry about worry. It is at this point, when individuals perceive their worrying as dangerous and uncontrollable, and dwell on its implications, that the worry process can be considered pathological (Wells, 2005).

1.3.2.4. The mood-as-input hypothesis and pathological worry (Davey, 2006; Startup & Davey, 2001).

According to the mood-as-input hypothesis (Davey, 2006), people use their mood as a source of information in deciding when to stop a certain cognitive activity. When in a negative mood, people tend to interpret their mood as evidence that their goal has not been attained, and continue to pursue that activity, whereas in a positive mood they feel they have completed their goal sooner during the task.

High worriers tend to experience negative mood frequently (Davey et al., 1992; Metzger, Miller, Chen, Sofka & Borkovec, 1990), and are likely to hold stringent "as many as can" stop rules in relation to their worry, given that they generally think worry is a necessary process for avoiding or for preparation for future catastrophes (Borkovec et al., 1999; Borkovec & Roemer, 1995; Davey et al., 1996). Therefore, following "as many as can" stop rules, they regard their negative mood as a clue indicating that the process of worry has to continue.

1.3.3. The Functions of Worry

1.3.3.1. Positive beliefs about worry.

The fact that worry is a common and pervasive experience indicates that the worry process could serve a vast array of functions. Indeed, most of the models of worry and GAD point to positive beliefs about worry as an important initiation and maintaining factor. The avoidance theory of worry highlights the suppressive effect of worrisome thoughts over negative imagery and emotional arousal, and also considers the perceived functions of worrying (Borkovec et al., 2004). The intolerance of uncertainty model of worry and GAD (Dugas, et al., 1998) and the meta-cognitive model (Wells, 1995, 1999)

also stress the importance of positive beliefs about worry, which are specifically addressed in the course of treatment of GAD.

Commonly reported reasons for worrying include the prevention of negative outcomes, the minimizing of the effects associated with negative events by reducing guilt and disappointment, and the distraction from thinking about even more negative outcomes. Also, people believe that worry has positive effects in terms of finding solutions and betters ways of dealing with issues, and increasing control (Freeston et al., 1994). Moreover, worriers report the belief that worrying is a positive personality trait that shows responsibility and concern for others (Cartwright-Hatton & Wells, 1997).

1.3.3.2. Worry and performance.

Apart from the positive beliefs about worry as a motivating factor in achieving performance, several lines of studies have addressed the relation between worry and performance in academic and work settings. In this respect, a series of studies found that worry is positively related to academic performance when trait anxiety is controlled for (Siddique, LaSalle-Ricci, Glass, Arnkoff, & Diaz, 2006), and that worry as a trait is positively associated with job performance for the individuals at the higher end of the ability scale (Perkins & Corr, 2005).

However, the results of studies investigating the relationship between worry and performance are rather mixed. For instance, the worry component of test anxiety is associated with poor performance due to the cognitive distortions it facilitates (Putwain, Connors, & Symes, 2010), or due to the fact that it interferes with the cognitive resources necessary for completing elaborate, complex tasks (Eysenck, Derekeshan, Santos, & Calvo, 2007).

Moreover, worry is associated with negative problem orientation, and that leads to perceiving problems as threats, lack of problem-solving confidence, and experiencing frustration throughout the problem-solving process (Davey, Jubb, & Gameron, 1996; Dugas & Koerner, 2005). Last but not least, worry is an abstract process, and this lack of concreteness makes it less likely to be really helpful in problem solving (Stöber, 1998).

1.3.3.3. The perceived functions of worry – immediate benefits, illusion of control, or post-hoc rationalizations?

The fact that people hold various positive beliefs about worry does not tell us whether worry indeed serves its supposed functions. It is possible that all positive beliefs about worry are reinforced simply by positive and negative reinforcement, without worry having any real benefit. Therefore, positive beliefs about worry could be merely post hoc rationalizations (Borkovec & Roemer, 1995).

In this sense, a first question that emerges is whether the functions of worry are perceived “online”, during the worry episode, or they emerge afterwards, as post-hoc explanations. For example, one might generally think that worry lowers the probability of a bad outcome to happen, but he/she might not actually perceive this probability to be lower while worrying. Some authors mention the idea that worry is considered to be beneficial on account of the illusion of control it provides (Borkovec & Roemer, 1995; Freeston et al., 1994). However, few studies have addressed this matter.

So far, there are few studies that applied the illusion of control paradigm to the study of anxiety disorders. A recent study (Reuven-Magril, Dar, & Liberman, 2008)

investigated the association between obsessive-compulsive tendencies and the illusion of control experienced in an uncontrollable, contingency judgment task. They found that obsessive-compulsive tendencies are positively associated with the illusion of control, and pointing to the idea that people with OCD tendencies are prone to extract an illusory sense of control in contingency tasks, and this could be an additional mechanism for maintaining compulsions. In this sense, extending the investigation of the illusion of control to the field of worry and GAD could bring similar valuable information, taking into account the similarity between the two disorders and the propensity of worriers to form positive beliefs about their worrying.

The illusion of control.

The concept of "illusion of control" was introduced by Langer (1975) who defined it as "an expectancy of personal success probability inappropriately higher than the objective probability would warrant" (p. 311). Since Langer's seminal experiments in the field, the concept of "illusion of control" has been investigated in studies from a wide range of domains especially social psychology (e.g., Langer, 1975; Langer & Roth, 1975; Morris & Sim, 1998; Thompson et al., 2007), mental health (e.g., Alloy & Abramson, 1979; Reuven-Magril et al., 2008), motivation and emotion (Biner, Johnston, Summers, & Chudzynski, 2009; Langens, 2007a; Rudski & Edwards, 2007), or decision making (Fenton-O'Creevy, Nicholson, Soane, & Willman, 2003; Kahai, Solieri, & Felo, 1998).

Factors that induce the illusion of control.

In a series of experiments, Langer (1975) demonstrated that, when dealing with chance-based situations, people have the tendency to act as if they could control outcomes because some features of the chance situations makes these resemble skill situations. These elements include: familiarity with the task, choice, involvement, competition, or foreknowledge. As an example, individuals are willing to trade a lottery ticket for a larger amount of money if they were given the possibility of choosing their own tickets because making a choice is usually associated with controllable situations (Langer, 1975, experiment 2). Other factors that influence perceptions of controllability are the sequence of the desired outcomes and the frequency of reinforcement (e.g., Alloy & Abramson, 1979; Thompson et al., 2007).

Anxiety and the illusion of control.

The relationship between the illusion of control and anxiety has not been extensively explored but, so far, it seems that individuals in stressful or threatening situations have an enhanced need for control and this makes them more prone to the illusion of control (Friedland, Keinan, & Regev, 1992) and superstitious behaviors (Keinan, 2002). A recent study on this topic also showed that individuals with obsessive-compulsive tendencies are more likely to report higher estimations of control in false contingency tasks (Reuven-Magril et al., 2008).

Explanatory theories of the illusion of control.

The illusion of control can form when variables usually related to skill-determined situations (e.g., familiarity, involvement, competition) are introduced in a chance-based situation (Langer, 1975; Langer & Roth, 1975). In the presence of these

factors, individuals mistakenly attribute their successes to their personal effort or skill, perceiving themselves as causal agents.

The wide range of factors responsible for inducing illusions of control were more recently comprised in a unifying theory, namely "the control heuristic" (Thompson et al, 1998; Thompson et al., 2004; Thompson et al., 2007). Briefly, the theory states that when assessing their level of personal control, people use a control heuristic which relies on estimating the connection between actions and outcomes and on the intent to obtain those results. When people see a connection between their behavior and a specific outcome, they are motivated to attain that outcome and put effort into it, they are likely to report higher estimates of personal control.

1.3.4. Distinguishing Functions and Dysfunctions – The Role of Irrational Beliefs

1.3.4.1. The nature of rational and irrational beliefs.

An area of research particularly relevant to psychopathology and its underlying mechanisms relates to the distinction between rational and irrational beliefs. Irrational beliefs, as defined by Albert Ellis (1962, 1994) in the framework of Rational-Emotive Behavior Therapy (REBT), are evaluative beliefs which have no logical, empirical and/or pragmatic support. That is, they are illogical, they are not supported by evidence and/or they do not serve the purposes of the individual. By contrast, rational beliefs are logical, and/or have empirical support, and/or are pragmatic.

According to REBT, dysfunctional emotions like anxiety or depression are triggered and maintained by irrational beliefs, whereas functional emotions, either positive or negative (e.g., concern, sadness), are primed by rational beliefs.

In REBT theory, there are four types of core irrational beliefs (Ellis, 1994): demandingness (DEM), awfulizing (AWF), low frustration tolerance (LFT), and global evaluation and self-downing (SD) and they can be associated with various content areas, like achievement, comfort, affiliation, etc. (Ellis, 1994; Walen, DiGiuseppe, & Dryden, 1992). Their rational counterparts are preference, non-awfulizing, frustration tolerance, and contextual evaluation of the self, others and the world. Demandingness refers to absolutistic requirements expressed as "musts", "shoulds", and "oughts" and is considered a core belief involved in primary appraisal of events (DiLorenzo, David, & Montgomery, 2007). Its rational counterpart implies formulating one's goals and desires in preferential rather that absolutistic terms. Demandingness is considered the core irrational belief, while all the others are derived from it (Ellis, 1962; 1994).

1.3.4.2. Rational/irrational beliefs and their emotional consequences.

An extensive line of research has shown the relevance of rational and irrational beliefs in relation to emotional distress and dysfunctional behaviors. Irrational beliefs have been associated with high levels of distress in academic settings (DiLorenzo et al., 2007; Montgomery, David, DiLorenzo, & Schnur, 2007), and demandingness emerged as an irrational primary appraisal component, its relation to emotional distress being mediated by the other three categories of irrational beliefs: awfulizing, low frustration tolerance and self-downing (DiLorenzo et al., 2007). Experimental data also show that, when experiencing similar levels of physiological arousal, participants primed with irrational beliefs report both dysfunctional and the corresponding functional negative

emotions, while those primed with rational beliefs report more positive emotions (David, Schnur, & Birk, 2004).

Irrational beliefs have been constantly addressed in relation to depression (e.g., Rosenbaum, Lewinsohn, & Gotlib, 1996; Solomon, Haaga, Brody, Kirk, & Friedman, 1998), anxiety (e.g., Deffenbacher, Zwemer, Whisman, Hill, & Sloan, 1986; Himle, Thyer, & Papsdorf, 1982), and other clinical conditions (Browne, Dowd, & Freeman, 2010).

In reference to the relation between rational/irrational beliefs and functional/ dysfunctional emotions, research has indicated that high levels of irrational beliefs are associated with both functional and dysfunctional emotions experienced in stressful situations, whereas low levels of irrational beliefs are associated only with functional negative emotions - e.g., concern, sadness-, but not with dysfunctional ones - e.g., anxiety, depression- (David, Schnur, & Belloiu, 2002; David, Montgomery, Macavei, & Bovbjerg, 2005).

1.3.4.3. Rational/irrational beliefs and worry.

Rational and irrational beliefs could relate differently to the functions of worry, indicating that the rational/irrational formulation of certainty and control-related goals may facilitate the use of worry as a strategy for enhancing certainty and control. For example, it could be that holding absolutistic requirements about uncertainty and control makes the individual more prone to experience the illusion of control while worrying.

Rational and irrational beliefs and, consequently, functional and dysfunctional emotions could also help delineating functional and dysfunctional worry. In this sense, worry that is associated with irrational beliefs and dysfunctional negative emotions is, by definition, dysfunctional. If an individual has a high level of irrational beliefs that are triggered in a particular situation, he/she is likely to experience worry and dysfunctional negative emotions (e.g., anxiety) as a consequence. On the other hand, if, in the same negative situation, rational beliefs are triggered, the consequent worry process and the experienced emotions will be functional, even if negatively affect laden.

So far, there are few studies that addressed the association between worry and irrational beliefs. Previous investigations of the relation between irrational beliefs and worry have found that the two concepts are significantly correlated, and that the propensity to worry is predicted mainly by specific irrational beliefs related to the importance of being loved and approved by everyone, the fact that the past necessarily determines future behavior, and the tendency to become overly upset when things go wrong (Lorcher, 2003).

CHAPTER II. RESEARCH OBJECTIVES AND OVERALL METODOLOGY

The present research aimed to address several theoretical and methodological objectives related to the functions of worry. We started from the concept of positive beliefs about worry (i.e., perceived functions of worry) because it is a considered an important etiological mechanism in most cognitive models of worry and GAD and because it constitutes a good starting point for enquiring the true functions of worry.

Theoretical Advances: Explaining the Functions of Worry

1. The first question refers to the real effects of worrying and can be expressed as follows: does worry serve its supposed functions on the spot, offering immediate relief, or the perceived functions of worry (i.e., positive beliefs about worry) are merely post hoc rationalizations, formed on the basis of positive and negative reinforcement? In order to answer this research question, two research objectives have been proposed:

1.1. Evidencing the nature of the feeling of control while worrying, whether it occurs online, as the person worries. In order to attain this objective, in Study 2, we used the illusion of control paradigm enquiring whether GAD symptoms and worry are associated with a tendency to extract an illusory sense of control while performing repetitive actions, pointing to the role of rational and irrational beliefs related to uncertainty and control. Furthermore, Studies 5 and 6 investigated the sense of control associated with worry in stressful situations.

1.2. Investigating the relationship between positive beliefs about worry and the real effects of worrying. To reach this objective, Studies 4, 5 and 6 analyzed the correspondence between perceived functions of worrying and the actual effects as they are evidenced in stressful, performance-related situations.

2. The second main question addressed by the current research refers to the real benefits of worrying, apart from what people perceive them to be. In other words, we started looking for evidence that worry does or does not help us attain our goals. For this purpose, we followed two research objectives:

2.1. Finding out whether worrying is positively related to performance. In this sense, Study 4 enquired whether worrying is positively associated with academic performance when taking other important variables into account, and Study 6 addressed this possibility in an experimental setting, focusing on attaining performance on a specific task, in a stressful situation.

2.2. Enquiring the emotional reactions associated with worry. Worry can be considered to be functional if it improves performance and if it is associated with functional, and not dysfunctional, emotional reactions. In this matter, we took into account the role of rational and irrational beliefs behind worrying, adding a new dimension to the functional – dysfunctional distinction for the worry process. In this direction, Studies 3, 5, and 6 followed specific association patterns between worry, rational and irrational beliefs, and functional/dysfunctional emotions.

Methodological and Practical Developments

3. First, one important methodological objective refers to identifying (1) the most suitable method for investigating the illusory sense of control supposedly elicited by worry, and (2) estimating the effect sizes of different independent variables used to trigger the illusion of control. In this sense, Study 1 consisted of a quantitative meta-

analysis aimed to summarize recent experimental data on the illusion of control phenomenon and tried to highlight the differences in terms of effect sizes between distinct categories of independent variables and dependent measures.

4. Considering the differential role of rational and irrational beliefs in predicting qualitatively and quantitatively distinct consequences, integrating data on worry functions and rational/irrational beliefs also requires the development of content-specific instruments. In order to identify the cognitive mechanisms responsible for the illusion of control phenomenon in the context of worry and anxiety symptoms, in Study 3, we developed content-specific instruments meant to capture rational and irrational beliefs related to uncertainty and control.

CHAPTER III. ORIGINAL RESEARCH

The empirical studies presented in this chapter were conducted in order to answer the research questions mentioned above and to follow the proposed theoretical and methodological/practical objectives.

Study 1 is a quantitative meta-analysis investigating recent experimental data on the illusion of control. The purpose of this meta-analytic study was to enquire the most relevant variables that trigger the illusion of control, and also to find the most suitable measurement method for the illusion of control (i.e., associated with the largest effect sizes).

Afterwards, in an attempt to address the first theoretical objective (i.e., determining whether worry elicits an illusory sense of control), Study 2 investigated whether GAD symptoms and trait worry are associated with a tendency to experience the illusion of control in a false contingency task, when no actual control was possible. In this direction, we also explored the relation between rational and irrational beliefs related to uncertainty and control on the one hand, and the illusion of control, on the other hand.

However, because rational and irrational beliefs related to uncertainty and control needed to be measured using specific instruments, with adequate psychometric qualities, we developed such specific instruments and analyzed their psychometric properties in Study 3, attaining the second methodological research objective.

Study 4 addressed the relationship between worry and academic performance by taking other important variables into account: trait and state anxiety, the effort invested in the task, the motivation for obtaining high performance, and positive beliefs about worry. Study 4 was conducted in order to respond to the third theoretical objective, describing the relation between worry and performance.

Extending the investigation on the online versus post-hoc nature of perceived functions of worry, Study 5 investigated the effects of worrying on variables amendable to change according to positive worry beliefs in an experimental situation designed as an uncontrollable, stressful situation. At the same time, Study 5 addressed the effects of worrying on emotional reactions, taking into account the role of rational and irrational beliefs.

Following the integration of the theoretical research objectives, Study 6 enquired the relation between worry and performance, worry and its perceived functions, and worry and emotional reactions respectively, in stressful controllable and uncontrollable situations.

Study 1. Recent Developments in the Experimental Investigation of the Illusion of Control. A Meta-Analytic Review[1]

Overview of the Present Research

The purpose of this meta-analytic review involves offering effect size estimates for the factors manipulated to induce the illusion of control and for the different conceptualizations of the phenomenon since 1996, when a meta-analysis in the field (Presson & Benassi, 1996) was published, until the present day. We intended to offer a

[1] This study was accepted for publication.
Stefan, S., & David, D. (in press). Recent Developments in the Experimental Investigation of the Illusion of Control. A Meta-Analytic Review. *Journal of Applied Social Psychology*

more accurate image of the illusion of control as it has been conceptualized and investigated in later years, and also to highlight the influence of the new factors that have been recently introduced in the study of illusory control. The purpose of the present study also refers to highlighting the distinction between the skill and chance confusion hypothesis (Langer, 1975) and the control heuristic (Thompson et al., 1998; Thompson et al., 2004; Thompson et al., 2007) by analyzing the differences among the independent variables advanced by the these two theoretical approaches in terms of effect sizes.

The most important study characteristics taken into the consideration in the meta-analysis refer to (1) the independent variables used to trigger illusions of control (e.g., involvement, choice, outcome sequence), (2) the type of the dependent variable (e.g., estimation of control, skill estimation, expectation of success), (3) the direct-indirect and behavioral-subjective character of the dependent measures, (4) the presentation of the task as chance-based or skill-determined, (5) whether the task involved gambling, decision making or was an experimental task adapted from previous works or especially designed for the study. Some of these factors were investigated in the meta-analysis conducted by Presson and Benassi (1996) as well (e.g., type of situational variable, assessment methods for the dependent variable) while others are only considered in the present research (e.g., the presentation of the task as chance based or skill-related).

Method

For the present meta-analysis we selected experimental studies in which one or more independent variables were manipulated in order to induce the illusion of control. We conducted a computer-assisted literature search on the PsycInfo database, using the following search terms: *illusion of control* and *illusory control*. The computer search algorithm was set to only find articles published between 1996 and 2010. The search resulted in 635 items, out of which only 20 met the inclusion criteria.The total number of papers was 20. As some papers comprised more studies, 34 studies were analyzed, with a total of 84 measures for which we calculated effect sizes.

The inclusion criteria were as follows: (1) studies addressing the illusion of control published between 1996 and 2010, including *in press* articles already available online; (2) experimental studies in which the illusion of control was the dependent variable; and (3) studies which included sufficient information to compute effect size estimates. Many studies included several independent and dependent variables, and in these cases, several effect sizes were calculated. However, in order to estimate the average effect size for all the studies, a single effect size per study was computed. Only studies that used multiple samples were included in the analyses with more effect size estimates.

Every study was coded for the following information: 1) sample size, 2) year of publication, 3) the independent variable, 4) type of dependent variable, 5) assessment method for the dependent variable--direct versus indirect, behavioral versus subjective, 6) whether the task was designed as a skill-based or as a chance-based situation, 7) whether the task involved gambling, decision making or was a laboratory experimental task adapted from previous works or especially designed for the study, and 8) effect size.

As we analyzed the experimental data, we chose Cohen's *d* (1977) as a measure of effect size.

Considering this variability in study characteristics, following recommendations in the literature (e.g., Borenstein, Hedges, Higgins, & Rothstein, 2009; Hunter & Schmidt, 2004), we decided to use a random effects model to analyze the data.

Results

The overall effect size estimates were computed using the methods presented by Hunter and Schmidt (2004). Only one effect per study was included and the overall effect size estimate (*d*) was .79, *SD* = .47. Due to the fact that the studies varied widely in sample size, the overall *d* value was corrected for sample size, and we obtained a weighted mean value (*D*) of .62, *VarD* = .15, indicating a medium effect size. Taking all the studies into consideration, the 95% confidence interval about the mean was .49 to .75, $p < .05$, which indicates that the effect size statistically differs from zero.

Effect Sizes and Type of the Dependent Measures

The results indicated that effects sizes do not differ significantly when it comes to using direct versus indirect approaches of illusory control, $F(1, 82) = .15$, $p > .05$, or subjective versus behavioral measures, $F(1, 82) = .61$, $p > .05$. We also computed separate effect sizes for each category of direct and indirect dependent measures, respectively. When presented in this way, the differences in effect sizes become more obvious, as shown in Table 1.

Table 1

Dependent measures and mean effect sizes

Dependent measure	*Number of studies*	*N*	*Average weighted effect size (D)*	*VarD*	*95% Confidence interval of D*
Direct measures					
Expectancies of success	15	919	.54	.10	.38 – .70
Control	10	629	.79	.20	.52 – 1.06
Indirect measures					
Behavior	8	613	.54	.15	.27 – .79
Skill estimation	6	300	.87	.18	.53 – 1.21
Decision to become involved	5	439	.43	.04	.27 – .59

When grouped in this way, larger effect sizes are associated with studies using direct estimates of control (e.g., asking the participant to estimate the degree of control available in a certain situation) and studies which use participants' judgment of the skill involved in solving the experimental task as dependent measures. In contrast, studies which employ expectancies of success or behavioral responses as dependent measures tend to have smaller effect sizes.

Effect Sizes and Independent Variables

For analyzing effect sizes and independent variables, we decided to group the independent variables into four categories: skill-related cues, success emphasis (i.e., sequence of the expected stimuli and reinforcement), need for the outcome/ motivation and other variables. The analysis of variance (ANOVA) did not reveal any significant

differences among the four categories, F (3, 80) = .7, p > .05, indicating that the independent variables, at least coded in this manner, do not yield different effect sizes.

The effect sizes associated with the most common categories of independent variables are individually presented in Table 2.

Table 2

Independent variables and mean effect sizes

Independent variable	*Number of studies*	*N*	*Average weighted effect size (D)*	*VarD*	*95% Confidence interval of D*
Skill-related factors					
Active involvement in the task	9	842	.43	.20	.14 – .72
Choice	3	292	.47	.02	.31 – .63
Success emphasis					
Sequence of expected stimuli	4	312	.89	.75	.04 – 1.74
Reinforcement	4	288	.80	.01	.70 – .90
Need for the outcome/ motivation	7	362	.71	.06	.52 – .90

In the case of independent variables, the largest effect sizes were associated with the sequence of the expected stimuli--whether the stimuli followed a descendent or an ascendant pattern--, and the reinforcement rate--the number of cases in which the expected stimuli appeared regardless of the degree of control the participants had over the outcome.

Discussion and Conclusion

The overall mean effect size estimate in our study (D = .62) indicates a medium effect size, showing that the manipulation of different factors in order to promote the illusion of control has been constantly effective.

Although the ANOVA did not reveal significant differences in terms of effect size among the various dependent measures, larger effect sizes seem to be associated with judgments related to the skill involved in solving the experimental task and direct estimates of personal control.

Concerning independent variables, the reinforcement rate and the sequence of the expected stimuli tend to produce the largest effect sizes. This finding could provide additional support for the control heuristic theory (Thompson et al., 1998), which states that the connection between one's actions and outcomes is crucial in the formation of the illusion of control. The skill cues which have been more frequently investigated, namely active involvement in the task and choice, are associated with somewhat smaller effect sizes but they still have a constant influence on the illusion of control.

Similar to other meta-analytic studies, the present research has several limitations. First, it can be argued that only studies obtaining significant results were published and that, as a consequence, the overall effect size estimate (D) is positively biased. However, this does not seem to be the case, as many studies comprised in this meta-analysis also

reported non-significant results. Nevertheless, following published procedures (Hunter & Schmidt, 2004), we calculated the number of studies with no effect which could reduce the overall effect size to a small value of .1 and we obtained a number of 177 studies. It is therefore unlikely for such a large number of unpublished papers with no effect to exist.

Second, neither all the independent variables nor all the dependent measures were included in the analyses. The independent and the dependent variables were grouped into several distinct categories on the basis of previous findings in the literature and we cannot argue that our strategy of combining the studies into categories is the only appropriate one. Third, the coding categories we used are also not the only ones possible or appropriate. Depending on the objectives of the meta-analysis, one can use different coding systems, with different results.

Study 2. Obsessive-Compulsive, Generalized Anxiety Tendencies and the Illusion of Control: An Investigation of Cognitive Mechanisms[2]

Overview of the Present Research

The current study attempts to extend the findings regarding the relation between OC tendencies and the illusion of control to the field of generalized anxiety (GA) and worry. Also, we intended to explore the association between irrational and rational uncertainty and control beliefs on the one hand, and the illusion of control, on the other hand. Based on previous findings (e.g., Moulding & Kyrios, 2006; Reuven-Magril, et al., 2008), we hypothesized that (1) OC tendencies will be positively related to the illusion of control; and (2) GA tendencies will be positively related to the illusion of control. The relation between the illusion of control and worry, and the relation between general and specific (i.e., uncertainty and control) irrational/ rational beliefs and the illusion of control were investigated in an exploratory manner.

Method

Participants

Sixty-nine Psychology undergraduate students from Babes-Bolyai University, Cluj-Napoca, participated in the study in exchange for course credits. Their age ranged from 18 to 29 (M = 20.3, SD = 2.11), 58 were women and 11 were men.

Design and Procedure

The designed we employed was correlational. On arrival to the laboratory, participants were told that the task they were to complete involved visual processing and that it consisted of trying to control the occurrence of a series of stimuli that were about to appear on a computer screen. The illusion of control task was designed following the procedure described by Reuven-Magril et al. (2008), it lasted for 4 minutes and it consisted of 40 pictures of either distorted faces (aversive stimuli) or household items (neutral stimuli) that appeared on a computer screen followed by a neutral screensaver. Participants were asked to try to shorten the duration of each stimulus' presentation by

[2] Parts of this paper were presented at the EABCT Congress, Reykjavik, 2011
Stefan, S., & David, D. (2011, September). *Obsessive-compulsive, generalized anxiety tendencies and the illusion of control: An investigation of cognitive mechanisms*. Poster presented at the European Association for Behavioural and Cognitive Therapy (EABCT) Congress, Reykjavik, Iceland.

finding the right combination between two keys, the *z* key and the *space* key. In fact, the presentation duration of the stimuli was pre-programmed and participants did not actually have any control over it. After the completion of the task, participants were asked to provide control estimations and then they were asked to fill in the questionnaires.

Measures

The illusion of control. During the completion of the task, participants were asked to indicate the degree of control they thought they had over the disappearance of the stimuli on a scale ranging from 0 (*no control*) to 100 (*total control*). Participants were asked to judge their degree of control three times during the task: after 30s, after 2 minutes and after 4 minutes.

Obsessive-Compulsive Inventory (OCI, Foa, Kozak, Salkovskis, Coles, & Amir, 1998) is a 42-item measure of frequency and distress associated with obsessive-compulsive symptoms. It consists of 7 sub-scales: washing, checking, doubting, ordering, obsessions, hoarding, and neutralizing. In this study, we used the distress version of the scale.

Generalized Anxiety Disorder Questionnaire IV (GAD-Q-IV, Newman et al., 2002) is a 9-item self-report measure designed to capture the DSM-IV criteria for GAD. Most items are dichotomous and assess whether certain criteria are likely or not to be present, one item is open-ended, and two items relating to functional impairment and distress are scored on scales ranging from 0 (*none*) to 8 (*very severe*). The GAD-Q-IV was designed as a screening tool for GAD, it can be scored both in a dimensional and in a categorical manner, and it has also been used with non-clinical populations (Tan, Moulding, Nedeljkovic, & Kyrios, 2010).

Penn State Worry Questionnaire (PSWQ, Meyer et al., 1990) is a widely-used,16-item instrument designed to measure trait worry in terms of frequency and controllability.

Irrational and rational beliefs about uncertainty and control were assessed using an instrument particularly designed for this study. The participants indicated on a 5-point Likert scale their agreement with either rational or irrational assertions related to uncertainty and control. The items were constructed following the structure of the ABSs (David, 2007). The contents of the assertions were specifically connected to uncertainty and control.

Results

OC,GA Tendencies, Worry, and the Illusion of Control

Analyzing the complete data set, we found that neither OC, nor GA symptoms and worry were significantly related to the illusion of control, $r(63) = .100$, $p > .05$; $r(67) = .050$, $p > .05$, $r(67) = .040$, $p > .05$ respectively. However, when we split the data set by the aversive or neutral version of the task, we found that in the aversive stimuli condition, OC tendencies were significantly related to the illusion of control, $r(31) = .300$, $p = .045$, whereas in the neural stimuli condition, the correlation was no longer significant, $r(30) = -.033$, $p > .05$. GA tendencies and worry were not significantly correlated with the illusion of control either in the aversive stimuli condition, $r(32) = .147$, $r(32) = .177$, $p > .05$, or in the neutral stimuli condition, $r(33) = -.020$, $r(32) = -.120$, $p > .05$.

Because the data distribution for the overall control estimation was bimodal, in the sense that a large number of scores were either very low (close to 0) or very high (close to 100), we decided to run the analyses by using a median split based on the overall control estimations. For those participants who offered low estimations of control (scores below 30 out of a maximum of 100), OC and GA symptoms were *positively* related to the illusion of control, although the values were close but did not reach statistical significance, $r(30) = .280$, $p = .056$, and $r(32) = .268$, $p = .063$, respectively. For the participants who reported high levels of perceived control (scores above 30 out of a maximum of 100), OC and GA tendencies were *negatively* related to the illusion of control, $r(31) = -.280$, $p = .053$, and $r(33) = -.349$, $p = .020$ respectively. Regarding the relation between worry and the illusion of control, for the participants who reported low estimations of control, the relation was in a positive direction, but not significant, $r(29) = .205$, $p = .139$, whereas for those participants who offered high estimations of control, the relation was negative and close to reaching statistical significance, $r(37) = -.239$, $p = .075$.

Rational and Irrational Uncertainty and Control Beliefs and the Illusion of Control

Overall, irrational uncertainty beliefs were significantly related to the illusion of control, $r(66) = .291$, $p = .008$, whereas rational uncertainty beliefs were not significantly related to the illusion of control, $r(66) = -.018$, $p > .05$. When it comes to control-related beliefs, neither irrational, nor rational beliefs were significantly related to the illusion of control.

Finally, we applied a multiple regression model to see which of the factors outlined in this study, i.e., OC and GA symptoms, uncertainty irrational beliefs, predict the illusion of control. Out of all these factors, only irrational uncertainty beliefs emerged as a significant predictive factor, $R^2 = .110$, $R^2_{change} = .097$, $F_{change}(1,59) = 6.45$, $p = .014$.

Discussion and Conclusion

The present study was conducted in an attempt to extend the findings related to the association between OC tendencies and the illusion of control (i.e., Reuven-Magril et al., 2008) to the field of GAD, and also to introduce some potential mechanisms responsible for the occurrence of the illusion of control in the context of anxiety disorders (i.e., rational and irrational beliefs).

An interesting finding is the fact that OC, GA tendencies and worry seemed to be positively related to the illusion of control in the case of participants offering low and medium control estimations, whereas in the case of participants offering high control estimations, the relations seemed to be reversed. Extrapolating these findings, it could be that people with OC and/or GA tendencies tend to infer a subjective sense of control when engaging in certain strategies (e.g., checking, worrying) but that sense of control does not seem to be particularly high. One possible explanation points to the fact that GAD-prone individuals require elevated evidence to conclude that their actions have achieved their final goal (Salkovskis, 1985; Startup & Davey, 2002).

Irrational uncertainty beliefs appear to be significantly related to the illusion of control, and they constitute the only significant predictor for the illusion of control in the whole data set. Rational uncertainty beliefs were not related to the illusion of control. This finding is particularly interesting because both rational and irrational uncertainty

beliefs comprise a strong desire for certainty. The difference lies in the fact that irrational beliefs are formulated in absolutistic terms, whereas rational beliefs are formulated in preferential, nuanced terms.

Study 3. Designing and Testing New Measurement Instruments for Irrational Beliefs Related to Uncertainty and Control

Overview of the Present Research

The current study implies testing the psychometric properties of two instruments designed to capture rational and irrational beliefs related to uncertainty and control. In terms of fidelity, we computed the internal consistency index in order to check whether the two instruments measure rational and irrational uncertainty and control beliefs as unitary concepts. In terms of construct validity, we investigated the association between rational and irrational uncertainty and control beliefs on the one hand, and certain related concepts, like intolerance of uncertainty, desire for control, general rational and irrational beliefs, on the other hand. In order to test the criterion-related validity, we investigated the association between our measures and worry, automatic thoughts, and functional and dysfunctional emotions.

Method

Participants

The participants (N = 216) were second year Psychology undergraduate students, who completed the measures in exchange for course credits. Their age ranged from 19 to 49, (M = 23.11, SD = 5.75), 191 were female and 25 were male.

Design and Procedure

The current study used a correlational design. The scales were administered online. Initially, the participants filled in the informed consent and provided essential demographic information and then the program introduces the scales in turn.

Measures

Rational and Irrational Uncertainty Beliefs Scale (RAIBS uncertainty) is comprised of four items, each tapping a category of irrational beliefs and their rational counterparts (i.e., demandingness and preference, awfulizing and non-awfulizing, low frustration tolerance and frustration tolerance, self-downing and unconditional self-acceptance). The items have been adapted following the Attitude and Belief Scale, short version (ABSs, David, 2007) and the content of the items refers to uncertainty. The respondent has to choose between the rational and the irrational statement, and then express on a 5-point Likert scale, the frequency of that belief, its intensity, and the time duration that beliefs remains on one's mind. It is important to note the fact that, when the respondent chooses the irrational alternative of the statement, and rates its frequency, intensity and persistence, the rational alternative automatically gets the score 0.

Rational and Irrational Control Beliefs Scale (RAIBS control) is a 4-item measure built on the same principles like the RAIBS uncertainty, except that the items are related to the issue of being in control.

Construct validity

Intolerance of Uncertainty Scale (IUS, English version: Buhr & Dugas, 2002) is a 27-item scale measuring different negative beliefs about uncertainty and its consequences, including the idea that uncertainty is stressful and upsetting, prevents action or reflects badly on a person.

Desirability of Control Scale (DC, Burger & Cooper, 1979) is a self-report 20-item measure designed to capture individuals' desire for control over events in their lives.

Attitude and Belief Scale II (ABS II, DiGiuseppe et al., 1988) is a 72-item measure of rational and irrational beliefs concerning three major life domains: comfort, approval, and achievement. Half of the items are rationally phrased and half are irrationally phrased. The scale comprises the four major types of irrational beliefs and their rational counterparts.

Attitude and Belief Scale short version (ABSs, David, 2007) is an 8-item measure of rational and irrational beliefs, developed as a shorter version of the Attitude and Belief Scale II (ABS II, DiGiuseppe et al., 1988). The scale is designed to capture the four categories of irrational beliefs and their rational counterparts.

Criterion-related validity

Penn State Worry Questionnaire (PSWQ, Meyer et al., 1990)

Profile of Affective Distress (PDA, Opris & Macavei, 2007) is a 39-item measure of functional and dysfunctional emotional states. The items were developed starting from the Profile of Mood States, short version (DiLorenzo, Bovbjerg, Montgomery, Valdimarsdottir, & Jacobsen, 1999). The PDA includes items referring to functional negative emotions (e.g., sad, concerned, tense), dysfunctional negative emotions (e.g., depressed, frightened, panicked), and positive emotions (e.g., happy, cheerful, content).

Automatic Thoughts Questionnaire (ATQ, Hollon & Kendall, 2007) is a 15-item measure of negative automatic thoughts usually related to depression.

Results

Internal Consistency

The rational and irrational subscales of the RAIBS showed a high internal consistency, obtaining an alpha value of .86 for Irrational Uncertainty Beliefs (UncertIR), α = .91 for Rational Uncertainty Beliefs (UncertR), α = .88 for Irrational Control Beliefs (ControlIR), and α = .92 for Rational Control Beliefs (ControlR).

Construct Validity

The correlations between the RAIBS scales and other important concepts are depicted in Table 1.

Table 1

Correlations between the RAIBS subscales and measures of related constructs

Measure	***M (SD)***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1.UncertIR	2.65 (6.44)	-								
2.UncertR	33.21 (12.72)	-.366**	-							

3.ControlIR	2.4 (6.41)	.612**	-.244**	-						
4.ControlR	35.24 (12.62)	-.186**	.702**	-.424**	-					
5.ABSIR	75.54 (39.01)	.308**	-.199**	.420**	-.349**	-				
6.ABSR	113.27 (18.49)	-.209**	.226**	-.354**	.381**	-.857**	-			
7.ABSsIR	9.02 (3.11)	.298**	-.026	.238**	-.055	.557**	-.369**	-		
8.ABSsR	15.38 (3.23)	.045	.187**	-.048	.188**	-.166**	.315**	.276**	-	
9.IUS	67.35 (18.41)	.317**	.037	.294**	-.037	.590**	-.393**	.529**	.091	-
10.DC	97.11 (13.45)	-.084	.121*	.008	.183**	-.238**	.324**	-.142*	-.035	-.098

Note. UncertIR = Uncertainty Irrational Beliefs; UncertR = Uncertainty Rational Beliefs; ControlIR = Control Irrational Beliefs; ControlR = Control Rational Beliefs; ABSIR = Attitude and Beliefs Scale Irrational; ABSR = Attitude and Belief Scale Rational; ABSsIR = Attitude and Belief Scale Short Version Irrational; ABSsR = Attitude and Belief Scale Rational; IUS = Intolerance of Uncertainty Scale; DC = Desire for Control Scale

*$p < .05$; **$p < .01$

Criterion-Related Validity

In order to test the predictive validity of RAIBS scales, we correlated the rational and irrational subscales with measures of worry (PSWQ), functional and dysfunctional emotions (PDA), and automatic thoughts (ATQ). The correlations are displayed in Table 2.

Table 2

Correlations between the RAIBS subscales and criterion measures - functional and dysfunctional emotions, worry, and automatic thoughts

Measure	***M (SD)***	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1.UncertIR	2.65 (6.44)	-						
2.UncertR	33.21 (12.72)	-.366**	-					
3.ControlIR	2.4 (6.41)	.612**	-.244**	-				
4.ControlR	35.24 (12.62)	-.186**	.702**	-.424**	-			
5.PDA dysfunctional	31.60 (7.48)	.258**	-.010	.244**	-.034	-		
6. PDA negative functional	31.36 (7.31)	.243**	.102	.208**	.057	.845**	-	
7.PSWQ	47.82 (13.05)	.320**	.042	.257**	.001	.547**	.588**	-
8.ATQ	29.11 (12.72)	.277**	.015	.272**	-.065	.711**	.704**	.567**

Note. UncertIR = Uncertainty Irrational Beliefs; UncertR = Uncertainty Rational Beliefs; ControlIR = Control Irrational Beliefs; ControlR = Control Rational Beliefs; PDA dysfunctional = Profile of Affective Distress dysfunctional emotions; PDA negative functional = Profile of Affective Distress negative functional emotions; PSWQ = Penn State Worry Questionnaire; ATQ = Automatic Thoughts Questionnaire.
*$p < .05$; **$p < .01$

Apart from the correlation values displayed in Table 2, analyses showed that irrational uncertainty beliefs predict worry independent from intolerance of uncertainty (IU), showing that this concept can be useful in distinguishing high and low worry levels, $R^2 = .509$, $R^2_{change} = .010$, $F_{change}(1, 213) = 4.40$, $p = .037$.

Discussion and Conclusion

Taking into account the fact that the RAIBS rational and irrational subscales are significantly related with measures of related constructs, it follows that the scales can be used for measuring rational and irrational beliefs related to uncertainty and control. However, due to the limited variability in the data in the case of irrational uncertainty and control beliefs, it is very likely that the irrational subscales are not sensitive enough, possibly obtaining a large number of false negatives. Taking this aspect into account, the results obtained with the RAIBS subscales should be carefully interpreted. Moreover, some of the correlations are rather small in magnitude, meaning that the relations are not always as consistent as usually required.

When it comes to predicting worry, the RAIBS uncertainty subscale adds a statistically significant contribution, independent of that of the IUS (Buhr & Dugas, 2002). Also, worry was significantly associated with irrational uncertainty and control beliefs, but not with their rational counterparts. This could mean that worry can be sustained by irrational uncertainty and control beliefs, and not by the rational desires for certainty and control.

Study 4. Worry in the Context of Academic Performance. An Investigation of Related Constructs

Overview of the Present Research

The aim of the present study is to address the relation between worry and performance in an academic setting (i.e., an important exam), by taking into account the effort one invests in the task and the specific positive beliefs about worry that one can endorse in the context of academic performance. First, we hypothesize that, when controlling for trait anxiety, specific, exam-related worry and trait worry will be positively associated with exam performance. We also tested a mediation/indirect effects model with the effort invested in the task as a mediator of the relation between worry and performance. In this sense, worrying could promote increased effort which, in turn, could facilitate obtaining a higher performance. The relation between worry and academic performance could also be subject to a moderation effect of positive beliefs about worry. In this sense, we enquired whether worry and academic performance are more consistently related for those participants with a higher level of positive beliefs about worry (i.e., people who believe that worrying is helpful and motivating).

Second, we hypothesize that the effort invested in the task will be predicted by worry, and more specifically, we intended to investigate whether positive beliefs about worry act as a moderator of this relation. We also decided to include a measure of the interest in performance to see whether the relations among the investigated variables still remain significant after including this potentially important variable.

Method

Participants

The participants in this study were 205 psychology undergraduate students (183 female, 22 male) and they took part in the study in exchange for course credits. Their age ranged from 19 to 49 (M = 21.37, SD = 3.02).

Design and Procedure

This study used a correlational design. The participants completed the questionnaires following an important exam in exchange for course credits. Apart from the trait measures, the questions were all related to this particular exam situation.

Measures

The Penn State Worry Questionnaire (PSWQ, Meyer et al., 1990) was used in this study in order to measure trait worry.

The State-Trait Anxiety Inventory (STAI-T, Spielberger, 1983) is a frequently used measure of state and trait anxiety. It consists of 40 items, 20 measuring state anxiety and 20 addressing trait anxiety.

Specific, exam-related worry was measured with 5 items adapted from the PSWQ. The structure of these items, except for their exam-related contents, has been previously used in the literature (Buhr & Dugas, 2009). The items were presented twice; once enquiring the level of worry while preparing for the exam, and the second time enquiring the level of worry experienced during the exam.

Specific, exam-related positive beliefs about worry were measured by 7 items adapted from the Structured Interview for Positive Beliefs About Worry (SIBAW, Francis & Dugas, 2004), completed by 2 additional items, one addressing the sense of control associated with worry and another measuring a superstitious belief related to worry. The 5 items adapted after the SIBAW address the main categories of positive beliefs about worry.

The grade obtained at an important exam (i.e., Psychological assessment) was taken as a measure of academic performance in the current study.

The effort invested in the task was measured by using an estimate referring to the number of hours the participants spent preparing for the exam.

The interest in performance was measured by one item, answered on a 5-point scale (i.e., How interested are you in achieving a good performance at this exam?).

Results

Predicting Academic Performance

Correlation analyses

Academic performance was not directly associated with specific, exam-related worry, $r(203) = -.050$, $p > .05$, or with trait worry, $r(203) = .060$, $p > .05$. Academic performance only seems to be related to the effort invested in studying, $r(202) = .266$, $p < .001$, which is an expected finding. When controlling for trait anxiety, as performed in previous studies (e.g., Siddique et al., 2006), we found that the association between trait worry and exam performance became significant, $r(192) = .220$, $p = .001$. This association remained significant also after controlling for the interest in performance, $r(191) = .180$, $p = .005$.

Mediation and moderation analyses

The results showed that the effort invested in the task mediated the relation between specific, exam-related worry experienced prior to the exam and academic performance (i.e., the grade), indirect effect =.020, *SE*=.01, 95% *CI* (bias corrected and accelerated) = .009 to .054. These relations were highlighted only when trait anxiety was introduced as a covariate. Similarly, the effort invested in the task mediated the relation between trait worry and academic performance (i.e., the grade), indirect effect =.008, *SE*=.003, 95% *CI* (bias corrected and accelerated) = .002 to .017, again, when trait anxiety was introduced as a covariate.

With respects to the moderation model we proposed (i.e., worry will be positively related to performance only for those participants with higher levels of positive beliefs about worry), the results showed a significant moderation effect of positive beliefs about worry only when trait worry (i.e., not specific, exam-related worry) was introduced as a predictor of academic performance, $b = -.003$, $t(190) = -2.01$, $p = .045$. However, the interaction effect was in the reversed direction compared to what we expected. Therefore, trait worry was more strongly associated with academic performance for those participants with a lower level of positive beliefs about worry.

Predicting the Effort Invested in the Task

Correlation analyses

When it comes to the effort invested in the task, we found that it was positively and significantly related to exam-related worry, referring to both worrying prior to the exam, $r(202) = .227$, $p = .001$, and during the exam, $r(202) = .181$, $p = .005$. Also the effort invested in studying was related to trait worry, $r(202) = .175$, $p = .006$, and to the interest in performance, $r(202) = .405$, $p < .001$. However, the relation between the effort invested in the task and exam-related worry (i.e., referring to worry prior to the exam) and trait worry, was no longer significant after controlling for the interest in performance, $r(200) = .096$, and $r(200) = .062$, *all p*s > .05, respectively.

Moderation analyses

Positive beliefs about worry did not act as a moderator of the relation between specific, exam-related worry (i.e., referring to worry prior to the exam) and the effort invested in the task, $b = .039$, $t(194) = .783$, $p > .05$. Also, positive beliefs about worry did not moderate the relation between trait worry and invested effort, $b = -.017$, $t(183) = -1.29$, $p > .05$. Therefore, the relation between worry (trait and exam-specific) and effort remained the same regardless of the prior level of beliefs about the benefits of worry.

Discussion and Conclusion

Worry and Academic Performance

Although specific, exam-related worry, and trait worry were not directly associated with exam performance, after controlling for trait anxiety, the relation between trait worry and performance became significant, a finding previously mentioned in the literature (e.g., Siddique et al., 2006). It suggests that, when someone is not too anxious, worrying (i.e., cognitions concerning possible future dangers) makes good academic performance more likely. Therefore, our first hypothesis seems to be partially supported.

The relation between exam-related worry (i.e., experienced prior to the exam) and trait worry on the one hand, and academic performance, on the other hand, was mediated by the effort invested in the task. It seems that worrying (generally or with reference to the exam) promotes an increased effort investment which, in turn, facilitates obtaining a higher academic performance. However, the indirect effects we obtained were very small in magnitude, so no firm conclusion can be drawn at this point.

We also obtained a significant moderation effect of positive beliefs about worry in the relation between trait worry and performance, but in the opposite direction than we had expected. Paradoxically, for the people who strongly believe in the beneficial role of worry, their worrying does not actually relate to a better performance.

Worrying and the Effort Invested in the Task

Not surprisingly, the effort invested in the task was also associated with specific and trait worry, showing that people who worry are more likely to put more effort into what they do. However, when controlling for the interest in performance, the relation between worry, specific or trait, and effort was no longer significant. So, it looks like worry associates with effort mostly due to the interest in performance.

Also, for those people who believe that worry is helpful and motivating, worry is not associated with increased effort.

Study 5. The Functions of Worry in Uncontrollable Situations – Perceived Effects of Worry, the Illusion of Control and Emotional Consequences

Overview of the Present Research

The aim of the current study was to investigate the immediate effects of worry in a stressful, uncontrollable situation, and the functional/ dysfunctional character of worry judging by its association with rational/irrational beliefs and functional/dysfunctional emotions. We therefore hypothesized that: 1) Participants with a higher level of positive beliefs about worry will experience a higher sense of control when worrying than when engaged in another mental activity; 2) Participants with a higher level of positive beliefs about worry will experience the effects of worrying to a higher extent, and 3) Participants with a high level of irrational beliefs, compared with participants with a low level of irrational beliefs, will experience more dysfunctional emotions when worrying. We also wanted to investigate, in an exploratory manner, whether the sense of control in an uncontrollable stressful situation is associated with rigid, irrational beliefs related to uncertainty and control or with rational, flexible preferences for certainty and control.

Method

Participants

The participants (N = 79) were second-year psychology students and took part in the experiment in exchange for course credits. Their age ranged from 19 to 35 (M = 20.62, SD = 2.69), 65 were female and 14 were male.

Design and Procedure

In order to test our hypotheses, we used a univariate between-groups design (worry vs. distraction mental task). After signing the informed consent, the participants were randomly assigned to one of the two experimental conditions. Participants in both conditions were immersed in the same stressful, uncontrollable situation, that of an impromptu speech. Participants were told they were supposed to deliver a speech in front of a camera on a topic which was to be known just before beginning their presentations. Not knowing the theme of the speech, they could not prepare or objectively control the outcome. Participants were told that their speech was to be evaluated and marked by several members of the department and that performance in this type of tasks is indicative of general cognitive abilities. Afterwards, participants in the worry condition were instructed to worry for the next five minutes as intensely as they can about the things that can go wrong during the speech, following the procedure developed by McLaughlin et al. (2007). Participants in the mental task—distraction-- condition were instructed to think, for the next five minutes, as intensely as they can, of as many things as they know about five countries (e.g., England, Italy, Sweden, Egypt and Mexico), from five different domains. The instructions were identical to those received in the worry condition, apart from the focus on worry about the presentation (the worry condition) versus the information about the five countries (the mental task condition).

After the five-minutes task, the participants filled in the state measures and, after completing them, they were given the themes for their speeches. The speeches were recorded but they were not actually assessed. Following their presentation, participants completed the trait measures, they were debriefed and thanked for their participation.

Measures

Manipulation check

Task-specific worry was measured by using five items adapted from the Penn State Worry Questionnaire (Meyer et al., 1990). The items were modified as to refer to the specific context of worrying about the future presentation, and they have been previously used in a similar form in experimental research (Buhr & Dugas, 2009).

Dependent measures

Visual Analogue Scales (VAS) were used to measure anxiety, involvement in the task, perceived effects of worry, and the sense of control. Participants were instructed to indicate, by marking a cross on 10 cm VAS scales, the degree of anxiety, involvement in the task, their sense of control over the situation, and the perceived effects of worry. With respects to the effects of worry, the items were constructed as to present them (following the Why Worry Questionnaire, WW II; Holowka et al., 2000), without being directly portrayed as consequences of worry. For example, the item referring to the belief that by

worrying, the probability of a negative outcome diminishes, was phrased as follows: "Please mark a cross (X) along the scale to indicate the probability for the speech you are about to deliver to go wrong".

Profile of Mood States Short Version (POMS-SV; DiLorenzo et al., 1999)
Profile of Affective Distress (PDA, Opris & Macavei, 2007)

Trait measures

Attitude and Belief Scale 2 (ABS2; DiGiuseppe et al., 1988)
Rational and Irrational Uncertainty Beliefs (RAIBS uncertainty)
Rational and Irrational Control Beliefs (RAIBS control)
Penn State Worry Questionnaire (PSWQ*;* Meyer et al., 1990)
Why Worry? (WW II, Holowka et al., 2000) is a 20-item measure addressing positive beliefs about worry. The instrument comprises items related to beliefs such as: worry prevents negative outcomes from happening, it offers distraction from more upsetting topics, it has positive effects like finding better solutions, increasing motivation, or diminishing disappointment, and worry constitutes a sign of responsibility in a person.

Results

Manipulation Check

In order to check whether the worry induction had the intended effects, we compared the levels of worry, anxiety, and involvement in the task for the two conditions. The participants in the worry conditions reported higher levels of worrying, $t(74) = 3.13$, $p = .001$, $d = .35$, higher levels of anxiety, $t(77) = 2.09$, $p = .02$, $d = .23$, but also higher levels of involvement in the task, $t(77) = 3.08$, $p = .003$, $d = .35$, so we included the level of involvement as a covariate in all subsequent analyses.

Worrying and the Sense of Control

To test whether worrying elicits a subjective feeling of control in participants with high levels of positive beliefs about worry, we tested the interaction between the experimental condition (worry vs. control) X positive beliefs about worry (high level of positive beliefs vs. low level of positive beliefs). We found no significant effect of the interaction as was expected, $F(1,68) = .004$, $p > .05$, meaning that participants with higher levels of positive beliefs do not experience a higher sense of control in the worry condition, and neither in the control condition. There was a significant main effect of positive beliefs about worry, but in the opposite direction than the predicted one, $F(1,68) = 4.30$, $p = .04$, $d = .50$. That is, participants with high levels of positive beliefs about worry have a diminished sense of control compared to the participants with low levels of positive beliefs.

Overall, the sense of control was negatively associated with trait worry, $r(78) = -.512$, $p < .001$, situational worry, $r(75) = -.318$, $p = .005$, and positive beliefs about worry, $r(72) = .231$, $p = .049$.

Worrying and the Perceived Effects of Worry

If the effects of worry occur on the spot, offering immediate relief, we would expect that, for those participants with high levels of specific positive beliefs, the effects of worry are perceived online, as the individual is engaged in the worry bout. Therefore, we tested this hypothesis using a two-way ANOVA procedure with the experimental condition (worry vs. control) and the levels of specific positive beliefs about worry (high level of positive beliefs vs. low level of positive beliefs) as independent variables, and their interaction, as a proof of the "online" nature of perceived functions of worry. We performed the analysis for the three categories of positive beliefs about worry that can emerge in uncontrollable situations, namely superstition (worrying can prevent undesired outcomes from happening), anticipatory emotion regulation (worrying will make one less disappointed in case the undesired event occurs), and worry as a personal quality (the fact that one worries means he/she is a responsible person). We found no significant main or interaction effects, for any of the three perceived functions of worry, meaning that people who generally endorse positive beliefs about worry do not perceive their worry to be functional as they worry.

Irrational Beliefs, Worry, and Dysfunctional Negative Emotions

In order to see if a high level of irrational beliefs is associated with a higher level of dysfunctional negative emotions while worrying, we used the interaction between the experimental condition (worry vs. control) and the level of irrational beliefs (high vs. low ABSs scores), with the level of dysfunctional emotions as the dependent variable. However, the level of dysfunctional negative emotions did not differ as an effect of the experimental condition, $F(1, 61) = .003$, $p > .05$, of the level of irrational beliefs, $F(1,61) = 1.18$, $p > .05$, or as an effect of the interaction between the two, $F(1,61) = .364$, $p > .05$.

Discussion and Conclusion

Worrying and the Sense of Control

The results indicate that, contrary to our expectations, worry does not elicit a subjective feeling of control. On the contrary, although the sense of control does not differ between the experimental and the control condition, worry is inversely related to the sense of control, showing that the more one worries, the less control he/she will experience.

Worrying and the Perceived Effects of Worry

Also, contrary to what we expected, the effects of worry in uncontrollable situations do not seem to be present, suggesting that positive beliefs about worry only emerge afterwards, as post-hoc rationalizations. However, in this study the control condition consisted of another mental task, and the differences between the two conditions in terms of worry, although significant, might have been insufficient to highlight an effect of worry on different outcomes.

Irrational Beliefs, Worry, and Dysfunctional Negative Emotions

In this study, no specific relation between irrational beliefs, worry, and dysfunctional emotions was found. It appears that, at least measured in this way,

irrational beliefs do not predict higher levels of dysfunctional emotions while worrying, so we cannot judge the functional and dysfunctional nature of worry according to this criterion.

All in all, the results of the current study indicate that worrying is associated with a diminished sense of control and that even if people generally hold positive beliefs about the functions of worry, the supposed effects of worry will not emerge on the spot, offering immediate relief in uncontrollable situations. At least in uncontrollable circumstances, worry does not appear to serve the functions it is believed to serve.

Study 6. The Functions of Worry in Controllable and Uncontrollable Situations

Overview of the Present Research

The aim of the current study was to investigate the functionality of worry in stressful controllable and uncontrollable situations. If those positive beliefs about worry that refer to increased motivation and analytic processing are actually "true", we expect for worry to be positively related to performance in a controllable situation, due to the supposed increase in motivation and analytic processing. Therefore, we hypothesized that: 1) Worry will be positively related to performance in the controllable, but not in the uncontrollable stressful situation; and 2) For those with higher levels of irrational beliefs, worry will be associated with dysfunctional negative emotions. Additionally, we intended to explore whether worry is believed to serve different functions in controllable versus uncontrollable situations, for example whether worry is perceived as an emotion regulation strategy in the uncontrollable situation, but as a strategy for increasing motivation in the controllable situation. Finally, we also explored whether worrying is differently associated with the sense of control experienced in the two settings.

Method

Participants

The participants (N = 72) were second-year psychology students and took part in the experiment in exchange for course credits. Their age ranged from 20 to 29 (M = 20.90, SD = 1.40), 65 were female and 7 were male.

Design and Procedure

To test our predictions, we used a univariate between-groups design (controllable vs. uncontrollable situation). After signing the informed consent, the participants were randomly assigned to one of the two experimental conditions. All participants were immersed in a stressful situation, that of delivering a speech in front of a camera. All participants were told that their speech was to be evaluated and marked by several members of the department and that performance in this type of tasks is indicative of general cognitive abilities. Participants in the controllable situation were informed in advance about the theme of the speech and they had five minutes to prepare. They could write down ideas and they could search information on the internet, on a computer available for them. Participants in the uncontrollable condition were told they are about to deliver a speech on a theme which would be disclosed right before beginning to speak, and were instructed to wait for five minutes. After the five minutes, the participants filled

in the state measures. Once they completed them, the participants in both conditions had to deliver their speech in front of a camera. Their task was to imagine they are tourism agents who want to promote their holiday offers. They were instructed to present three countries (e.g., France, Portugal, and Spain), by mentioning several aspects related to geography, history, culture, and cuisine. They were also encouraged to be creative and provide any additional information that would help them impress the audience. The task was identical for the participants in both conditions, although the countries which were the subject of their speech varied in order to avoid the possibility of the participants preparing in advance. The speeches were recorded and, at another moment, the performance of each participant was rated. Following their presentation, participants completed the trait measures, they were debriefed and thanked for their participation.

Measures

State measures

Task-specific worry was measured by using five items adapted from the Penn State Worry Questionnaire (Meyer et al., 1990). The items were modified as to refer to the specific context of worrying about the future presentation, and they have been previously used in a similar form in experimental research (Buhr & Dugas, 2009).

Visual Analogue Scales (VAS) were used to measure anxiety, involvement in the task, perceived functions of worry, and the sense of control. Participants were instructed to indicate, by marking a cross on 10 cm VAS scales, the degree of anxiety, involvement in the task, their sense of control over the situation, and the perceived functions of worry. With respects to the perceived functions of worry, the items were constructed as to present these functions as consequences of worrying. The items were constructed following the Why Worry (WW II; Holowka et al., 2002) and the Consequences of Worry Scale (COWS; Davey et al., 1996). For example, the item referring to the belief that by worrying, the probability of a negative outcome diminishes, was phrased as follows: "Please mark a cross (x) along the scale to indicate how strongly you hold the belief that worrying diminishes the probability for the speech to go wrong".

Speech performance was measured using seven items completed by an independent rater, four referring to the quality of the speech and three related to presence and appearance.

Profile of Mood States Short Version (POMS-SV; DiLorenzo et al., 1999)

Profile of Affective Distress (PDA, Opris & Macavei, 2007)

Trait measures

Attitude and Belief Scale 2 (ABS2; DiGiuseppe et al., 1988)

Penn State Worry Questionnaire (PSWQ*;* Meyer et al., 1990)

Why Worry? (WW II, Holowka et al., 2000)

Self-statements During Public Speaking (SSPS, Hoffman & DiBartolo, 2000) is a 10-item measure of relevant cognitions related to social anxiety. Five items represent positive self-statements, and five represent negative self-statements.

Results

Worry and Performance

The results show that, in the controllable situation, worry was negatively related to performance, $r(36) = -.469$, $p = .002$, while in the uncontrollable situation the association was not significant, $r(34) = -.106$, $p > .05$. The level of worry did not differ significantly between the two conditions, $t(70) = .42$, $p > .05$. The worry (high vs. low) X situation (controllable vs. uncontrollable) interaction, with performance as a dependent variable, was also not significant, $F(1, 71) = .56$, $p > .05$. Therefore, contrary to our expectations, worry was negatively related to performance in the controllable situation. The negative association was preserved when controlling for the level of anxiety, $r(34) = -.413$, $p = .006$, or for negative self-statements during public speaking, $r(34) = -.328$, $p = .025$. However, the relation became insignificant when controlling for the level of dysfunctional emotions, $r(33) = -.208$, $p > .05$.

Worry and Functional/Dysfunctional Emotions

In order to test whether worry is differently associated with functional and dysfunctional emotions depending on the level of irrational beliefs, we computed correlations by splitting the data file according to the level of irrational beliefs (high vs. low). The correlations between worry emotional reactions are presented in Table 1 (participants with a low level of irrational beliefs) and Table 2 (for participants with a high level of irrational beliefs).

Table 1

Correlations between worry and functional and dysfunctional emotions for participants with low levels of irrational beliefs

Measure	***M(SD)***	**1**	**2**	**3**	**4**	**5**
1.State worry	16.72 (4.30)	-				
2.Trait worry	49.11 (11.23)	-.019	-			
3.Dysfunctional emotions	21.31 (7.57)	.587**	.406**	-		
4.Functional negative emotions	27.17 (8.47)	.479**	.664**	.820**	-	
5.Anxiety	12.14 (7.39)	.630**	.447**	.880**	.831**	-
6.Anxiety VAS	53.22 (25.86)	.567**	.363**	.242	.492**	.625**

*$p < .05$; **$p < .01$

Table 2

Correlations between worry and functional and dysfunctional emotions for participants with a high level of irrational beliefs

Measure	***M (SD)***	**1**	**2**	**3**	**4**	**5**
1.State worry	17.80	-				

	(4.06)					
2.Trait worry	53.06 (11.20)	.487**	-			
3.Dysfunctional emotions	23.50 (9.01)	.453**	.572**	-		
4.Functional emotions	27.80 (8.18)	.589**	.673**	.846**	-	
5.Anxiety	12.00 (7.46)	.583**	.370*	.823**	.882**	-
6.Anxiety VAS	50.12 (21.63)	.664**	.351*	.456**	.640**	.636**

*$p < .05$; **$p < .01$

As shown in Table 1 and Table 2, worry is related to both functional and dysfunctional emotions, regardless of the level of irrational beliefs. However, for those with a high level of irrational beliefs, trait and state worry are positively related, while for those participants with a low level of irrational beliefs, state and trait worry are not significantly related.

Perceived Functions of Worrying and the Sense of Control

Worry is negatively related to the sense of control in the controllable situation, $r(36) = -.518$, $p = .001$, and also in the uncontrollable situation, $r(34) = -.490$, $p = .001$, suggesting that worry does not elicit a sense of control.

With regards to perceived functions of worrying, we found that, for those participants with a high level of positive beliefs about worry, worrying is not positively related to performance, $r(32) = -.196$, $p > .05$. There were also no significant differences between the controllable and uncontrollable condition with respects to perceived worry functions.

Discussion and Conclusion

Worry and Performance

Contrary to our expectations, worry was negatively associated with performance in the controllable situation, and this can be due to the fact that, as a repetitive, verbal mental activity, worry could have interfered with the preparation of the task, having thus a negative effect on performance (Stöber, 1998). However, when controlling for dysfunctional emotions, the negative relation between worry and performance was no longer significant, suggesting that, when worry is not accompanied by dysfunctional emotions, it may not be negatively related to performance.

Worry and Dysfunctional Emotions

With respects to the relation between worry and functional and dysfunctional emotions, we found no significant differences between participants with high and low levels of irrational beliefs. Worry is similarly associated with both functional and dysfunctional emotions, regardless of the underlying rational/irrational beliefs. However, while for participants with high levels of irrational beliefs, trait worry was significantly

related to state worry, for those with low levels of irrational beliefs, trait worry was not related to state worry. This could mean that high levels of irrational beliefs can favor the onset of worry episodes in stressful situations for those who generally are prone to worry.

Perceived Functions of Worry and the Sense of Control

Finally, the results showed that, even if people think that worry is helpful, worrying is negatively related to performance, suggesting that it rather impedes than facilitate a positive resolution. Also, worrying is also negatively related to the sense of control. Last but not least, no particular perceived functions of worry emerged in the two situations. That is, worry was not considered to serve different functions in the controllable versus uncontrollable situation.

CHAPTER IV. GENERAL CONCLUSIONS AND DISCUSSION

Overall, this research has contributed to some important theoretical and methodological advances, with several practical implications.

4.1. Theoretical Advances

The first objective of this research was evidencing the nature of the feeling of control while worrying, whether it occurs online or, if present, it is more likely a post-hoc rationalization. In Study 2, following research results previously obtained with OCD symptoms (Reuven-Magril et al., 2008), we investigated the relation between GAD symptoms and worry, on the one hand, and the tendency to form judgments of illusory control in a false contingencies task, on the other hand, and found that GAD symptoms seem to be positively related to the illusion of control, up to a certain point. This means that people with GAD symptoms could be more likely to extract a sense of control from performing repetitive actions. However, the association was not statistically significant, so, at least for this sample, sound conclusions cannot be drawn. Also, for those participants who expressed a high sense of control, this sense of control was negatively associated with GAD symptoms, indicating that people with GAD symptoms are not prone to developing *high* levels of illusory control. For participants expressing a high sense of control, the relation between worry and the illusion of control also seemed to be negative, but it did not reach statistical significance. One possible explanation relates to the fact that high worriers and GAD-prone individuals may need elevated evidence for concluding they have achieved the desired level of control, in the same way they have strong evidence requirements for decision making (Tallis et al., 1991). With regards to rational and irrational beliefs related to uncertainty and control, results showed that irrational uncertainty beliefs were the single predictor on the whole data set for the illusion of control, indicating that holding absolutistic demands about uncertainty could favor a tendency to experience control in uncontrollable circumstances.

The specific relation between worry and the perceived sense of control was investigated in Studies 5 and 6, by taking into account other relevant factors, like positive beliefs about worry and rational/irrational beliefs related to uncertainty and control. Overall, the results indicated that worry is consistently associated with a *diminished* sense of control, and that positive beliefs about worry are themselves *negatively* related to the sense of control. Also, for those individuals holding high levels of positive beliefs about worry, the relation between worry and the perceived sense of control remains negative.

That is, people who believe that worry is helpful do not feel more in control while worrying.

All in all, the current findings indicate that worrying is not associated with an online sense of control. If worry is maintained partially by an illusion of control, it is more likely that it occurs retrospectively, and not during the worry episode.

The second major theoretical objective refers to investigating the relationship between positive beliefs about worry and the real effects of worrying. To reach this objective, Studies 5 and 6 analyzed the correspondence between perceived functions of worrying and its actual effects as they are evidenced in stressful situations. In Study 5, we used a stressful uncontrollable situation (i.e., impromptu speech) as a setting for investigating the perceived functions of worry. The results showed that, even for those participants who previously held positive beliefs about worry, the supposed effects of worry were not present in the worry condition (nor in the mental distraction task condition, for that matter). For example, an individual who generally believed that worry diminishes the probability of a negative event did not perceive the probability of the negative event to be smaller while he/she worried. Generally speaking, it appears that, at least in uncontrollable situations, worry does not actually serve the functions it is supposed to serve.

In Study 6, we wanted to compare the perceived functions of worry in stressful controllable and uncontrollable situations and the results showed that these functions of worry are not perceived differently in the two categories of situations.

Stepping forward to the other major question of this research, Studies 4 and 6 investigated the relation between worry and performance, and worry and emotional reactions, respectively, in an attempt to enquire the truth behind the positive beliefs about worry.

The results of Study 4 indicated that trait worry was positively related to academic performance when controlling for trait anxiety, and that worry was positively associated with the invested effort. However, the relationship between worry and effort was no longer significant when controlling for the level of interest in obtaining high performance. The level of effort acted as a mediator between worry and performance, but the magnitude of the indirect effect was rather small. Also, worry was not associated with academic performance for those people who generally believed it to be helpful (i.e., with a higher level of positive beliefs about worry).

Study 6 investigated the association between worry and performance on a specific task, in controllable and uncontrollable situations. The results indicated that worry was *negatively* related to performance in the controllable situation, whereas in the uncontrollable situation, they were not significantly related. The negative association remained significant when controlling for the level of anxiety and negative self-statements during public speaking, but was no longer significant when controlling for dysfunctional emotions. These results indicate that worry might impede performance due to the cognitive load it generates, and that the presence of dysfunctional emotions may also contribute to this effect. Since the results of Study 6 seem to contrast the findings of Study 4, additional explanations are warranted at this point.

While Study 4 pointed out that *trait* worry was positively related to academic performance (when controlling for trait anxiety), Study 6 found that *state* worry is negatively related to performance on a specific task, which had to be solved on the spot.

Trait worry, as long as it is not accompanied by severe anxiety, might facilitate performance on the long run, because it is also associated with increased effort and interest in performance. In a current, ongoing task though, where all available resources are required on the spot, state worry might disturb performance because it interferes with the cognitive processes that sustain the completion of the task (Stöber, 1998).

Additionally, in Study 6, we also investigated the relation between positive beliefs about the instrumental value of worrying (i.e., worry motivates, worry facilitates systematic processing), worrying, and performance. Interestingly, even for those participants holding high levels of *situational* positive beliefs about worry, worry was not positively related to performance. In other words, believing that worry is helpful does not mean that one will actually obtain a higher performance while worrying.

Another important theoretical objective refers to the relation between worry and emotional reactions. Worry can be considered to be functional if it fosters performance and if it is associated with functional, and not dysfunctional, emotional reactions. In this matter, we took into account the role of rational and irrational beliefs, both general and content specific (i.e., related to uncertainty and control).

Overall, the results indicated that trait and state worry are strongly associated with both negative functional and dysfunctional emotions, regardless of the level of irrational beliefs. That is, we cannot state that for those participants with high irrationality, worry is associated with dysfunctional emotions whereas, for those with low rationality, worry is only related with functional negative emotions. However, in Study 6, one interesting difference emerged; for those participants with high irrationality, trait and state worry were significantly correlated, whereas for those with low irrationality, the association was no longer significant. This finding could indicate that a high level of irrational beliefs could trigger worry in stressful situations, at least for those with high trait worry.

With regards to rational and irrational uncertainty and control beliefs, the results showed that irrational uncertainty and control beliefs are associated with worry, functional and dysfunctional negative emotions, and automatic thoughts. Again, the relation between irrational beliefs, worry, and dysfunctional emotions did not emerge as specific.

4.2. Methodological/Practical Developments

Answering the proposed research questions also required some methodological advances regarding the measures used to highlight specific psychological phenomena. Study 1 was a quantitative meta-analysis aimed to summarize recent experimental data on the illusion of control and tried to highlight the differences in terms of effect sizes between distinct categories of independent variables and dependent measures. The results indicated that the illusion of control is constantly generated in experimental settings as a function of several psychological (e.g., motivation for the outcome) and situational factors (e.g., sequence of expected stimuli, involvement in the task), with a medium effect size.

No significant differences in terms of effect sizes emerged between the different categories of independent and dependent variables. However, concerning dependent measures, larger effect sizes seem to be associated with judgments related to the skill involved in solving the experimental task and direct estimates of personal control. More indirect measures, such as behavioral responses (e.g., the amount of money one is willing to bet) or decisions to become an active agent in the experimental situation tend to be

associated with moderate effect sizes. Therefore, in future studies, we decided to include direct estimations of control as measures of illusory control/perceived sense of control. Also, starting from the results of this meta-analysis, we expected a medium effect size when estimating the illusion of control as a function of worry.

The second methodological/practical objective refers to developing content-specific instruments meant to capture rational and irrational beliefs related to uncertainty and control (i.e., RAIBS uncertainty and RAIBS control). In order to attain this goal, in Study 3, we constructed the items by adapting the ABSs (David, 2007) as to fit contents related to uncertainty and control, and we also introduced a new response and coding system.

All in all, the results show that the RAIBS subscales can be used to estimate rational and irrational beliefs related to uncertainty and control, but with the major limit of a low sensitivity. The scales should be further improved in order to become psychometrically sound measurement instruments.

In summary, the present research provided answers for some important questions regarding the functions of worry. Generally, the studies found a negative relation between worry and the sense of control, and concluded that the positive beliefs about worry are unlikely to emerge online, as perceived effects of worry, being rather retrospective rationalizations.

Overall, it seems that trait worry may facilitate performance, most likely because it is associated with high motivation for the outcome and increased effort. However, when facing an immediate challenge, state worry seems to be negatively related to performance, probably because it interferes with the cognitive resources necessary for effectively dealing with the task. Another idea worth mentioning is the fact that, when controlling for dysfunctional emotions, the negative relation between worry and performance is no longer significant, suggesting that worry is not negatively related to performance provided that the individuals do not experience dysfunctional emotions.

When it comes to distinguishing functional and dysfunctional worry judging by its association with functional/dysfunctional emotions, the results consistently showed that worry is associated with both functional and dysfunctional emotions, regardless of the level of irrational beliefs. Therefore, is seems that the rational/irrational nature of the worry process can be found elsewhere, on the meta-cognitive level or in the specific content of worry.

Limits

The present research is not without limits. First, some of the correlational and experimental studies were conducting on rather small samples, and this could explain some of the non-significant results. Second, the samples included mostly undergraduate students, and most of the participants were women. Therefore, generalizing these results across genders and on different age groups may be problematic. Also, in most of the studies, neither worry, nor positive beliefs about worry were manipulated, so the causal direction of results cannot be clearly noticed. For the experimental studies, a stressful situation was created by asking participants to deliver a speech in front of a camera. This is not equally stressful for all participants, and some of them might not have perceived the task as particularly challenging. Still, we expected for social anxiety tendencies to be equivalently distributed between experimental conditions.

REFERENCES

Alloy, L. B., & Abramson, L. Y. (1979). Judgment of contingency in depressed and nondepressed students: sadder but wiser? *Journal of Experimental Psychology: General, 108*, 441- 485. doi: 10.1037/0096-3445.108.4.441

American Psychiatric Association (1987). Diagnostic and statistical manual of mental disorders (Rev. 3rd ed.). Washinton, DC: Author

Behar, E., DiMarco, I.,Hekler, E.,Mohlman, J., & Staples, A. (2009). Current theoretical models of generalized anxiety disorder (GAD): Conceptual review and treatment implications. *Journal of Anxiety Disorders, 23*, 1011–1023. doi: 10.1016/j.janxdis.2009.07.006

Biner, P. M., Johnston, B. C., Summers, A. D., & Chudzynski, E. N. (2009). Illusion of control as a function of the motivation to avoid randomly determined aversive outcomes. *Motivation and Emotion, 33*, 32-41. doi: 10.1007/s11031-008-9111-3

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. Chichester, United Kingdom: John Wiley & Sons.

Borkovec, T.D. (1994). The nature, functions and origins of worry. In G.C.L. Davey & F. Tallis (Eds.), *Worrying: Perspectives on theory, assessment and treatment* (pp. 5–33). Chichester, UK: Wiley.

Borkovec, T. D., Alcaine, O., & Behar, E. (2004). Avoidance theory of worry and generalized anxiety disorder. In R. G. Heimberg, C.L. Turk, & D.S. Mennin (Eds.), *Generalized anxiety disorder: Advances in research and practice*. New York: Guilford Press.

Borkovec, T. D., Hazlett-Stevens, H. & Diaz, M. L. (1999). The role of positive beliefs about worry in generalized anxiety disorder and its treatment. *Clinical Psychology and Psychotherapy, 6*, 126–138. doi: 10.1002/(SICI)1099-0879(199905)

Borkovec, T. D., & Inz, J. (1990). The nature of worry in generalized anxiety disorder: a predominance of thought activity. *Behaviour Research and Therapy, 21*, 69–73. doi: 10.1016/0005-7967(90)90027-G

Borkovec, T., Robinson, E., Pruzinsky, T., & DePree, J. (1983). Preliminary exploration of worry: Some characteristics and processes. *Behaviour Research and Therapy, 21*, 9 - 16. doi: org/10.1016/0005-7967(83)90121-3

Borkovec, T. D. & Roemer, L. (1995). Perceived functions of worry among general-ized anxiety disorder subjects: Distraction from more emotionally distressing topics. *Journal of Behavior Therapy & Experimental Psychiatry, 26*, 25–30. doi: org/10.1016/0005-7916(94)00064-S

Browne, C. M., Dowd, E. T., & Freeman, A. (2010). Rational and irrational beliefs and psychopathology. In D. David, S. J. Lynn, & A. Ellis (Eds.), *Rational and irrational beliefs: Research, theory and clinical practice* (pp.149-171). New York: Oxford University Press.

Buhr, K., & Dugas, M. J. (2002). The intolerance of uncertainty scale: psychometric properties of the English version. *Behaviour Research and Therapy, 40*, 931-945. doi: 10.1016/S0005-7967(01)00092-4

Buhr, K., & Dugas, M. J. (2009). The role of fear of anxiety and intolerance of uncertainty in worry: An experimental manipulation. *Behavior Research and Therapy, 47*, 215 – 223. doi: 10.1016/j.brat.2008.12.004

Burger, J. M., & Cooper, H. M. (1979). The desirability of control. *Motivation and Emotion, 3*, 381-393. doi: 10.1007/BF00994052

Cartwright-Hatton, S., & Wells, A. (1997). Beliefs about worry and intrusions: the meta-cognitions questionnaire and its correlates. *Journal of Anxiety Disorders, 11*, 279 – 296.doi: 10.1016/S0887-6185(97)00011-X

Cohen, J. (1977). *Statistical power analysis for the behavioral sciences* (Rev. ed.). New York: Academic Press.

Davey, G. C. L. (2006). A mood-as-input account of perseverative worry. In Davey, G. C. L., & Wells, A. (Eds.). *Worry and its psychological disorders: theory, assessment and treatment*. Chichester, England: John Wiley & Sons, Ltd.

Davey, G. C. L., Hampton, J., Farrell, J. J., & Davidson, S. (1992). Some characteristics of worry: Evidence for worrying and anxiety as separate constructs. *Personality and Individual Differences, 13*, 133–147. doi: org/10.1016/0191-8869(92)90036-O

Davey, G. G. L., Jubb, M., & Gameron, G. (1996). Catastrophic worry as a function of changes in problem-solving confidence. *Cognitive Therapy and Research, 20*, 333-344. doi: 10.1007/BF02228037

Davey, G. C. L, Tallis, F. & Capuzzo, N. (1996). Beliefs about the consequences of worrying. *Cognitive Therapy and Research, 20*, 499–520. doi: 10.1007/BF02227910

David, D. (2007). Scala de atitudini şi convingeri forma scurtă. In D. David (Ed.), *Sistem de evaluare clinică [Clinical Assessment System]*. Cluj-Napoca: Editura RTS.

David, D., Montgomery, G. H., Macavei, B., & Bovbjerg, D. H. (2005). An empirical investigation of Albert Ellis's binary model of distress. *Journal of Clinical Psychology, 61(4)*, 499 – 516. doi: 10.1002/jclp.20058

David, D., Schnur, J., & Belloiu, A. (2002). Another search for the "hot" cognitions: Appraisal, irrational beliefs, attributions, and their relation to emotion. *Journal of Rational-Emotive & Cognitive-Behavior Therapy, 15*, 93–131.

David, D., Schnur, J., & Birk, J. (2004). Functional and dysfunctional feelings in Ellis' cognitive theory of emotion: An empirical analysis. *Cognition and Emotion, 18(6)*, 869 – 880.

Deffenbacher, J. L., Zwemer, W. A., Whisman, M. A., Hill, R. A., & Sloan, R. D. (1986). Irrational beliefs and anxiety. *Cognitive Therapy and Research, 10*, 281 – 292. doi: 10.1007/BF01173466

DiGiuseppe, R., Leaf, R., Exner, T., & Robin, M. (1988). *The development of a measure of irrational/rational thinking*. Paper presented at the meeting of the World Congress of Behavior Therapy, Edinburg, Scotland.

DiLorenzo, T., Bovbjerg, D., Montgomery, G., Valdimarsdottir, H., & Jacobsen, P. (1999). The application of a shortened version of the profile of mood states in a sample of breast cancer chemotherapy patients. *British Journal of Health Psychology, 4*, 315-325.

DiLorenzo, T. A., David, D., & Montgomery, G. H. (2007). The interrelations between irrational cognitive processes and distress in stressful academic settings. *Personality and Individual Differences, 42*, 765-776. doi:10.1016/j.paid.2006.08.022

Dugas, M. J., Gagnon, F., Ladouceur, R., & Freeston, M. H. (1998). Generalized anxiety disorder: A pre-liminary test of a conceptual model. *Behaviour Research and Therapy, 36*, 215-226. doi: org/10.1016/S0005-7967(97)00070-3

Dugas, M. J., & Koerner, N. (2005). Cognitive-behavioral treatment for generalized anxiety disorder: Current status and future directions. *Journal of Cognitive Psychotherapy, 19*, 61–81.

Dugas, M. J., Letarte, H., Rheaume, J., Freeston, M. H., & Ladouceur, R. (1995). Worry and problem solving: Evidence of a specific relationship. *Cognitive Therapy and Research, 19*, 109-120. doi: 10.1007/BF02229679

Ellis, A. (1962). *Reason and emotion in psychotherapy*. New York: Stuart.

Ellis, A. (1994). *Reason and emotion in psychotherapy*. Secaucus, NJ: Birch Lane Press.

Eysenck, M. W., & Calvo, M. G. (1992). Anxiety and performance: The processing efficiency theory. *Cognition and Emotion, 6*, 409 - 434. doi: 10.1080/02699939208409696

Eysenck, M. W., Derakshan, N., Santos, R., Calvo, M. G. (2007). Anxiety and cognitive performance: Attentional control theory. *Emotion, 7*, 336 – 353. doi: org/10.1037/1528-3542.7.2.336

Fenton-O'Creevy, M., Nicholson, N., Soane, E., & Willman, P. (2003). Trading on illusions: Unrealistic perceptions of control and trading performance. *Journal of Occupational and Organizational Psychology 76*, 53-68. doi: 10.1348/096317903321208880

Foa, E. B., Kozak, M. J., Salkovskis, P. M., Coles, M. E. & Amir, N. (1998). The validation of a new obsessive compulsive disorder scale: The Obsessive Compulsive Inventory (OCI). *Psychological Assessment, 10*, 206-214.

Francis, K., & Dugas, M. J. (2004). Assessing positive beliefs about worry: validation of a structured interview. *Personality and Individual Differences, 37*, 405–415. doi: 10.1016/j.paid.2003.09.012

Freeston, M. H., Dugas, M. J., & Ladouceur, R. (1996). Thoughts, images, worry and anxiety. *Cognitive Therapy and Research, 20*, 265–273. doi: 10.1007/BF02229237

Freeston, M. H., Rheaume, I., Letarte, H., Dugas, M. I., & Ladouceur, R. (1994a). Why do people worry? *Personality and Individual Differences, 17*, 791-802. doi: 10.1016/0191-8869(94)90048-5

Friedland, N., Keinan, G., & Regev, Y. (1992). Controlling the uncontrollable: Effects of stress on perceptions of controllability. *Journal of Personality and Social Psychology, 63*, 923–931. doi: 10.1037/0022-3514.63.6.923

Gladstone, G., & Parker, G. (2003). What's the use of worrying? Its function and dysfunction. *Australian and New Zealand Journal of Psychiatry, 37*, 347–354.

Himple, D., Thyer, B., & Papsdorf, J. (1982). Relationships between rational beliefs and anxiety. *Cognitive Therapy and Research, 6*, 219 – 223. doi: 10.1007/BF01183895

Hofmann, S. G., & DiBartolo, P. M. (2000). An instrument to assess self-statements during public speaking: Scale development and preliminary psychometric properties. *Behavior Therapy, 31*, 499 – 515. doi: 10.1016/S0005-7894(00)80027-1

Hollon, S., & Kendall, P. (2007). Automatic Thoughts Questionnaire (adapted by Moldovan, R.). In David, D. (Ed.), *Sistem de evaluare clinică [Clinical Assessment System]*. Cluj-Napoca: Editura RTS.

Holowka, D. W., Dugas, M. J., Francis, K., & Laugesen, N. (2000, November). *Why Worry II*. Poster presented at the Annual Meeting of the Association for Advancement of Behavior Therapy, New Orleans, LO.

Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis. Correcting error and bias in research findings* (2nd ed.). Thousand Oaks, CA: Sage.

Kahai, S. S., Solieri., S. A., & Felo, A. J. (1998). Active involvement, familiarity, framing, and the illusion of control during decision support system use. *Decision support systems, 23*, 133-148. doi: 10.1016/S0167-9236(98)00043-8

Keinan, G. (2002). The Effects of Stress and Desire for Control on Superstitious Behavior. *Personality and Social Psychology Bulletin, 28*, 102-108. doi: 10.1177/0146167202281009

Koerner, N., & Dugas, M. J. (2006). A cognitive model of generalized anxiety disorder: the role of intolerance of uncertainty. In: G. C. L. Davey & A. Wells (Eds.), *Worry and Its Psychological Disorders: theory, Assessment and Treatment* (pp. 201–216). Cichester, England: Wiley and Sons Ltd.

Langens, T. A. (2007). Emotional and motivational reactions to failure: the role of illusions of control and explicitness of feedback. *Motivation and Emotion, 31*, 105-114. doi: 10.1007/s11031-007-9058-9

Langer, E. J. (1975). The Illusion of Control. *Journal of Personality and Social Psychology, 32*, 311-328. doi: 10.1037/0022-3514.32.2.311

Langer, E. J., & Roth, J. (1975). Heads I win, tail it's chance: The illusion of control as a function of the sequence of outcomes in a purely chance task. *Journal of Personality and Social Psychology*, *32*, 951-955. doi: 10.1037/0022-3514.32.6.951

Lorcher, P. S. (2003). Worry and irrational beliefs: A preliminary investigation. *Individual Differences Research, 1*, 73 – 76.

McLaughlin, K. A., Borkovec, T. D., & Sibrava, N. J. (2007). The effects of worry and rumination on affect states and cognitive activity. *Behavior Therapy, 38*, 23–38. doi: 10.1016/j.beth.2006.03.003

Metzger, R. L., Miller, M. L., Cohen, M., Sofka, M. & Borkovec, T. D. (1990). Worry changes decision making: The effect of negative thoughts on cognitive processing. *Journal of Clinical Psychology, 48*, 76–88. doi: 10.1002/1097-4679(199001)

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy, 28*, 487-495. doi: org/10.1016/0005-7967(90)90135-6

Montgomery, G., David, D., DiLorenzo, T., & Schnur, J. (2007). Response Expectancies and Irrational Beliefs Predict Exam-Related Distress. *Journal of Rational-Emotive & Cognitive-Behavior Therapy, 25(1)*, 17 – 34. doi: 10.1007/s10942-006-0029-y

Morris, M. W., & Sim, D. L. H. (1998). Distinguishing sources of cooperation in one-round prisoner's dilemma: Evidence for cooperative decisions based on the illusion of control. *Journal of Experimental Social Psychology, 34*, 494-512. doi: 10.1006/jesp.1998.1361

Moulding, R., & Kyrios, M. (2006). Anxiety disorders and control related beliefs: the exemplar of Obsessive-Compulsive Disorder (OCD). *Clinical Psychology Review*, *26*, 573-583. doi: 10.1016/j.cpr.2006.01.009

Mowrer, O. H. (1947). On the dual nature of learning—a re-interpretation of "conditioning" and "problem-solving." *Harvard Educational Review, 17*, 102–148.

Newman, M. G., Zuellig, A. R., Kachin, K. E., Constantino, M. J., Przeworski, A., Erickson, T., & Cashman-Macgrath, L. (2002). Preliminary reliability and validity of the Generalized Anxiety Disorder Questionnaire-IV: A revised self-report diagnostic measure of generalized anxiety disorder. *Behavior Therapy, 33*, 215 – 233. doi: 10.1016/S0005-7894(02)80026-0

Opris, D., & Macavei, B. (2007). Profilul distresului afectiv. In David, D. (Ed.), *Sistem de evaluare clinică [Clinical Assessment System]*, Cluj-Napoca: Editura RTS.

Perkins, A. M., & Corr, P. J. (2005). Can worriers be winners? The association between worrying and job performance. *Personality and Individual Differences, 38,* 25–31. doi: org/10.1016/j.paid.2004.03.008

Presson, P. K., & Benassi, V. S. (1996). The illusion of control: A meta-analytic review. *Journal of Social Behavior and Personality, 11*, 493-510.

Putwain, D. W., Connors, L., & Symes, W. (2010). Do cognitive distortions mediate the test anxiety–examination performance relationship? *Educational Psychology, 30,* 11 – 26. doi: 10.1080/01443410903328866

*Reuven – Magril, O., Dar, R., & Liberman, N. (2008). Illusion of control and behavioral control attempts in obsessive compulsive disorder. *Journal of Abnormal Psychology, 117*, 334-341. doi: 10.1037/0021-843X.117.2.334

Rosenbaum, M., Lewinsohn, P. M., & Gotlib, I. H. (1996). Distinguishing between state dependent and non-state-dependent depression-related psychosocial variables. *British Journal of Clinical Psychology, 35*, 341–358. doi: 10.1111/j.2044-8260.1996.tb01189.x

Rudski, J. M., & Edwards, A. (2007). Malinowski goes to college: Factors influencing students' use of ritual and superstition. *The Journal of General Psychology*, *134*, 389 – 403.

Ruscio, A. (2002). Delimiting the boundaries of generalized anxiety disorder: Diferentiating high worriers with and without GAD. *Journal of Anxiety Disorders, 16*, 377 – 400. doi: org/10.1016/S0887-6185(02)00130-5

Salkovskis, P. M. (1985). Obsessional-compulsive problems: A cognitive-behavioural analysis. *Behaviour Research and Therapy, 23(5)*, 571–583. doi: 10.1016/0005-7967(85)90105-6

Siddique, H. I., Holland LaSalle-Ricci, V., Glass, C. R., Arnkoff, D. B., & Díaz, R. J. (2006). Worry, optimism, and expectations as predictors of anxiety and performance in the first year of law school. *Cognitive Therapy and Research, 30*, 667 – 676. doi: 10.1007/s10608-006-9080-3

Solomon, A., Haaga, D. A. F., Brody, C., Kirk, L., & Friedman, D. G. (1998). Priming irrational beliefs in formerly depressed individuals. *Journal of Abnormal Psychology, 107*, 440–449. doi: 10.1037/0021-843X.107.3.440

Spielberger, C. D. (1983). *Manual for the State-Trait Anxiety Inventory (STAI: FormY).* Palo Alto, CA: Consulting Psychologists Press.

Startup ,H. M. & Davey, G. C. L. (2001). Mood-as-input and catastrophic worrying. *Journal of Abnormal Psychology, 110 (1),* 83–96. doi: 10.1037/0021-843X.110.1.83

Startup, H. M., & Davey, G. C. L.(2002). Inflated responsibility and the use of stop rules for catastrophic worrying. *Behavior Research and Therapy, 41*, 495 – 503.doi: 10.1016/S0005-7967(02)00245-0

Stöber, J. (1998). Worry, problem solving, and suppression of imagery: The role of concreteness. *Behaviour Research and Therapy, 36*, 751-756. doi: 10.1016/S0005-7967(98)00027-8

Tallis, F., Davey, G.C.L. & Capuzzo, N. (1994). The phenomenology of nonpathological worry: A preliminary investigation. In G.C.L. Davey & F. Tallis (Eds.), *Worrying: Perspectives on theory, assessment and treatment* (pp. 61–89). NewYork: John Wiley & Sons, Inc.

Tallis, F., Eysenck, M. W., & Mathews, A. (1991). Elevated evidence requirements and worry. *Personality and Individual Differences, 12*, 505 – 520. doi: 10.1016/0191-8869(91)90128-X

Tan, S., Moulding, R., Nedeljkovic, M., & Kyrios, M. (2010). Metacognitive, cognitive and developmental predictors of generalized anxiety disorder symptoms. *Clinical Psychologist, 14 (3), 84 – 89*. doi: 10.1080/13284207.2010.521521

Thompson, S. C., Armstrong, W., & Thomas, C. (1998). Illusions of control, underestimations, and accuracy: A control heuristic explanation. *Psychological Bulletin, 123*, 143-161. doi: 10.1037/0033-2909.123.2.143

Thompson, S. C., Kyle, D., Osgood, A., Quist, R. M., Phillips, D. J., & McClure, M. (2004). Illusory control and motives for control: the role of connection and intentionality. *Motivation and Emotion, 28*, 315-332. doi: 10.1007/s11031-004-2386-0

Thompson, S. C., Nierman, A., Schlehofer, M. M., Carter, E., Bovin, M. J., … Wurzman, L. (2007). How do we judge personal control? Unconfounding contingency and reinforcement in control judgments. *Basic and Applied Social Psychology, 29*, 74-84. doi: 10.1080/01973530701331189

Vrana, S.R., Cuthbert, B.N., & Lang, P.J. (1986). Fear imagery and text processing. *Psychophysiology, 23*, 247-253. doi: 10.1111/j.1469-8986.1986.tb00626.x

Walen, S. R., DiGiuseppe, R., & Dryden, W. (1992). A practitioner's guide to rational-emotive therapy (2nd ed.). New York: Oxford University Press.

Wells, A. (1995). Meta-cognition and worry: a cognitive model of generalized anxiety disorder. *Behavioural and Cognitive Psychotherapy, 23*, 301–320. doi: 10.1017/S1352465800015897

Wells, A. (1999). A cognitive model of generalized anxiety disorder. *Behaviour Modification, 23*, 526–555. doi: 10.1177/0145445599234002

Wells, A. (2005). The metacognitive model of GAD: assessment of meta-worry and relationship with DSM-IV generalized anxiety disorder. *Cognitive Therapy and Research, 29*, 107–121. doi: 10.1007/s10608-005-1652-0