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**INDIVIDUAL DIFFERENCES IN EMOTION AND DECISION-
MAKING**

PhD Thesis Abstract

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Key words: emotions, emotion regulation, economic decision-making, risk taking, framing effect, fairness

Chapter 1 Interaction of emotional processes with decision-making in economic psychology

For centuries, emotions were either totally ignored from the study of decisional processes or were thought of having a detrimental influence on decisions. The last decades, however, brought emotions in the focus of those studying decisional processes. If we were to summarize some of the main breakthroughs in this field, our list will include the following, which will be discussed in more detail throughout this thesis:

- a) Both incidental emotions – that is, emotions that are present at the time of a decision but are unrelated to the decisional process itself, and anticipated emotions – namely, emotions that the decision-maker anticipates will have after the selection of one alternative, have major influences on decision-making (Loewenstein & Lerner, 2003; Clore, 1992; Forgas, 1995; Isen, 1993; Lerner & Keltner, 2000; Schwarz, 1990; Davis, Love & Maddox, 2009);
- b) In some circumstances, emotional deficits lead to reduced capacity for making adaptive decisions (Damasio, 2005; Wilson et al., 1993);
- c) By including emotions in the major models of decision-making their explanation power is increased (Lopes, 1987; Lopes & Oden, 1998; Mellers et al., 1997).

Considering at least the arguments mentioned above, we have both empirical and theoretical motives to consider that emotions should be included among the scientific interests of those investigating decision-making (Loewenstein & Lerner, 2003).

We considered Marr's (1982) multi-level analysis of cognitive systems as a starting point in organizing this thesis. The computational analysis aims at identifying the functions that a cognitive system is supposed to fulfil. The human cognitive system must, first and foremost, solve problems related to the survival and reproduction of the individual, as well as increasing his/her adaptability to the environment. For these purposes, the problematic situations with the highest evolutionary relevance include searching for food and partner, early identification and avoidance of dangers, cooperation among individuals and identifying the cheaters. This thesis focuses mostly on identifying the functions that emotions and decisional processes fulfil in order to increase the individual's adaptability. The theories that explain the emotion-decision interactions can be subsumed to the algorithmic/representational level of analysis of the human cognitive system. The analysis of decisional situations that one is confronted with resulted in the formulation of theories that explain decisional behaviours (see sections 1.1.1. – 1.1.5.). The implementational level refers to the neural projections of the emotion – decision interaction. In section 1.5 we provide a description of the empirical studies that have analysed the neural mechanisms of emotions and decisions.

Theories of the effects of emotions and emotion regulation on decisional processes

The history of studying emotions in relation to decisional processes has been long and complicated. Not just economists ignored the impact of emotional states, but also psychologists understudied emotions.

The progresses made in the study of emotion-decision interaction were facilitated by psychologists' efforts to discover and understand as many aspects as possible about emotions, such as their role in decision-making (Damasio, 2005), their neural underpinnings (Panksepp, 1998), or the emotion-cognition interaction (Zajonc, 1980). Even though economists and psychologists became interested in the study of emotions in decisions about at the same time, the specialists from the two domains focused on different types of emotions (Loewenstein, 2000). Economists were interested in anticipated emotions, such as regret and disappointment (Loomes & Sugden, 1982; see also the following sections of this thesis). On the other hand, psychologists mostly focused on immediate emotions. Immediate emotions have impact on various levels of cognitive processing. Positive emotional states are associated with increased problem solving capacity (Isen, 1984, 1987, 1993), remembering positive events (Bower, 1981), increased risk-taking (Kahn & Isen, 1993) and optimism towards the possibility of living positive events in the future (Wright & Bower, 1992; Nygren, Isen, Taylor & Dulin, 1996). On the other hand, negative affective states predispose individuals towards remembering negative past events (Bower, 1981) as well as overestimating the chances of a negative event in the future (Johnson & Tversky, 1983). Moreover, if the negative affective state is also associated with increased physiological arousal, it is even more difficult to use available information when judging decisional options (Forgas, 1992; Forgas & Bower, 1987; Gleicher & Weary, 1991) and the search for available alternatives is blocked (Fiedler, 1988; Keinan, 1987). In some cases, emotional states are strong enough to completely overcome cognitive processes and guide behavior, such as in the cases of phobias or addictions (Baron, 1992; Loewenstein, 1996).

Controlling emotions through emotion regulation

Obviously, people are not at the whim of their emotions. They can use a number of regulation strategies designed to alter their emotional reactions. Under the best circumstances, the success of regulatory strategies assures a good emotional and social functioning of the individual, even in difficult situations. Nevertheless, when emotion regulation mechanisms are malfunctioning, they can increase the risk for developing symptoms of several major categories of psychiatric disorders (Davidson et al., 2000; Phillips et al., 2003). One of the most influential current approaches in the study of emotion and emotion regulation (ER) is the process model of emotions (Gross, 1998, 2002). ER is a construct that subsumes all the actions that people take in order to control which emotions they have, when they have them and how they experience or express those emotions (Gross, 2002). Although the line of research on ER was initially related to the developmental literature (Campos et al., 1983; Campos, Campos & Barrett, 1989; Thompson 1990, 1991), the adult literature on ER has rapidly expanded in the last decade (e.g., Gross & Levenson, 1993; Izard, 1990; Ochsner & Gross, 2005; Gross & Thompson, 2007).

Cognitive and behavioural effects of emotion regulation

Individual differences in ER (i.e., cognitive reappraisal and expressive suppression) have been associated with effects on affective, social and cognitive

functioning of the individual, physiological changes or even psychological well-being (John & Gross, 2004). In Figure 1.4 we summarize the main effects of the habitual use of suppression and reappraisal on various domains of human life.

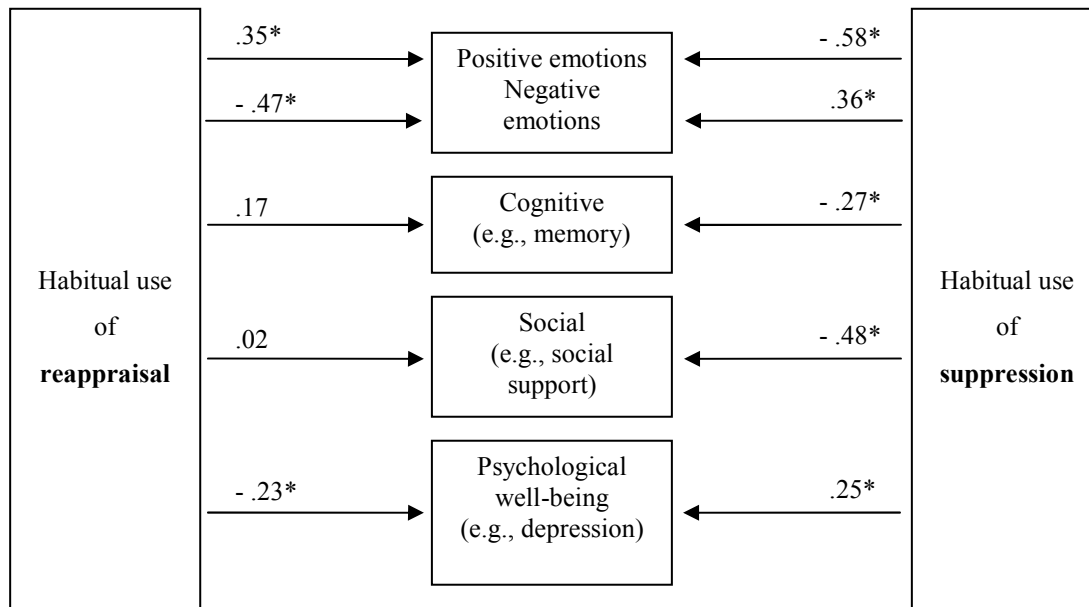


Fig. 1.4. Summary of results from previous studies (see Gross & John, 2003; John & Gross, 2004) regarding individual differences in the habitual use of reappraisal or suppression on individual's affective, cognitive, social functioning.

* $p < 0.05$

Emotion regulations and the emotion-decision interaction

Because ER is widespread in our daily lives, it is possible that it might actually mediate the involvement of emotion in economic decision-making. Most of the previous studies on emotion and decision-making have not controlled for ER. Therefore, effects on economic decision making, ranging from “coloring” the content of thoughts to interfering with information processing, which have been previously attributed to acute emotions might actually be mediated by ER strategies such as cognitive reappraisal or expressive suppression.

The important role of ER in decision-making is supported by at least four lines of evidence:

- (1) Emotions are frequently regulated, in a spontaneous or incidental manner; the ubiquity of ER in situations that trigger emotions makes difficult the isolation of the direct and specific effects of emotion;
- (2) the distinct effects of specific emotions on decision making are explained by differences in the underlying pattern of appraisals, particularly on the certainty and control dimensions (Lerner & Keltner, 2000; also see the next paragraph); by effectively down-regulating emotion experience, ER contributes to an increased sense of emotional control that might influence decision making;
- (3) recent neuropsychological studies indicated that certain brain lesions (e.g., ventromedial prefrontal cortex) have detrimental effects on both economic behaviour (e.g., bargaining behaviour) and emotion regulation (e.g., Koenigs &

Tranel, 2007); at the same time, pharmacological manipulations of serotonin signalling, which very likely affected prefrontal functioning, influence both inequity aversion in economic bargaining, and ER (e.g., Crockett, Clark, Tabibnia, Lieberman, & Robbins, 2008);

(4) both ER, and decision making dimensions that are critically influenced by emotions (e.g., risk taking, susceptibility to framing, bargaining behaviour) depend on similar emotion-cognition brain hubs (Pessoa, 2008), such as increased functional coupling prefrontal-amygdala circuits (e.g., Goldin et al., 2008; DeMartino et al., 2006). A recent review documented the common neural mechanisms that underlie ER and decision making, by focusing on the involvement of ventrolateral, medial, dorsomedial and dorsolateral prefrontal cortex in both ER strategies and reversal learning (i.e., the capacity to alter choice behaviour when the value of response options change) (see Mitchell, 2011).

The experimental studies presented in the following chapters offer incontestable evidence of the effects of ER on decision-making. The quality of a decisional output is not influenced only by immediate or anticipated emotions, but also by the effectiveness the regulatory strategies employed to control the affective states.

Chapter 2 Psychometric properties of the instruments used on Romanian samples

Study 1.1. Psychometric properties of ERQ

The last two decades were marked by a significant increase in the scientific interest in ER. These new research projects confirmed the idea that efficient regulatory strategies are necessary for adaptive human functioning (Gross, 2001, 2007). Two ER strategies that received major attention were cognitive reappraisal - that refers to interpreting a situation in a way to decrease its emotional impact, and expressive suppression, referring to the attempt to inhibit behavioural manifestations of emotional states (Gross, 1998b).

In order to facilitate the scientific progress in investigating individual differences in reappraisal and suppression, Gross and John (2003) developed the Emotion Regulation Questionnaire (ERQ), comprising of two scales that assess the habitual use of reappraisal and suppression.

Results published so far indicate that ERQ is a valid instrument that measures individual differences in reappraisal and suppression. In the last years the ERQ has been translated and adapted in several languages (for a complete list see www.spl.stanford.edu/resources.html). All these versions have good internal consistency coefficients for both reappraisal and suppression scales. The purpose of our study was to translate the ERQ in Romanian and initiate an adaptation study, with particular relevance for young adults.

Materials and methods

The translation and adaptation of ERQ

We initiated the adaptation process of the ERQ (Gross & John, 2003) by translating the original questionnaire into Romanian. After finalizing the first form of the translated instrument, this was revised by psychology experts who were fluid in both English and Romanian in order to retranslate the instrument into English. Based on the experts' comments we created the final version of the questionnaire so that it would take into consideration the suggestions made by the experts. The Romanian version of the ERQ is presented in Table 2.1. The answers to the questionnaire items evaluate the participant's level of agreement with each statement and are scored on a 7-point Likert scale, where 1 indicates "strong disagreement" and 7 indicates "strong agreement". The final score for each scale is computed by dividing the sum of the items to the number of items in the scale.

Table 2.1.

Original and translated items of the ERQ

Item number	Item description
Reevaluare (Reappraisal)	
1.	Când vreau să am mai multe emoții pozitive (cum ar fi bucurie sau amuzament), schimb lucrul la care mă gândeam. (When I want to feel more positive emotions, such as joy or amusement, I change what I am thinking about.)
3.	Când vreau să am mai puține emoții negative (cum ar fi tristețea sau furia), schimb lucrul la care mă gândeam. (When I want to feel less negative emotion, such as sadness or anger, I change what I am thinking about.)
5.	Când mă confrunt cu o situație stresantă, încerc să mă gândesc la ea în așa fel încât să rămân calm. (When I am faced with a stressful situation, I make myself think about it in a way that helps me stay calm.)
7.	Când vreau să am mai multe emoții pozitive, îmi schimb felul cum văd situația. (When I want to feel more positive emotion, I change the way I am thinking about the situation.)
8.	Îmi controlez emoțiile schimbând felul în care văd situația în care sunt. (I control my emotions by changing the way I think about the situation I am in.)
10.	Când vreau să am mai puține emoții negative, îmi schimb felul în care văd situația. (When I want to feel less negative emotion, I change the way I am thinking about the situation.)
Supresie (Suppression)	
2.	Îmi țin emoțiile pentru mine.

-
- (I keep my emotions to myself.)
4. Când trăiesc emoții pozitive, am grijă să nu mi le exprim.
(When I am feeling positive emotions, I am careful not to express them.)
6. Îmi controlez emoțiile prin faptul că nu mi le exprim.
(I control my emotions by not expressing them.)
9. Când trăiesc emoții negative, mă asigur că nu le exprim.
(When I am feeling negative emotions, I make sure not to express them.)
-

Participants

The participants of our study were undergraduate students from the Department of Psychology of Babes-Bolyai University. The initial sample included $N = 324$ participants, while the re-test after 2 months was done on $N = 118$ participants. Demographic data of the sample is presented in Table 2.2.

Table 2.2.

Demographic data of participants included in the National adaptation studies

	Test				Retest			
		Age				Age		
	<i>N</i>	min	max	mean \pm s.d.	<i>N</i>	min	max	mean \pm s.d.
Women	292	18	48	20.51 \pm 2.85	114	19	48	33.5 \pm 16.74
Men	32	19	59	24.18 \pm 9.14	4	18	27	20.15 \pm 1.37
Total	324	18	59	20.88 \pm 4.15	118	18	48	20.61 \pm 3.86

Procedure

Participants completed the questionnaire individually, without time limit. After 2 months the questionnaire was administered again in order to establish its test-retest stability.

Questionnaire reliability

We decided to compute Alpha Cronbach coefficient for internal consistency and the test-retest coefficient for stability of the results.

Data analyses

The data analyses included the determination of the psychometric properties of the translated questionnaire. We computed means and standard deviations for the two scales (i.e., reappraisal and suppression), Alpha Cronbach internal consistency coefficient and test-retest stability. All data analyses were conducted using SPSS 15.

Results

Internal consistency and test-retest stability

Internal consistency coefficients for the translated scales were 0.741 for reappraisal and 0.728 for suppression (Table 2.3). Just as in the original study, we tested for a correlation between the use of reappraisal and suppression and the result was non-significant ($r = 0.24$, *ns*). The test-retest coefficient was 0.443 for reappraisal and 0.571 for suppression, both significant at $p < 0.001$.

Table 2.3.

Psychometric properties of the translated and the original versions of the ERQ (Gross & John, 2003).

		mean \pm s.d. Translation	mean \pm s.d. Original	Alpha Cronbach Coefficient Translation	Alpha Cronbach Coefficient Original	Test-retest stability Translation
Reappraisal	<i>Women</i>	5.17 \pm 0.91	4.61 \pm 1.02	0.721		
	<i>Men</i>	5.01 \pm 1.5	4.40 \pm 0.94	0.87		
	<i>Total</i>	5.15 \pm 0.94		0.741	0.79	0.443***
Suppression	<i>Women</i>	2.97 \pm 1.14	3.14 \pm 1.18	0.72		
	<i>Men</i>	3.35 \pm 1.29	3.64 \pm 1.11 ^{§§}	0.76		
	<i>Total</i>	3.01 \pm 1.15		0.728	0.73	0.571***

Note *** $p < 0.001$, ^{§§} $p < 0.01$ t-tests on sex differences

Sex differences in the habitual use of reappraisal and suppression

In the following step we computed t-test to determine whether there sex differences in the habitual use of reappraisal and suppression. Gross and John (2003) indicated that men use suppression more frequently than women. In our study this difference did not reach statistical significance, but we found the same tendency in our results ($t(322) = -1.756$, $p = 0.08$). There were no differences in the habitual use of reappraisal between men and women, and this result is accord with the one reported by the original study ($t(322) = 0.885$, $p = 0.37$).

Conclusions

The results of this study indicate that the Romanian translation of the ERQ (Gross & John, 2003) maintains the psychometric properties of the original instrument, and similar to those of other translations (Balzarotti et al., 2010). These results have high empirical relevance and offer an argument for the use of the translated version of the ERQ to assess individual differences in reappraisal and suppression on Romanian young adults.

Study 1.2. Psychometric properties of CERQ

The literature on coping can be subscribed to the more general approach of ER strategies. That is, coping mechanisms are particular ways in which an individual regulates his/her emotions in front of a negative event. Generally speaking, coping mechanisms can be differentiated in two broad categories: problem focused coping and emotion focused coping.

Even though the operationalization of coping by the distinction between problem-focused and emotion-focused coping strategies is widely accepted and most coping measures are based on it, this approach gives rise to a number of conceptual problems.

One of them is that the division into problem-focused and emotion-focused coping is not the only dimension by which coping strategies can be classified. In fact, another important dimension crosses the boundaries of this division, i.e., the cognitive (what you think) versus the behavioural (what you do) strategies. Generally speaking, cognitive coping and cognitive ER can be understood as the cognitive way of managing the intake of emotionally arousing information (Thompson, 1991). Cognition or cognitive processes may help us manage or regulate emotions or feelings, and to keep control over our emotions and/or not getting overwhelmed by them.

Until recently, cognitive ER strategies have not been separately studied from other forms of coping. The limits of the traditional approach on coping mechanisms create the opportunity to further investigate cognitive coping mechanisms. The first step in this scientific approach consisted in the making of an instrument that would evaluate only cognitive ER strategies. Building on existing coping instruments, Garnefsky and co-workers (2001) created the Cognitive Emotion Regulation Questionnaire (CERQ, Garnefski, Kraaij & Spinhoven, 2001). The CERQ includes nine scales that measure cognitive coping mechanisms that have previously been associated with affective beneficial or detrimental consequences.

There is currently no doubt about the role played by cognitive ER in human emotions. Further investigations of these mechanisms might result in major implications for preventive or psychotherapeutic programs. Numerous studies conducted so far argue for the importance of cognitive ER in relation with clinical symptomatology. Based on these previous results, we decided to initiate a study to adapt the CERQ on young adult Romanian population.

Materials and methods

The translation and adaptation of CERQ

The translation of the CERQ was done in a similar way as that described in Study 2.1. In Table 2.4. we present the translated items of the CERQ. The participant's answer to each question evaluates the frequency of that particular reaction.

Table 2.4.

Original and translated items of the CERQ

Item number	Item description
Auto-blamare (Self-blame)	
1.	Simt că eu sunt de vină pentru ceea ce s-a întâmplat. (I feel that I am the one to blame for it.)
10.	Simt că eu sunt cel/cea care e responsabil(ă) pentru ceea ce s-a întâmplat. (I feel that I am the one who is responsible for what has happened.)
19.	Mă gândesc la greșelile pe care le-am facut eu în această situație. (I think about the mistakes I have made in this matter.)
28.	Mă gândesc că în fond eu sunt cauza pentru ceea ce s-a întâmplat. (I think that basically the cause must lie within myself.)
Acceptare (Acceptance)	

-
2. Mă gândesc că trebuie să accept ce s-a întâmplat.
(I think that I have to accept that this has happened.)
11. Mă gândesc că trebuie să accept situația.
(I think that I have to accept the situation.)
20. Mă gândesc că nu pot să schimb nimic la cele întâmplate.
(I think that I can not change anything about it.)
29. Mă gândesc că trebuie să învăț să trăiesc cu asta.
(I think that I must learn to live with it.)
-

Ruminare
(Rumination)

3. Adesea mă gândesc la ce simt față de ceea ce mi s-a întâmplat.
(I often think about how I feel about what I have experienced.)
12. Mă preocupă ceea ce gândesc și simt legat de ceea ce mi s-a întâmplat.
(I am preoccupied with what I think and feel about what I have experienced.)
21. Doresc să înțeleg de ce mă simt în acest fel în legătura cu ceea ce mi s-a întâmplat.
(I want to understand why I feel the way I do about what I have experienced.)
30. Insist pe sentimentele pe care mi le-a declanșat situația.
(I dwell upon the feelings the situation has evoked in me.)
-

Reorientare pozitivă
(Positive refocusing)

4. Mă gândesc la lucruri mai placute decât la ce mi s-a întâmplat.
(I think of nicer things than what I have experienced.)
13. Mă gândesc la lucruri plăcute care nu au nicio legătură cu situația respectivă.
(I think of pleasant things that have nothing to do with it.)
22. Mă gândesc la ceva agreabil în loc să mă gândesc la ceea ce s-a întâmplat.
(I think of something nice instead of what has happened.)
31. Mă gândesc la experiențe plăcute.
(I think about pleasant experiences.)
-

Reorientare pe planificare
(Refocus on planning)

5. Mă gândesc la ceea ce pot face cel mai bine.
(I think I can learn something from the situation.)
14. Mă gândesc la cum pot face față cât mai bine situației.
(I think about how I can best cope with the situation.)
23. Mă gândesc la cum aș putea să schimb situația.
(I think about how to change the situation.)
32. Mă gândesc la un plan privitor la ceea ce ar fi cel mai bine să fac.
(I think about a plan of what I can do best.)
-

Reevaluare pozitivă
(Positive reappraisal)

6. Mă gândesc că pot învăța ceva din situația respectivă.
(I think I can learn something from the situation.)
15. Mă gândesc că pot deveni un om mai puternic în urma a ceea ce s-a întâmplat.
(I think that I can become a stronger person as a result of what has happened.)
24. Mă gândesc că situația are și părți bune.
-

-
33. (I think that the situation also has its positive sides.)
Caut părțile bune ale situației.
(I look for the positive sides to the matter.)
-

**Punere în perspectivă
(Putting into perspective)**

7. Mă gândesc că totul putea fi mult mai rău.
(I think that it all could have been much worse.)
16. Mă gândesc că alți oameni trec prin experiențe mult mai rele.
(I think that other people go through much worse experiences.)
25. Mă gândesc că nu e chiar atât de rău în comparație cu alte lucruri.
(I think that it hasn't been too bad compared to other things.)
34. Îmi spun că exista și lucruri mai rele în viață.
(I tell myself that there are worse things in life.)
-

**Catastrofare
(Catastrophizing)**

8. Adesea mă gândesc că ceea ce mi s-a întâmplat este mult mai rău decât ceea ce li s-a întâmplat altora.
(I often think that what I have experienced is much worse than what others have experienced.)
17. Mă gândesc în continuu la cât de groaznic e ceea ce mi s-a întâmplat.
(I keep thinking about how terrible it is what I have experienced.)
26. Adesea mă gândesc că ceea ce mi s-a întâmplat e cel mai rău lucru care i se poate întâmpla cuiva.
(I often think that what I have experienced is the worst that can happen to a person.)
35. Mă gândesc în continuu la cât de oribilă a fost situația.
(I continually think how horrible the situation has been.)
-

**Învinuirea altora
(Blaming others)**

9. Simt că alții sunt de vină pentru ceea ce s-a întâmplat.
(I feel that others are to blame for it.)
18. Consider că alții sunt responsabili pentru ceea ce s-a întâmplat.
(I feel that others are responsible for what has happened.)
27. Mă gândesc la greșelile pe care le-au făcut ceilalți în situația respectivă.
(I think about the mistakes others have made in this matter.)
36. Consider că în fond alții sunt cauza pentru ceea ce s-a întâmplat.
(I feel that basically the cause lies with others.)
-

Participants

The participants included in Study 1.2 are the same from Study 1.1. For the demographic characteristics check Table 1.2.

Procedure

The same procedure as in Study 1.1 was applied.

Questionnaire reliability

We decided to compute Alpha Cronbach coefficient for internal consistency and the test-retest coefficient for stability of the results.

Data analyses

The data analyses included the determination of the psychometric properties of the translated questionnaire. We computed means and standard deviations for the nine scales, Alpha Cronbach internal consistency coefficient and test-retest stability. All data analyses were conducted using SPSS 15.

Results

Internal consistency and test-retest stability

Alpha Cronbach internal consistency coefficients ranged between 0.68, for the Acceptance scale, and 0.87 for the Positive refocusing scale. They were comparable with the original coefficients. The test-retest stability also resulted in good psychometric coefficients, similar to those of the original CERQ scales.

Table 2.5.

Psychometric properties of the translated and the original versions of the CERQ (Garnefski and Kraaij, 2007).

CERQ scales		mean \pm s.d. Translation	mean \pm s.d. Original	Alpha Cronbach Coefficients Translation (Original)	Test-retest correlation coefficients Translation (Original)
Self-blame	Women	10.84 \pm 2.96		0.754	
	Men	10.87 \pm 2.95		0.726	
	Total	10.85 \pm 2.96	8.22 \pm 2.96	0.751 (0.75)	0.301** (0.55**)
Acceptance	Women	12.44 \pm 3.31		0.695	
	Men	13.03 \pm 2.94		0.603	
	Total	12.5 \pm 3.28	11.01 \pm 3.53	0.685 (0.76)	0.639*** (0.51**)
Rumination	Women	12.98 \pm 3.39		0.768	
	Men	12.12 \pm 2.94		0.603	
	Total	12.89 \pm 3.36	10.46 \pm 3.72	0.757 (0.83)	0.459*** (0.60**)
Positive refocusing	Women	10.31 \pm 3.79		0.872	
	Men	11.12 \pm 3.61		0.896	
	Total	10.39 \pm 3.78	10.01 \pm 3.53	0.875 (0.85)	0.636*** (0.52**)
Positive reappraisal	Women	14.72 \pm 3.15		0.712	
	Men	15.87 \pm 3.8		0.66	
	Total	14.83 \pm 3.23	12.46 \pm 4.07	0.715 (0.85)	0.718*** (0.57**)
Refocus on planning	Women	14.48 \pm 3.15		0.857	
	Men	15.31 \pm 4.4		0.83	
	Total	14.56 \pm 3.99	13.03 \pm 3.89	0.856 (0.86)	0.720*** (0.48**)
Putting into	Women	13.31 \pm 3.89		0.831	

perspective	Men	11.93 ± 4.46		0.815	
	Total	13.18 ± 3.97	11.64 ± 3.91	0.83 (0.82)	0.501*** (0.56**)
Catastrophizing	Women	7.48 ± 3.17		0.785	
	Men	6.93 ± 3.11		0.686	
	Total	7.75 ± 3.17	6.05 ± 2.43	0.776 (0.79)	0.576*** (0.61**)
Blaming others	Women	7.74 ± 2.22		0.725	
	Men	7.43 ± 2.74		0.827	
	Total	7.71 ± 2.27	6.38 ± 2.69	0.761 (0.82)	0.643*** (0.65**)

Note: * $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$

Mean scores of the CERQ scales

Overall, in our sample we found that participants use more frequently adaptive ER strategies, such as Positive reappraisal, Putting into perspective or Refocus on planning, compared to the use of less adaptive strategies. The less frequently used strategies were Catastrophizing and Blaming others, a result that resembles that reported by Garnefski and Kraaij (2007).

Correlations between cognitive ER strategies scales

We also computed Pearson correlations between the nine scales of the CERQ. We obtained several significant correlations, which are presented in Table 2.7. The strongest correlation was between Positive reappraisal and Refocus on planning ($r = 0.622$), whereas the lowest correlation was between Positive refocusing and Self-blame ($r = -0.2$). In general, we found positive relations between the scales that assess adaptive ER strategies, and negative correlations between these scales and the maladaptive ER strategies.

Table 2.7.

Pearson correlations between CERQ scales

CERQ scales	1	2	3	4	5	6	7	8
1. Self-blame	-	-	-	-	-	-	-	-
2. Acceptance	0.21**	-	-	-	-	-	-	-
3. Rumination	0.37**	0.25**	-	-	-	-	-	-
4. Positive refocusing	-	0.24**	-0.08	-	-	-	-	-
5. Positive reappraisal	0.08	0.22**	0.23**	0.39**	-	-	-	-
6. Refocus on planning	-0.07	0.28**	0.02	0.47**	0.62**	-	-	-
7. Putting into perspective	-0.07	0.31**	0.03	0.38**	0.37**	0.57**	-	-
8. Catastrophizing	0.28**	0.05	0.29**	-	-	-	-	-
9. Blaming others	-0.01	0.01	0.23**	-0.05	0.01	-0.03	0.09	0.35**

Note: ** $p < 0.01$

Conclusions

In the current study we presented preliminary data on the national adaptation process of the CERQ, with special application on the young adult population. The CERQ is the first instrument that assesses specifically cognitive coping strategies, focused both on emotions as well as problems. The psychometric properties of the translated questionnaire indicate a good reliability, both for internal consistency as well as test-retest stability. These results support the idea of using this translated version of the CERQ in our future studies in order to investigate individual differences in cognitive ER. The national adaptation of the questionnaire was recently concluded and the norms for each scale have been published (Perțe & Miclea, 2011).

Study 1.3. Psychometric properties of DOSPERT

People differ in their predisposition towards risk taking, and these differences are often described in terms of attitudes towards risks (Blais & Weber, 2006).

Since there was a stringent need for an instrument that might evaluate risk attitudes and risk taking behaviours, in various domains of life, Weber, Blais and Betz (2002) developed the Domain Specific Risk Taking Scale (DOSPERT). The DOSPERT allows researchers and practitioners to assess both conventional risk attitudes, defined as the reported level of risk taking, as well as perceived risk attitudes, defined as the willingness to engage in a risky activity as a function of its perceived riskiness, in five commonly encountered content domains (i.e., financial, social, ethical, recreational, health). Studies conducted so far support the instrument's validity and confirm its factorial structure. The initial study (Weber et al., 2002) reported good psychometric properties of the scales. Numerous research groups have acknowledged the importance of DOSPERT to the field of risk taking. Moreover, it is even considered to have clinical relevance for the assessment of risk taking in health related situations (Harrison et al., 2005). Therefore, we are confident that the DOSPERT is a valuable instrument and our research projects would benefit if it was used on our young adults samples.

Materials and methods

The translation and adaptation of DOSPERT

The translation of the DOSPERT was done in a similar way as that described in Study 2.1. In Table 2.8. we present the translated items of the DOSPERT.

Table 2.8.

Original and translated items of the DOSPERT

Item number	Item description
Etic (Ethical)	
6.	Să declar deconturi îndoielnice în declarația de impozit pentru FISC (Taking some questionable deductions on your income tax return)
9.	Să am o aventură cu o femeie maritată /un bărbat însurat.

-
10. (Having an affair with a married man/woman).
Să îmi asum creditul pentru munca altcuiva.
(Passing off somebody else's work as your own.)
16. Să dezvălui cuiva secretul unui prieten.
(Revealing a friend's secret to someone else.)
29. Să-mi las copiii mici singuri acasă, ca să-mi rezolv treburile în oraș.
(Leaving your young children alone at home while running an errand.)
30. Să nu returnez un portofel cu 200 de dolari pe care l-am găsit.
(Not returning a wallet you found that contains \$200.)
-

Financiar
(Financial)

3. Să pariez venitul pe o lună la cursele de cai.
(Betting a day's income at the horse races.)
4. Să investesc 10% din venitul anual într-un plan de investiții cu profit moderat.
(Investing 10% of your annual income in a moderate growth mutual fund.)
8. Să pariez venitul pe o lună la un joc de poker cu mize mari.
(Betting a day's income at a high-stake poker game.)
12. Să investesc 5% din venitul anual în acțiuni la bursă foarte speculative.
(Investing 5% of your annual income in a very speculative stock.)
14. Să pariez venitul pe o lună pe rezultatul unui meci sportiv.
(Betting a day's income on the outcome of a sporting event.)
18. Să investesc 10% din venitul pe un an ca să lansez o nouă afacere.
(Investing 10% of your annual income in a new business venture)
-

Sănătate
(Health)

5. Să consum foarte mult alcool într-un context social.
(Drinking heavily at a social function.)
15. Să fac sex neprotejat.
(Engaging in unprotected sex.)
17. Să conduc o mașină fără să port centură de siguranță.
(Driving a car without wearing a seat belt.)
20. Să conduc o motocicletă fără să port cască.
(Riding a motorcycle without a helmet.)
23. Să fac plajă fără să folosesc cremă de protecție solară.
(Sunbathing without sunscreen.)
26. Să merg singur acasă, pe jos, noaptea, într-o zonă nesigură a orașului.
(Walking home alone at night in an unsafe area of town.)
-

Recreațional
(Recreational)

2. Să merg în excursie în sălbăticie.
(Going camping in the wilderness.)
11. Să cobor o pârtie de schi care îmi depășește deprinderile.
(Going down a ski run that is beyond your ability.)
13. Să fac rafting pe râuri repezi de munte, primăvara, când nivelul apei este ridicat.
(Going whitewater rafting at high water in the spring.)
-

-
- 19. Să iau cursuri de parașutism.
(Taking a skydiving class.)
 - 24. Să fac bungee-jumping de pe un pod înalt.
(Bungee jumping off a tall bridge.)
 - 25. Să pilotez un avion de dimensiuni mici.
(Piloting a small plane.)
-

**Social
(Social)**

- 1. Să admit că am gusturi diferite de cele ale unui prieten.
(Admitting that your tastes are different from those of a friend.)
 - 7. Să dezaprob o autoritate într-o problemă majoră.
(Disagreeing with an authority figure on a major issue.)
 - 21. Să aleg o meserie care îmi face plăcere în locul uneia mai sigure.
(Choosing a career that you truly enjoy over a more secure one.)
 - 22. Să spun ceea ce gândesc pe o temă nepopulară la o ședință de la serviciu.
(Speaking your mind about an unpopular issue in a meeting at work.)
 - 27. Să mă mut într-un alt oraș, departe de familie.
(Moving to a city far away from your extended family.)
 - 28. Să încep o nouă carieră la 30-40 de ani.
(Starting a new career in your mid-thirties.)
-

Participants

The participants included in Study 1.3 are the same from Study 1.1. For the demographic characteristics check Table 1.2.

Procedure

The same procedure as in Study 1.1 was applied.

Questionnaire reliability

We decided to compute Alpha Cronbach coefficient for internal consistency and the test-retest coefficient for stability of the results.

Data analyses

The data analyses included the determination of the psychometric properties of the translated questionnaire. We computed means and standard deviations for the two scales, Alpha Cronbach internal consistency coefficient and test-retest stability. All data analyses were conducted using SPSS 15.

Results

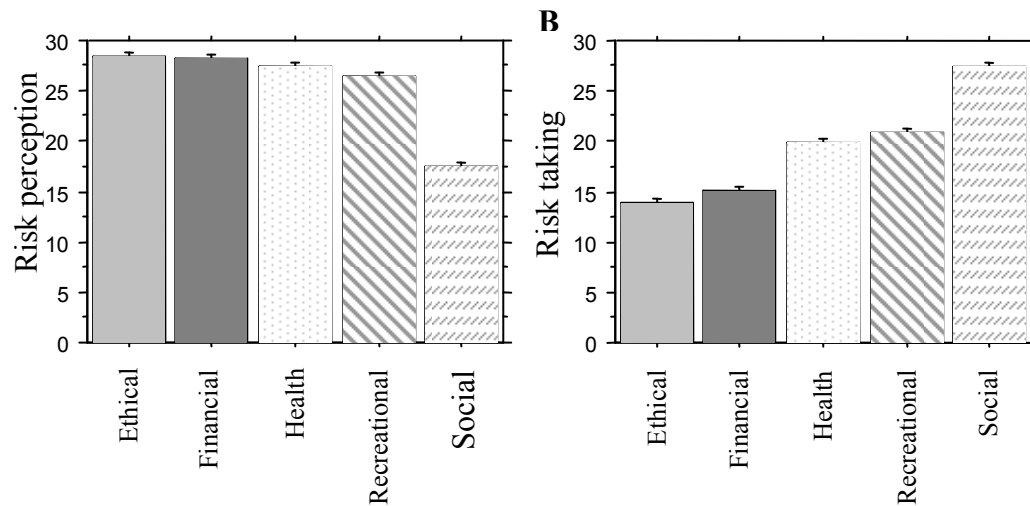
Descriptive statistics and sex differences in risk taking between domains

A simple ANOVA highlighted a significant effect of decisional domain, both for risk perception ($F[4, 319] = 137.359, p < 0.0001$), as well as for risk taking ($F[4, 319] = 164.431, p < 0.0001$). The results are presented in Figure 2.1 and Table 2.10. We also computed correlations between risk perception and risk taking scores and each of the five domains. Our results showed that there is a negative correlation between the two risk measures, on each domain (see Table 2.9).

Table 2.9.

Correlations between risk perception and risk taking scales.

		Risk taking				
		<i>Ethical</i>	<i>Financial</i>	<i>Health</i>	<i>Recreational</i>	<i>Social</i>
Risk perception	<i>Ethical</i>	-0.67***	-0.53***	-0.47***	-0.33***	0.10
	<i>Financial</i>	-0.54***	-0.69***	-0.35***	-0.34***	0.24***
	<i>Health</i>	-0.54***	-0.39***	-0.66***	-0.43***	-0.03
	<i>Recreational</i>	-0.35***	-0.39***	-0.39***	-0.70***	-0.07
	<i>Social</i>	0.43***	0.34***	0.09	0.02	-0.59***

Note: *** $p < 0.001$ **Fig. 2.1.** Participants' answers to the scales of risk perception (A) and risk taking (B) on the five domains investigated**Internal consistency and test-retest stability**

The internal consistency coefficients ranged between 0.701 and 0.843, being considered good and similar to the ones reported in other studies (Blais & Weber, 2006; Weber, Blais & Betz, 2002). In addition, test-retest stability was found to be satisfactory for all five domains (see Table 2.10).

Table 2.10.

Descriptive statistics and reliability coefficients of the Romanian translations of the DOSPERT scales

DOSPERT Scale		mean ± s.d. Translation	mean ± s.d. Original	Alpha Cronbach Coefficient Translation	Test-retest correlation coefficient Translation
SPR- Ethical	<i>Women</i>	28.56 ± 8.07		0.834	
	<i>Men</i>	26.5 ± 7.11		0.695	
	<i>Total</i>	28.36 ± 7.99	27.39 ± 6.59	0.822	0.330**
SPR-	<i>Women</i>	28.15 ± 6.81		0.769	

Financial	<i>Men</i>	28.21 ± 6.27		0.590	
	<i>Total</i>	28.16 ± 6.75	26.53 ± 7.73	0.754	0.694***
SPR- Health	<i>Women</i>	27.75 ± 6.85		0.724	
	<i>Men</i>	23.56 ± 5.14		0.388	
SPR- Recreational	<i>Total</i>	27.33 ± 6.81	28.15 ± 7.43	0.712	0.348**
	<i>Women</i>	26.59 ± 7.02		0.775	
SPR- Social	<i>Men</i>	24.15 ± 6.50		0.723	
	<i>Total</i>	26.35 ± 7.00	27.17 ± 9.14	0.770	0.473***
SAR- Ethical	<i>Women</i>	17.52 ± 6.13		0.723	
	<i>Men</i>	17.56 ± 7.48		0.829	
SAR- Financial	<i>Total</i>	17.53 ± 6.26	17.01 ± 5.69	0.737	0.269*
	<i>Women</i>	13.69 ± 7.37		0.814	
SAR- Health	<i>Men</i>	16.21 ± 7.20		0.734	
	<i>Total</i>	13.94 ± 7.38	16.92 ± 6.59	0.805	0.239*
SAR- Recreational	<i>Women</i>	14.92 ± 6.72		0.796	
	<i>Men</i>	17.53 ± 7.10		0.712	
SAR- Social	<i>Total</i>	15.17 ± 6.79	19.61 ± 7.73	0.789	0.278*
	<i>Women</i>	19.57 ± 7.60		0.714	
SAR- Ethical	<i>Men</i>	22.34 ± 5.99		0.484	
	<i>Total</i>	19.84 ± 7.49	20.63 ± 7.43	0.701	0.440***
SAR- Financial	<i>Women</i>	20.55 ± 8.98		0.852	
	<i>Men</i>	23.18 ± 8.00		0.744	
SAR- Health	<i>Total</i>	10.81 ± 8.92	22.43 ± 9.14	0.843	0.722***
	<i>Women</i>	27.53 ± 6.93		0.706	
SAR- Recreational	<i>Men</i>	27.28 ± 6.92		0.688	
	<i>Total</i>	27.5 ± 6.92	32.58 ± 5.69	0.703	0.536***

Note: * $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$

Conclusions

The results of experimental studies that have used the DOSPERT support the idea that risk perception and risk taking vary in different life domains. Our study confirms these conclusions, indicating that risk attitudes are different across situations. Moreover, our results show that risk perception and risk taking are inversely related to decisions regarding financial, ethical, recreational, health or social contexts.

Our study has the great merit of providing a useful translation of the DOSPERT and preliminary results on Romanian young adult population. Future studies using this instrument might extend the research sample and might also investigate sex differences in risk taking across the five domains.

Chapter 3 Emotion regulation and risk taking

It is well-established that emotion plays a key role in human social and economic decision making (see, e.g., Elster, 1998; Loewenstein, 2000; Peters, Västfjäll, Gärling, & Slovic, 2006). People evaluate objective features of alternatives such as expected return in a subjective way (Edwards, 1962; Kahneman & Tversky, 1979), and emotions are understood to influence these subjective evaluations (Loewenstein & O'Donoghue, 2004; Naqvi, Shiv, & Bechara, 2006; Slovic, Finucane, Peters, & MacGregor, 2007). The recent literature on emotion regulation (ER), however, highlights that humans typically make efforts to control emotion experiences (Gross, 2002). This leaves open the possibility that decision effects attributed to acute emotions may be mediated by ER strategies. If so, this raises the additional possibility that different regulation strategies could have different decision implications. Only very recently, however, have scholars begun to investigate these possibilities. We here report data from both designed and naturally occurring environments providing convergent evidence that ER strategies modulate decision making. In particular, we find that the decision effects of emotion vary according to the way in which a person regulates the emotion experience.

In this research we manipulate ER strategies under controlled conditions in order to provide rigorous evidence on their decision making effects. We focus on instructed and incidental reappraisal and suppression used to regulate negative emotions induced by movies (Study 2), and naturally occurring negative and positive emotions (Study 3). Moreover, we also investigated the effects of individual differences on the acquisition of declarative knowledge about the decisional task (Study 4). We evaluate the effects of these ER strategies on decision making under both risk and uncertainty.

We study decisions in the Balloon Analogue Risk Task (BART) (Lejuez et al., 2002) as well as the Iowa Gambling Task (IGT) (Bechara, Damasio, Damasio, & Anderson, 1994). BART is a computer-based measure of risk-taking, in which participants can earn financial rewards by pumping balloons presented on a screen; different balloons have variable explosion points, and once a balloon explodes, the money deposited for pumping that balloon is lost (Lejuez et al., 2002). The other economic game, IGT, simulates real-life decision making in the way it factors uncertainty of premises and outcomes as well as reward and punishment (Bechara et al., 1994). It measures the degree to which individuals come to choose small immediate gains (associated in the long term with smaller losses) over large immediate gains (associated in the long term with larger losses) (Bechara et al., 1994).

We next report (a) whether manipulations of ER of two negative emotions induced by films influence decision making performance; and (b) whether the incidental use of ER strategies on naturally occurring positive and negative emotions affect decisions. We find statistically identical decision patterns between those who use suppression and a control group using no ER strategy. In contrast, in relation to both the control and suppression groups, participants using reappraisal displayed systematically and statistically different decision patterns. In particular, we find that reappraisal promotes increased risk taking (or equivalently, reduces risk aversion), and we trace the source of this effect to the emotional route.

Study 2

This study was designed to investigate the effects of ER on decision making in laboratory conditions that involved the controlled induction of two negative emotions. Fear and disgust were induced by movies, and the effects of suppressing or reappraising these emotions were tested in IGT and BART. We chose to study fear and disgust for three reasons. First, they are both negative emotions that according to the previous literature on ER (e.g., Gross & Levenson, 1997), should be effectively down regulated by reappraisal, but not suppression. Therefore, this study allowed us to test the “emotional route” by which ER may influence decision making. Second, little is known about the way different emotions of the same valence differentially influence judgment and choices (Lerner & Keltner, 2000). This is relevant because while both fear and disgust involve unpleasant states, they differ in important dimensions including certainty and attentional activity (Smith & Ellsworth, 1985). In contrast to disgust, which involves high levels of certainty and is associated with a strong unwillingness to attend to the situation, fear involves maximal uncertainty reflected in the apparent indecisiveness regarding whether to attend to the situation. In addition, disgust may have evolved to ward off contamination, and this might increase its effects on risk attitudes (Fessler, Pillsworth, & Flamson, 2004). Third, fear and disgust are among the emotions that can be reliably induced using movies in the laboratory (Kreibig, Wilhelm, Roth, & Gross, 2007; Rottenberg, Ray, & Gross, 2007).

In summary, laboratory-induced fear and disgust can plausibly inform the effects of ER on decision making in controlled conditions. In light of the known differences in their ability to down regulate negative emotions, we hypothesized that participants using reappraisal would make riskier decisions than those using suppression.

Materials and methods

Participants

Sixty participants (56 women; mean age = 21.45 years) from the Babeş-Bolyai University campus volunteered for this study. All participants signed an informed consent before the experiment.

Procedure

They were randomly distributed in six groups defined by the induced emotion (i.e., fear or disgust) and ER strategy (i.e., cognitive reappraisal, expressive suppression, or control/no ER instructions). Immediately prior to the experiment participants completed the Positive and Negative Affect Scales of PANAS-X (Watson & Clark, 1999) in order to control for their dispositional mood. They also completed the Specific Affect Scales of the same questionnaire as a pre-test measure of emotion. Then, according to the experimental condition, the participants viewed one of two short (i.e., approximately 2 minutes) movie excerpts (either *Gothika*, 2003, or *Pink Flamingos*, 1972) both of which reliably elicit fear or disgust (Rottenberg et al., 2007).

Participants viewed the movies with standard instructions to reappraise, suppress their emotions, or in the absence of instructions related to ER (see also Richards & Gross, 2000). Immediately after the movie they completed the specific affects scales of PANAS-X (post-test), enabling us to measure the induced emotion. They also completed the

Emotion Regulation Questionnaire (ERQ) (Gross & John, 2003) to confirm that participants employed the instructed ER strategy.

Next, participants played computer versions of BART and IGT. The average number of pumps per unexploded balloon in BART, and the difference between advantageous (i.e., C and D) and disadvantageous (i.e., A and B) selections in IGT were the dependent variables, as described in the standard protocols (Bechara et al., 1994; Lejuez et al., 2002). In addition, CD – AB scores were calculated for each 20 selection block of IGT, in light of the observation that these blocks reflect stages of decision making optimization, which can be differentially influenced by emotions (see Bechara, Damasio, Tranel, & Damasio, 1997). The order of BART and IGT was counterbalanced between the two groups. The experimental procedure is presented in Figure 3.1.

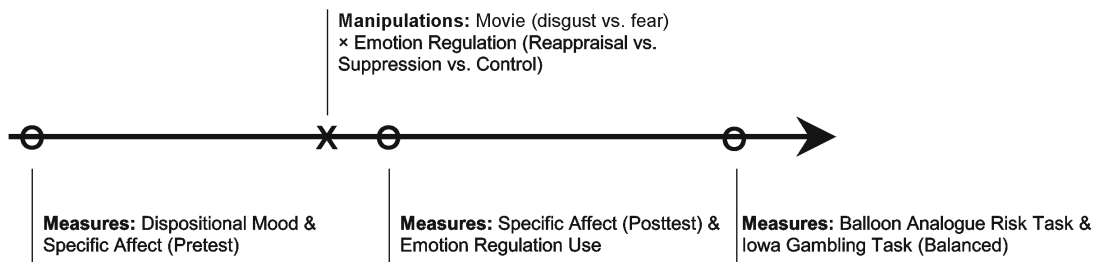


Fig. 3.1. *Experimental procedure used in Study 2*

Results

Manipulation checks

The positive and negative affect scores indicated that immediately before the movies, there were no significant differences in dispositional mood between the conditions. The movies succeeded to specifically induce fear and disgust, as indicated by the significant increases in the corresponding specific affect scores in post-test, over all the groups (see Table 1). ERQ scores confirmed that the participants successfully used the strategy that they were instructed to use during the movies (see Table 3.1).

Emotion experience

The type of ER that participants used during the movie affected the emotion they experienced. In comparison to the control group, reappraisers, but not suppressors, displayed significantly decreased fear and disgust (Table 3.1).

Decision making performance

A 3 (ER: reappraisal vs. suppression vs. control) × 2 (emotion: fear vs. disgust) ANOVA indicated a significant main effect of ER on BART performance ($F(2, 57) = 22.69, p < 0.01, \eta^2 = 0.8$). The effects of emotion or ER × emotion on BART were not statistically significant. Post-hoc analyses showed that reappraisers had significantly higher mean pumps per unexploded balloons in BART than suppressors and controls (Fig. 3.2.A).

Similar statistical analyses on the total CD – AB scores indicated no significant effects of ER or emotion on IGT performance. However, by including the block of selections as an additional factor in the ANOVA, we found a significant effect of ER ($F(2, 57) = 19.8, p < 0.05, \eta^2 = 0.4$) and block ($F(4, 55) = 9.5, p < 0.01, \eta^2 = 0.3$) on IGT

performance. Post-hoc analyses indicated that reappraisers had significantly higher scores in the third block of trials, in comparison to suppressors and controls (Fig. 3.2.B).

Table 3.1.

Mood before the experiment, specific emotions induced by movies, and use of cognitive reappraisal and expressive suppression in Study 2

Groups (ER & emotion)	Measures	Mood: Positive Affect	Mood: Negative Affect	Specific Affect (pre-test)		Specific Affect (post-test)		Cognitive Reappraisal	Expressive Suppression
				Fear	Disgust	Fear	Disgust		
<i>Total</i>	<i>Fear</i>	32.42 ± 5.6	22.18 ± 7.86	10.1 ± 3.94	8.17 ± 3.5	12.27 ± 4.69*	8.16 ± 3.72	3.77 ± 1.46	2.53 ± 1.1
	<i>Disgust</i>	35.36 ± 5.58	21.8 ± 6.71	10.1 ± 3.94	8.17 ± 3.5	10.47 ± 4.83	9.31 ± 4.03**	4 ± 1.52	2.47 ± 1.06
<i>Reappraisers</i>	<i>Fear</i>	34.44 ± 4.64	21 ± 8.18	10 ± 4.53	8.55 ± 4.3	10.15 ± 4.41	8.44 ± 4.36	5.68 ± 0.16 ^{§§}	1.77 ± 0.19
	<i>Disgust</i>	38.45 ± 4	20.18 ± 4.97	9.54 ± 3.11	8.5 ± 4.13	9.5 ± 2.94	8.4 ± 4.01	5.95 ± 0.03 ^{§§}	1.81 ± 0.31
<i>Suppressors</i>	<i>Fear</i>	30.71 ± 7.29	20.87 ± 8.7	10.2 ± 3.49	9.37 ± 5.34	12.8 ± 4.95*	9.31 ± 4.59	2.81 ± 0.13	4 ± 0.65 ^{§§}
	<i>Disgust</i>	33.8 ± 6.9	22.2 ± 6.49	8.7 ± 2.16	8.27 ± 3.92	8.7 ± 2.05	11.02 ± 4.27**	2.91 ± 0.16	3.82 ± 0.67 ^{§§}
<i>Controls</i>	<i>Fear</i>	31.8 ± 5.71	24.3 ± 7.24	10.3 ± 3.9	7.6 ± 2.17	14 ± 4.05*	7.6 ± 2.31	2.83 ± 0.07	2.05 ± 0.62
	<i>Disgust</i>	33.33 ± 4.3	23.33 ± 8.86	9.88 ± 4.22	7.73 ± 2.28	9.44 ± 3.57	10.42 ± 3.15**	2.83 ± 0.19	1.77 ± 0.29

Note: ** $p < 0.01$ (Student *t* tests) in comparison to the corresponding pre-test measure; ^{§§} $p < 0.01$ (ANOVA) in comparison to the other two emotion regulation groups.

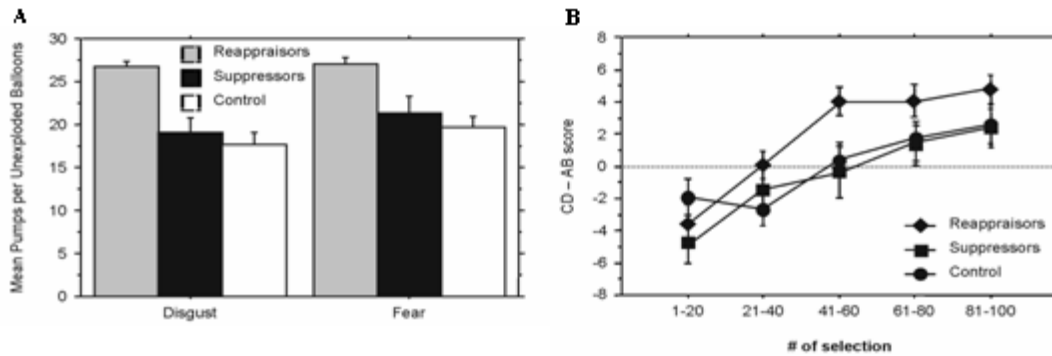


Fig. 3.2 Behavioural performance of participants in BART (A) and IGT (B).

Study 3

This experiment was designed to replicate the effects of ER on decision making in conditions that involved naturally occurring emotions, and extend these effects to positive emotions. It is widely accepted that naturally occurring emotions are more salient and valenced than those induced in the laboratory, and their influences on cognition may be more conspicuous (for various perspectives, see Bradley & Lang, 2007; Damasio, 2005; Frijda, 1988). Fortunately, intense emotions such as those triggered by having just learned the result of a final exam can be measured and studied (see also Gramzow, Willard, & Mendes, 2008). We investigated the effects of incidental ER on decision making in this natural context.

Positive emotions offered a ground for testing whether the effects of ER on decision making are supported by the different degrees of effortfulness or cognitive load. Specifically, both reappraisal and suppression down regulate positive emotions (Gross & Levenson, 1997). In this context, any difference between the effects of these two ER strategies on decision making may be attributed to the increased effort that is required to suppress the expression of emotions. Therefore, this experiment enables us to replicate and extend the previous results to naturally occurring negative and positive emotions, as well as to determine whether the effects of ER on decision making are supported by emotional or non-emotional mechanisms.

Our hypotheses were:

1. reappraisal of negative emotions would reduce risk aversion in comparison to the suppression of negative emotions.
2. no differences in risk attitudes between participants using reappraisal or suppression to control positive emotions.

Materials and methods

Participants

Forty-four students (33 women; mean age: 22.6 years) attending an undergraduate course at Babeş-Bolyai University agreed to participate in this study. All participants signed an informed consent before the experiment.

Procedure

All the participants had the final exam several days before the experiment and on that occasion they had been asked to provide self-evaluations of their performance, and to assess the importance they placed on that exam. The participants for this study were recruited from those students for whom the exam was extremely important, and either under- or overestimated their evaluation with one or two points (out of ten). Immediately after learning their exam results they were asked to volunteer for this study, and those who agreed completed PANAS-X. They also completed ERQ in order to identify those who incidentally used reappraisal, suppression, or neither one of these ER strategies to control the emotions elicited by learning their exam outcome. Just as in the above-discussed experiment, immediately after completing the questionnaires participants were taken to a nearby laboratory room where they played BART and IGT. The experimental procedure is presented in Figure 3.3.

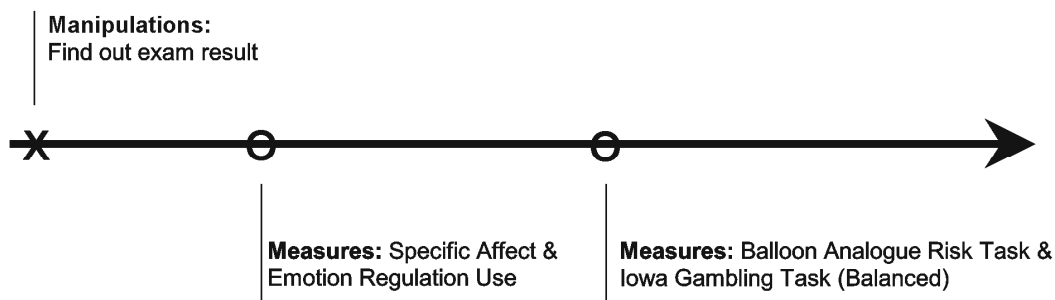


Fig. 3.3. *Experimental procedure used in Study 3*

Results

Manipulation checks

An ANCOVA confirmed our prediction that self-evaluations of the exam results (under- vs. overestimation) had a significant effect on negative ($F(1, 42) = 4.3, p < 0.05, \eta^2 = 0.4$) and positive affect scores ($F(1, 42) = 7.83, p < 0.01, \eta^2 = 0.6$), with the differences between the self- and the objective evaluations included as a covariate. Post-hoc analyses indicated that the participants who overestimated their evaluation displayed more negative affect than those who underestimated their evaluation, and the latter displayed more positive affect than the former (Table 2). ERQ scores indicated that $N = 17$ participants (9 who overestimated their evaluation) predominantly used reappraisal, $N = 13$ participants (7 who overestimated) used suppression, and $N = 14$ (7 who overestimated) used neither reappraisal nor suppression (hereinafter “controls”) to regulate emotions elicited by learning their exam score (Table 3.2).

Table 3.2

Positive and negative affect induced by learning the results of the exam, and use of cognitive reappraisal and expressive suppression in Study 3

	Measures	General Positive Affect	General Negative Affect	Cognitive Reappraisal	Expressive Suppression
Groups (ER & result anticipation)					

<i>Total</i>	<i>Under-estimation</i>	35.58 ± 15.15	27.58 ± 3.2	4.77 ± 1.22	2.87 ± 1.22
	<i>Over-estimation</i>	27.75 ± 3.27	43.12 ± 14.52**	4.61 ± 1.3	3 ± 1.53
<i>Reappraisers</i>	<i>Under-estimation</i>	27.5 ± 4.35	27 ± 3.16	6.29 ± 0.64 ^{§§}	2 ± 0.35
	<i>Over-estimation</i>	30.2 ± 1.48	26.4 ± 2.3	6.36 ± 0.59 ^{§§}	2.1 ± 0.28
<i>Suppressors</i>	<i>Under-estimation</i>	27.4 ± 3.78	25.8 ± 2.28	3.76 ± 0.4	4.2 ± 0.32 ^{§§}
	<i>Over-estimation</i>	25.33 ± 3.07	53.33 ± 11.79**	3.77 ± 0.2	4.7 ± 1.05 ^{§§}
<i>Controls</i>	<i>Under-estimation</i>	60 ± 3.6	31.33 ± 1.15	4.44 ± 0.25	1.83 ± 0.52
	<i>Over-estimation</i>	28.2 ± 3.11**	47.6 ± 9.01*	3.86 ± 0.61	1.85 ± 0.57

Note: * $p < 0.05$ and ** $p < 0.01$ (ANOVA) in comparison to the group that underestimated the exam result; ^{§§} $p < 0.01$ (ANOVA) in comparison to the other two emotion regulation groups.

Emotion experience

The type of ER used by participants had significant effect on positive ($F(2, 41) = 5.6, p < 0.01, \eta^2 = 0.7$) and negative affect ($F(2, 41) = 4.63, p < 0.05, \eta^2 = 0.5$). In comparison to controls, reappraisers, but not suppressors, reported reduced negative affect. However, both reappraisers and suppressors had significantly reduced positive affect scores, in comparison to controls (Table 3.2).

Decision making performance

A 3 (ER: reappraisal vs. suppression vs. control) × 2 (emotion: positive vs. negative affect) ANOVA indicated the significant main effect of emotion ($F(1, 42) = 16.8, p < 0.01, \eta^2 = 0.9$), and the significant interaction of ER × emotion on BART performance ($F(4, 39) = 8.13, p < 0.01, \eta^2 = 0.7$). Post-hoc analyses showed that negative affect reduced risk taking in comparison to positive affect. In addition, in relation to suppressors, participants who reappraised their negative affect displayed increased risk taking (Fig. 3.4.A).

Similar statistical analyses identified a significant interaction of ER × emotion × block on IGT performance ($F(9, 34) = 3.7, p < 0.01, \eta^2 = 0.5$). Post-hoc tests indicated that participants who reappraised their negative affect displayed increased CD – AB scores in the third block of IGT, in comparison to the suppressors and controls who also experienced negative affect (Fig. 3.4.B).

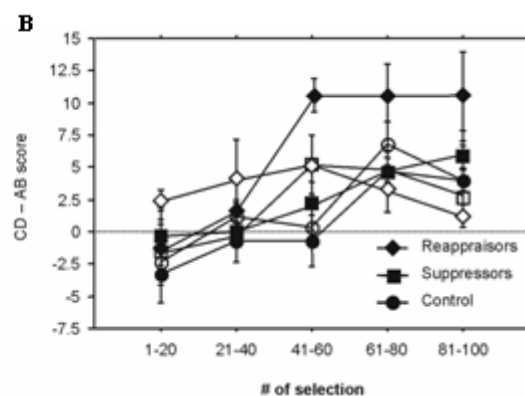
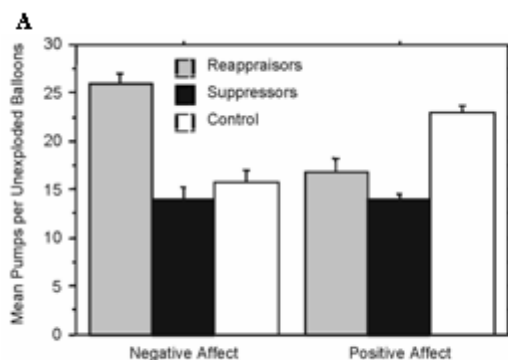


Fig. 3.4. *Behavioural performance of participants in BART (A) and IGT (B). In (B), solid symbols are for the negative affect condition, and open symbols are for the positive affect condition. Error bars indicate standard error of the mean.*

Discussions for studies 2 and 3

The present results indicate that acute cognitive reappraisal increases risk taking by effectively reducing the experience of negative emotions. In contrast, expressive suppression does not decrease risk aversion because it is ineffective in regulating unpleasant feelings. These effects were replicated in conditions that involved fear and disgust induced by movies in the laboratory, as well as naturally occurring negative emotions triggered by learning the previously overestimated result of an exam. The effects of ER on decision making were also investigated in conditions that involved naturally occurring positive emotions, where there were no differences in risk taking as a function of ER. This may indicate that in conditions (i.e., positive emotions) in which reappraisal and suppression are equally effective in reducing the experience of emotion, the difference in effortfulness between them does not further influence decision making. Therefore, these results suggest that ER affects decision making under risk and uncertainty by reducing the experience of emotion.

Previous studies showed that negative emotions such as anxiety increase risk aversion in BART (Maner et al., 2007) and impair decision making optimization in IGT (Miu, Heilman et al., 2008; Preston et al., 2007). Experimentally induced and naturally occurring fear is also associated with risk aversion and pessimistic risk appraisals (Lerner & Keltner, 2001; see also Gasper & Clore, 1998; Miu, Miclea, & Houser, 2008; Stöber, 1997). The magnitude of risk aversion induced by fear and disgust in the present study (i.e., the control conditions in Study 1) was similar to that reported in previous studies using BART (e.g., Maner et al., 2007). However, the aim of the present Study 1 was to investigate the effects of regulating the experience of these emotions using reappraisal or suppression on decision making under risk. We show for the first time that instructing participants to reappraise both fear and disgust significantly reduces the unpleasant experience of these emotions and consequently promotes risky decision making (or decreases risk aversion) in relation to both a control group as well as a group using suppression.

This effect was replicated in Study 2 in which participants incidentally used reappraisal to reduce the unpleasant feelings triggered by learning the previously overestimated result of an important exam and consequently displayed reduced risk aversion in BART. By effectively down regulating the experience of negative emotions, reappraisal contributes to an increased sense of emotional control that mitigates aversion to risky decisions. This interpretation accords well with previous results suggesting that the appraisal of control mediates the relationship between emotions and risk taking (Lerner & Keltner, 2001).

In contrast to reappraisal, suppression is ineffective in reducing the experience of negative emotions. Consequently, risk attitudes among suppressors are not changed in

relation to those experiencing negative emotions but not using ER strategies. Focusing on the ego-depleting capacity of self-regulation, several studies have argued that bad moods increase risk aversion and the suppression of these moods may augment this effect (Leith & Baumeister, 1996; Muraven et al., 1998). However, these studies have focused on emotions (e.g., embarrassment) that differ in important dimensions of appraisal (e.g., control), and sometimes failed to induce bad moods that significantly differ from neutral moods (see e.g., Study 2 in Leith & Baumeister, 1996). Our results offer compelling evidence that expressive suppression cannot mitigate risk aversion induced by negative emotions because it cannot decrease the experience of these emotions. At the same time, future studies might control for both the degree of effortfulness as well as the success of ER in reducing experienced emotions in order to compare the effects of ER on risk taking through emotional and non-emotional mechanisms.

A different mechanism may be involved in the effect of reappraisal on IGT. Previous studies have shown that the optimization of performance in IGT is influenced by somatic markers such as sympathetic increases in skin conductance that anticipate disadvantageous selections and adaptively bias decision making (Bechara et al., 1999). This role of somatic markers is especially important in the so-called “prehunch” period, when participants start to show a preference for advantageous decks without being yet able to tell why (Bechara et al., 1997). Negative emotions such as anxiety alter IGT performance by increasing the physiological noise that impedes somatic markers, along with the tendency to overwrite the adaptive influence of somatic markers through worry and rumination (Miu, Heilman et al., 2008; Preston et al., 2007). Reappraisal decreases sympathetic responses related to anticipation of reward (Delgado et al., 2008) and loss aversion (Sokol-Hessner et al., 2009), whereas suppression increases sympathetic activation (Gross, 1998a; Gross & Levenson, 1997). Therefore, the opposing physiological effects of these two ER strategies probably support the increased performance of reappraisers compared to suppressors in the transition from the “prehunch” to the “hunch” period in this study. In future psychophysiological studies, we intend to directly investigate the effects of ER on somatic markers and declarative learning in IGT.

Turning to positive emotions, previous studies have shown that happiness reduces risk aversion (Lerner & Keltner, 2001). This view is also supported by the results of the present Study 2 that showed reduced risk aversion in a condition that involved pleasant feelings triggered by learning the previously underestimated results of an exam. We show that the incidental use of reappraisal and suppression to control these positive emotions abolishes their effect on risk aversion. This effect is explained by the similar effectiveness of both ER strategies on reducing the experience of positive emotions (Gross, 1998a, 2002; Gross & Levenson, 1997). The only difference that exists between reappraisal and suppression in this condition is the increased effort associated with the latter (Muraven et al., 1998). However, we found no difference in risk taking between the conditions that involved the reappraisal and suppression of positive emotions. The implication is that the differential effectiveness of these ER strategies in reducing the experience of emotion (what we denoted above as the “emotional route”) seems to be the primary mechanism underlying their effects on risk attitudes.

The present results may also be viewed through the lens of cognitive neuroscience and neuroeconomics. Several studies offer convergent evidence on the key role played by

ventromedial prefrontal cortex (VMPFC) in reappraisal (Banks, Eddy, Angstadt, Nathan, & Phan, 2007; Goldin, McRae, Ramel, & Gross, 2008; Wager, Davidson, Hughes, Lindquist, & Ochsner, 2008). The functional connectivity between VMPFC and amygdala (Banks et al., 2007; Goldin et al., 2008), insula (Goldin et al., 2008), as well as nucleus accumbens (Wager et al., 2008) is perhaps connected to the success of reappraisal in reducing experienced emotions. Intriguingly, functional neuroimaging studies have shown that the recruitment of VMPFC is also central in IGT performance (Northoff et al., 2006). Indeed, its failure may result in altered risk taking that characterizes the performance of patients with substance dependence or gambling problems (Tanabe et al., 2007).

Further evidence suggests that reappraisal may increase the efficacy of emotion-cognition “brain hubs” (Pessoa, 2008), such as prefrontal-amygdala and prefrontal-mesolimbic circuits that support optimal decision making under risk and uncertainty. In particular, the insula and basal ganglia may be specifically involved in the anticipation of outcomes in IGT (Lin, Chiu, Cheng, & Hsieh, 2008), while voluntary risk taking in BART is believed to involve the activation of a frontal-mesolimbic pathway (Rao, Korczykowski, Pluta, Hoang, & Detre, 2008).

The finding that reappraisal affects risk attitudes is also relevant to health psychology and psychiatry. On the one hand, a reduced risk aversion due to habitual use of reappraisal may contribute to an enhanced well-being among the general population (Gross & John, 2003; see also Magar et al., 2008). On the other hand, biased risk aversion has been involved in the pathogenesis of affective disorders (Chandler, Wakeley, Goodwin, & Rogers, 2009), as well as addiction (e.g., George, Rogers, & Duka, 2005) and pathological gambling (e.g., Brand et al., 2005). Poor ER skills and reduced ER-related neural activation have also been described in anxiety (Goldin, Manber, Hakimi, Canli, & Gross, 2009). Therefore, training these patients in effective ER strategies such as reappraisal may provide a means of both enhancing their emotional control as well as reducing decision making biases.

The use of BART and IGT in this study had the advantages of task simplicity and increased interdisciplinary relevance due to their extensive applications in psychology, economics and neuroscience. However, future studies of ER and decision making might use other risk taking tasks (see e.g., Holt & Laury, 2002; Tom, Fox, Trepel, & Poldrack, 2007), which would allow the estimation of utility functions that drive choices. This might be important in order to determine whether reappraisal has distinct effects on the valuation of losses and gains, and would be an important step towards connecting ER to prospect theory (see e.g., Kahneman, 2003; Rangel et al., 2008). Ongoing investigations in our laboratory target the effects of ER on susceptibility to framing and cooperation in social decision making, highlighting the relevance of this line of research to economics. It would be profitable for future studies to replicate the present results using continuous measurements of the effects of ER on emotions experienced during the decision making tasks. This could be accomplished using systems such as the Affect Rating Dial (see Ruef & Levenson, 2007).

In conclusion, the studies reported here show that cognitive reappraisal changes risk attitudes. By efficaciously down regulating a negative emotion experience, reappraisal enables riskier decision making that does not occur either with expressive suppression or an absent ER strategy. Emotion has taken the centre stage in decision

theory, and with it ER promises to play an increasingly prominent role in psychology, economics and cognitive neuroscience.

Study 4

Our previous studies highlighted the impact of individual differences in ER on decisions under risk and ambiguity. In the present study we intend to investigate the mechanisms underlying the influence of ER on decision-making in IGT. We decided to focus solely on IGT performance due to the fact that this decisional task allows for the identification of an adaptive strategy that leads to advantageous outcomes. The scientific literature has found two components that contribute to a good decisional performance, namely declarative knowledge about the task (Bechara et al., 1997; Maia & McClelland, 2004) and implicit somatic markers influences, evaluated through electrical skin conductance (Bechara et al., 1997; Damasio, 1994; Bechara, Damasio & Damasio, 2000; Bechara, Tranel & Damasio, 2000).

During these last years a few studies emerged that question the explicative value of the somatic markers hypothesis and the role of physiological biases in guiding decisions. A recent review study (Dunn, Dalgleish & Lawrence, 2006) argues against the idea that somatic markers are the most important influence in guiding advantageous decisions and supports the idea that declarative knowledge about the task might be more important than previously recognized. For instance, Maia and McClelland (2004) showed that participants have detailed knowledge about the task at the time they start to manifest advantageous behavior. By using a more complex method to assess knowledge about the task, Maia and McClelland (2004) observed that declarative knowledge is positively correlated with behavioral performance. A recent study (Guillaume et al., 2009) supports the idea that both declarative knowledge as well as somatic markers are essential to adaptive decision making. More importantly, the two types of influences appear to be independent of one another, since the authors found no correlations between declarative knowledge and the skin conductance response.

Building on this debate in the field concerning the roles played by declarative knowledge in advantageous IGT performance, we wanted to investigate the influence that individual differences in ER might exert on the acquisition rate of verbal knowledge about the task. In other words, we wanted to investigate the relation between declarative knowledge about the task and behavioral performance, and to what extent is this relation affected by individual differences in ER. Moreover, we extended the ER strategies studied, so that we also included coping mechanisms as well as defensive mechanisms. Our research hypotheses were as follows:

- a) Declarative knowledge would be positively associated with advantageous performance.

- b) Habitual use of reappraisal would predict higher decisional outcomes as well as a better rate of declarative knowledge acquisition.

Since no previous studies investigated the other ER strategies in relation to IGT performance, we were not able to formulate specific hypotheses regarding the effects of the other regulatory strategies.

Materials and methods

Participants

48 healthy volunteers participated at this study ($N = 42$ women, mean age = 21.39 years). All of the participants were undergraduate students at the Babes-Bolyai University and they all signed an informed consent before taking part to the study.

Evaluation of declarative knowledge

The evaluation of declarative knowledge was done using a questionnaire similar to the one proposed by Maia and McClelland (2004). The questionnaire was administered 5 times, after each block of 20 cards selections.

ER strategies

In the current study we used several instruments to assess ER strategies. First of all, we used the ERQ (Gross & John, 2003; see the detailed presentation of the instrument in Study 1.1). Furthermore, we used the CERQ (see the detailed presentation of the instrument in Study 1.2) to assess cognitive ER strategies, *The Defense Style Questionnaire* (Andrews, Singh, & Bond, 1993, DSQ) and the coping strategies questionnaire, *Coping orientations to problems experienced* (Carver, Scheier & Weintraub, 1989, COPE).

Procedure

All the participants were tested by a female experimenter. After having received the instructions, participant played the IGT and completed the self-assessment instrument, in a balanced manner. After each block of 20 cards selections, participants had to answer the questions that would evaluate their level of declarative knowledge.

Results

Demographic data of our sample

In Table 2.3 we present the means and standard deviations of the participants' scores of the ER scales.

Table 2.3.
Individual differences in ER strategies use

		mean \pm s.d.		
		Total	Women	Men
ERQ	<i>Reappraisal</i>	5.06 \pm 0.91	5.05 \pm 0.88	5.1 \pm 1.19
	<i>Suppression</i>	2.91 \pm 1.08	2.91 \pm 1.08	2.87 \pm 1.21
CERQ	<i>Self-blame</i>	11.06 \pm 2.97	10.85 \pm 2.99	12.5 \pm 2.66
	<i>Acceptance</i>	12.27 \pm 3.36	12.04 \pm 3.41	13.83 \pm 2.71
	<i>Rumination</i>	12.95 \pm 2.98	12.85 \pm 3.04	13.66 \pm 2.65
	<i>Positive refocusing</i>	10.58 \pm 3.33*	10.28 \pm 3.27	12.66 \pm 3.26
	<i>Positive reappraisal</i>	14.12 \pm 4.49*	13.9 \pm 3.31	17.5 \pm 3.5
	<i>Refocus on planning</i>	14.35 \pm 3.51	13.57 \pm 4.07	18 \pm 5.72

	<i>Putting into perspective</i>	13.56 ± 4.03	13.61 ± 4.07	13.16 ± 4.07
	<i>Catastrophizing</i>	8.45 ± 3.48	8.69 ± 3.65	6.83 ± 2.48
	<i>Blaming others</i>	8.35 ± 2.55	8.5 ± 2.55	7.33 ± 2.5
DSQ	<i>Sublimation</i>	4.89 ± 1.76	4.78 ± 1.81	5.66 ± 1.16
	<i>Humour</i>	5.78 ± 1.18	5.63 ± 1.89	6.83 ± 1.12
	<i>Anticipation</i>	5.78 ± 1.57	5.72 ± 1.62	6.16 ± 1.21
	<i>Suppression</i>	5.06 ± 1.96	4.85 ± 2	6.5 ± 0.83
	<i>Undoing</i>	4.61 ± 1.74	4.63 ± 1.8	4.5 ± 1.41
	<i>Pseudo-altruism</i>	4.61 ± 1.74	4.63 ± 1.8	4.5 ± 1.41
	<i>Idealization</i>	5.5 ± 1.22*	5.64 ± 1.11	4.5 ± 1.54
	<i>Reaction formation</i>	5.05 ± 2.14	5.2 ± 2.11	4 ± 2.25
	<i>Projection</i>	2.92 ± 2.05	2.89 ± 2.04	3.16 ± 2.33
	<i>Passive aggression</i>	3.72 ± 1.72	3.86 ± 1.75	2.75 ± 1.25
	<i>Acting out</i>	4.93 ± 2.38	5.13 ± 2.38	3.58 ± 2.03
	<i>Isolation</i>	3.78 ± 1.9	3.9 ± 1.97	2.91 ± 1.06
	<i>Devaluation</i>	3.89 ± 1.42**	4.11 ± 1.32	2.33 ± 1.21
	<i>Autistic fantasy</i>	3.54 ± 1.86	3.54 ± 1.82	3.5 ± 2.32
	<i>Denial</i>	3.76 ± 2.01	3.66 ± 1.96	4.41 ± 2.43
	<i>Displacement</i>	3.09 ± 1.84	3.17 ± 1.91	2.5 ± 1.18
	<i>Dissociation</i>	3.96 ± 1.72	3.88 ± 1.64	4.58 ± 2.45
	<i>Splitting</i>	5.04 ± 2.26	5.16 ± 2.27	4.16 ± 2.13
	<i>Rationalization</i>	6.24 ± 1.44	6.17 ± 1.49	6.66 ± 0.93
	<i>Somatization</i>	5.1 ± 2.15	5.32 ± 2.08	3.58 ± 2.17
COPE	<i>Active coping</i>	12.4 ± 1.67	12.26 ± 1.65	13.33 ± 1.63
	<i>Planning</i>	13.48 ± 2.25	13.31 ± 2.29	14.66 ± 1.5
	<i>Behavioural disengagement</i>	10.85 ± 2.11	11.12 ± 1.83	10.83 ± 2.04
	<i>Humour</i>	10.08 ± 1.84	10.85 ± 2.18	10.83 ± 1.72
	<i>Use of instrumental support</i>	13.38 ± 2.17	13.58 ± 2.08	12 ± 2.44
	<i>Use of emotional support</i>	13.44 ± 2.07	13.61 ± 1.89	12.33 ± 3.01
	<i>Positive reframing</i>	13.42 ± 2.24	13.41 ± 2.25	13.5 ± 2.58
	<i>Acceptance</i>	12.68 ± 2.47	12.85 ± 2.45	11.5 ± 2.51
	<i>Denial</i>	7.46 ± 2.64	7.36 ± 2.7	8.16 ± 2.31
	<i>Venting</i>	7.46 ± 2.64	7.36 ± 2.7	8.16 ± 2.31
	<i>Religion</i>	12.25 ± 4.17	12.68 ± 3.68	9.33 ± 6.31
	<i>Self-distraction</i>	10.06 ± 2.56	10.14 ± 2.5	9.5 ± 3.14
	<i>Behavioral disengagement</i>	7.76 ± 2.19	7.85 ± 2.16	7.16 ± 2.56
	<i>Substance use</i>	1.1 ± 0.37	1.12 ± 0.4	1 ± 0

Note: * $p < 0.05$; ** $p < 0.01$ la t -tests – for sex differences.

Behavioural decision-making performance

Similar to the procedure described by Bechara et al. (1994), we divided the total number of selection in 5 blocks, each containing 20 card selections, as follows: 1-20, 21-40, 41-60, 61-80, 81-100. The total score for each block was computed by subtracting the

number of disadvantageous selections from the number of advantageous selections made in the corresponding block $[(C+D)-(A+B)]$. For each block we considered that a negative total score is indicative of a predominantly disadvantageous decisional performance (since the number of disadvantageous selections is bigger than that of the advantageous selections), whereas a positive score reflects a preference for advantageous selections (Bowman, Evans & Turnbull, 2005). A t-test on total CD-AB indicated that participants did not have a preference towards selections from the advantageous decks ($t(47) = 1.34$). A repeated measures ANOVA evidenced a significant improvement in decision-making performance across the blocks ($F[4, 47] = 8.93, p < 0.0001$; see Figure 2.9.A).

Declarative knowledge about the task

In the following phase we analysed the declarative knowledge questionnaires. In Figure 2.7.A. we represented the number of participants who displayed advantageous performance at each selection as well as their declarative knowledge indexes. As it is shown in Figure 2.7.A, for all the declarative knowledge measures, most of the participants have explicit knowledge about the task. In addition, one can observe the tendency for the declarative knowledge to be more rapidly and better developed than behavioural performance, which might be affected by an impulse decision-making style of the participant or his/her tendency towards exploration of the decks. In other words, we might say that most of our participants know more things about their decisional task than those used in guiding their behaviour. We also present the results obtained by Maia and McClelland (2004) to compare participants' levels of knowledge between the two studies.

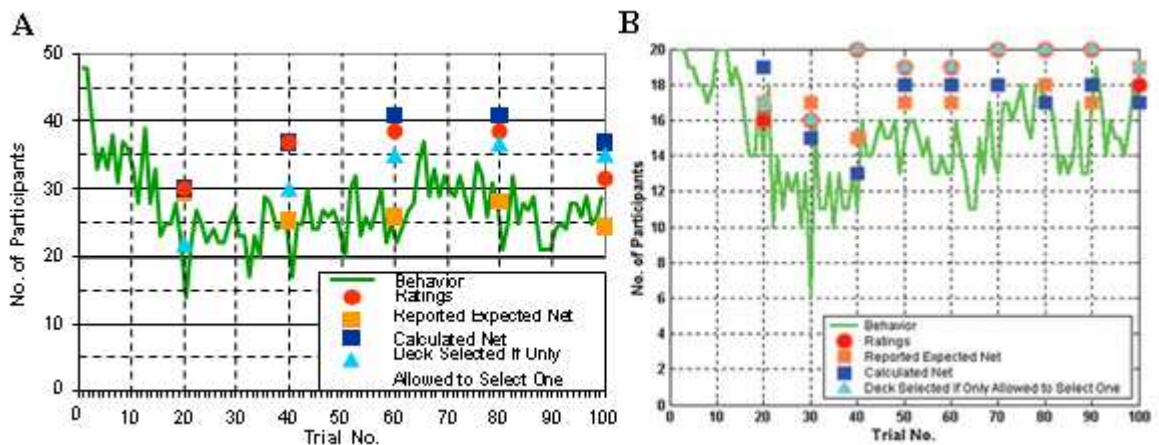


Fig. 2.7. Participants' knowledge that one of the two best decks is the best deck, as reflected in several verbal report measures, compared with participants' tendency to behaviourally select from one of the two best decks. (As mentioned in the text, we define the two best decks to be the two decks with the highest observed mean net outcome, according to each individual participant's sequence of observations up until the trial under consideration.) The green line shows how many participants actually picked one of the two best decks behaviourally. The red and cyan markers correspond, respectively, to the number of participants who gave the highest rating to one of the two best decks and the number of participants who said that they would select from one of the two best decks if they could only select from one deck. The square markers correspond to Level 2 knowledge. The light-brown marker corresponds to the number of participants who gave

the highest expected net to one of the two best decks, and the dark-blue marker corresponds to the number of participants who had the highest calculated net for one of the two best decks. (A) Behavioural performance and declarative knowledge of participants in Study 4. (B) Behavioural performance and declarative knowledge of participants in the Maia and McClelland (2004) study.

Next, we analysed the direct relation between behavioural performance and declarative knowledge. There was no significant correlation between the total CD-AB score and declarative knowledge level ($p = 0.09$). Nevertheless, we found that declarative knowledge and behavioural performance were positively correlate for each block of selections $r(46) = .24, p = 0.0007$ (see Fig. 2.9.). This result confirms our hypothesis regarding a positive association between declarative knowledge and behavioural performance.

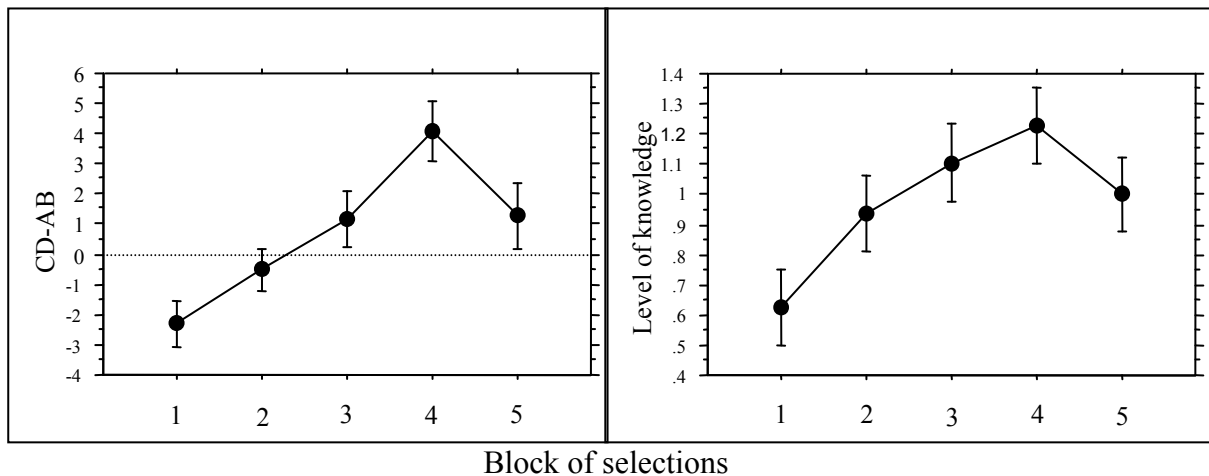


Fig. 2.9. Behavioural performance (A) and participants' declarative knowledge (B)

Individual differences in ER and their effect on behavioural performance and declarative knowledge

We analysed the effect of individual differences in ER on behavioural performance and rate of acquisition of declarative knowledge. The correlation analyses indicated that there is a significant positive association between reappraisal and behavioural performance ($r = 0.289$; see Table 2.4.), thus partially confirming our second hypothesis. There were no other significant associations between ER strategies and behavioural performance or level of declarative knowledge about the decisional task.

General discussions

Our aim in the current study was to further investigate the interactions between ER strategies and mechanisms through which they might influence behavioural decisional performance. Considering that there are some controversies in the literature about the role declarative knowledge might play in decision-making, we wanted to see if Er strategies influence decision-making by affecting the rate of acquiring declarative knowledge. We expected to identify a positive association between behavioural

performance and level of explicit knowledge, and that different ER strategies have specific effects. More specifically, we expected to find a positive impact of reappraisal on decision-making, and a negative effect of habitual use of suppression.

Our results indicate that participants progressively improve their behavioural performance through the decisional task and that these improvements are reflected in their knowledge level. Therefore, participants who demonstrated better behavioural outcomes also had higher levels of declarative knowledge to rely on. Summing up, our results confirm our first experimental hypothesis and they offer further support to the role of declarative knowledge, thus confirming the results obtained by Maia and McClelland (2004).

An important aspect that has previously been neglected is the degree to which participants rely on their declarative knowledge when making choices. Even if previous studies (Maia & McClelland, 2004; Bechara et al., 1996) showed that participants had declarative knowledge that might explain for the adaptive behaviour, it was not investigated how much participants use their knowledge. For this purpose, we included two new questions in our questionnaire so that we could measure the subjective level of knowledge as well as participants' evaluation on how much they relied on their knowledge. Our data confirm that participants who think they know many things about the task itself also tend to make use of their knowledge more than those who think have less declarative knowledge. Even if this effect does not assure a causal relation between subjective declarative knowledge level and the use of this information, this is the first study to indicate such an association.

Our study's second hypothesis referred to the association between ER strategies and decisional performance and declarative knowledge, respectively. We expected to identify a positive correlation between reappraisal and the two major aspects of decisions and a negative correlation between suppression and decisions. Moreover, we extended the number of ER strategies investigated, so that we also measured individual differences in cognitive ER, behavioural and cognitive coping as well as defensive mechanisms. The results offer partial support for our hypothesis. Namely, we found that habitual use of reappraisal was positively associated with behavioural performance in IGT. No other associations were significant. One reason for which we might have not been able to identify more effects relates to the fact that, unlike in our previous two studies, in this experiment we did not manipulate participants' emotional states and their use of ER. Nevertheless, these results offer further support for the adaptive effects of using reappraisal as an ER strategy.

In conclusion, our study builds on previous research and offers further empirical support for the implication of declarative knowledge in adaptive decision-making performance, as it is suggested by Maia and McClelland (2004). In addition, this study completes the results of our first two studies involving IGT as a risk-taking decisional task and the role of individual differences in ER strategies (Heilman et al., 2010). More specifically, we offer confirmation of the adaptive role of reappraisal as a habitual ER strategy.

Chapter 4 Emotion regulation and the framing effect

For centuries, economists referred to the normative models when judging whether a decision is rational or not. Although the definition of rationality has been largely debated, there is a general agreement that rational choices should, among others, satisfy an invariance requirement (Tversky & Kahneman, 1981). According to the invariance principle, the preference between options should be independent of their description (Tversky & Kahneman, 1986). In other words, when the options of the same situation are presented in different frames, this presentation should not influence people's preference for one option or another. However, an extensive body of evidence piles against the rationality of the decision-maker by proving that people do not act according to this principle and are, in fact, predisposed to consistent decisional biases.

One of the most studied violations of the invariance principle is the framing effect, where extensionally equivalent descriptions lead to different choices by altering the relative salience of different aspects of the problem (Kahneman, 2003). This effect was first demonstrated through the *Asian Disease Problem* (Tversky & Kahneman, 1981), which showed that people display risk aversion when alternatives are framed as gains, and risk seeking when objectively equivalent alternatives are framed as losses (Tversky & Kahneman, 1981). Ever since the first appearance of this classic problem, hundreds of studies have been published that provide further support for this general decisional bias.

Among the task-related aspects that were invoked to explain this decisional preference, in the last decade scholars have turned their attention to the role that emotions might play in the evaluation of the options (Kahneman, 2003) and even more recently ER became part of the explanation.

A study conducted by De Martino and co-workers (2006) provides objective evidence for the role of emotions in the framing effect, by showing that this decisional bias was associated with increased amygdala activity and was negatively predicted by orbital and medial prefrontal cortex activity. Thus, the authors conclude that the framing effect might be the consequence of an affect heuristic by which individuals incorporate emotional information in their decisional process (De Martino et al., 2006). Yet another study (Talmi et al., 2010) shows that patients with amygdala lesions as a result of Urbach-Wiethe disease display the same framing effect as neurologically intact controls, although the experimental group also manifested a higher frequency of risk taking in both frames. More recently, the positive involvement of ER in rational decision-making has been suggested by a report that highlighted the superiority of reappraisal over simply attending a series of economic gambles in reducing behavioural loss aversion and arousal responses related to loss aversion (Sokol-Hessner, 2009). Other studies provide further support for the ER-decisional processes interaction by implying that ER impairments due to ventromedial prefrontal cortex lesions (Koenings & Tranel, 2007), dysfunctional serotonin signalling (Crockett et al., 2008), or a common genetic polymorphism of the human serotonin transporter gene (Crişan et al., 2009; Roiser et al., 2009) might account for irrational economic decisions.

Although previous scholars have only hypothetically related ER and susceptibility to framing effects, by referring to the emotions experienced by participants

in a framing task, the neural networks involved in supporting emotion-guided and rational behaviour, or dysfunctional serotonergic functioning, until now there were no studies that directly investigated this complex relationship. Crişan and Miu (in press) conducted the first study that addressed this issue in two economic framing decision-making tasks. Their results indicate that cognitive reappraisal reduces participants' susceptibility to framing, thus guiding them towards economic rationality, whereas suppressors are more prone to framing biases Crişan and Miu (in press). In order to build on this first empirical result, we further investigated the effects of individual differences in ER on risk attitudes in framing problems that addressed aspects related to health, financial and nature issues (Heilman, Miclea & Miu, 2010). In accordance with the large majority of studies that have highlighted a framing effect, we also found that participants showed a significant preference for risky choices in the loss frame and for the risk averse choices in the gain frame, for all three problem domains. More importantly, our results indicated a major impact of ER on risk preference, with ER strategies accounting for up to 46.9% of the total variance. When we analyzed our data by looking at each framing problem category, we found that regulatory strategies were more relevant for domains related to human life, such as financial or health related issues, than nature-related aspects (Heilman, Miclea & Miu, 2010). To the best of our knowledge, this is the first study to have investigated the complex interaction between ER and framing effects in problems that mimic real life situations. Nevertheless, studies so far lead to the conclusion that people's choices not only are determined by the regulatory strategies employed, but that people can change how they decide, by using different ER strategies (Sokol-Hessner, 2009).

Study 5

The major aim of the current study was the evaluation of the effects of ER strategies on susceptibility to framing effects. To increase the ecological validity of the decisional situations used, we selected decisional problems that are similar to the original Asian Disease Problem. Because this is the first study that has ever approached the interaction between ER strategies and framing effects across life domains, we were not able to form specific hypotheses. Nevertheless, we did expect to find different ER strategies to be involved in risk-taking or risk-aversion behaviour in our decisional situations.

Materials and methods

Participants

We randomly selected 82 healthy participants for this study from the Babes-Bolyai undergraduate students' population (69 women, age: 27.134 ± 7.529 years). Before taking part to the experiment, all participants signed an informed consent that respects the requirements of the Helsinki Declaration regarding experimental procedures (1965/2004).

Materials

All participants were presented with nine decisional problems that referred to situations similar to the one described in the Asian Disease Problem. Half of the participants received the problems in a positive frame, whereas the other half received the same problems in negative frame. The problems referred to health issues (2 problems),

financial issues (3 problems) and situations involving animals and objects (4 problems). The problems are presented in Table 4.2 of the thesis.

In order to measure participants' positive and negative emotions, before and after the presentation of the decisional problems, we used the Positive and Negative Affect Schedule – Expanded Form (PANAS-X; Watson & Clark, 1999). Also, ER strategies were evaluated by using the ERQ (Gross & John, 2003) and the CERQ (Garnefski, Kraaij, & Spinhoven, 2002).

Results

Demographic data

The first step in the data analysis was the evaluation of the demographic data and individual differences in ER strategies, and emotional states of participants in the two experimental procedures (gain vs. loss frame). All the data is presented in Table 4.3 of the thesis.

Manipulation checks

The emotional valence was significantly different between conditions (gain vs. loss) only for financial problems, indicating that problems that were framed as the loss condition were perceived as more negative than those framed as gains ($t(81) = 3.53, p < 0.001$). For the other two categories of problems, there were no significant differences regarding emotional valence depending on the terms that the problems were framed in. Emotional arousal was found to be highest for health related issues, compared to financial or animals and nature problems, in both frames. The main effects and differences regarding valence or arousal associated with problems in gain and loss frames are presented in Fig. 4.1.

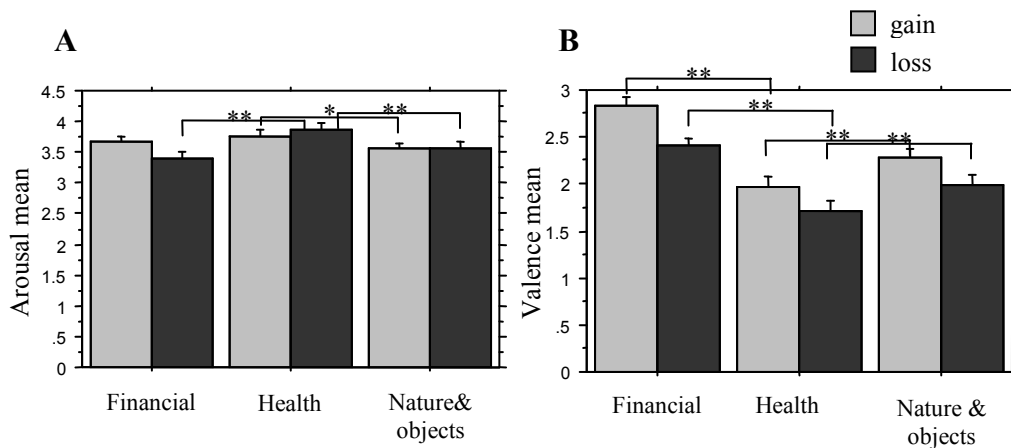


Fig. 4.1. Mean levels of arousal and valence, depending on the experimental condition (gain vs. loss frame).

Behavioural performance

A one-way ANOVA highlighted a significant effect of framing, with participants selecting the risky option in the loss frame compared to the gain frame $F[1, 80] = 38.627, p < 0.0001$ (post-hoc: mean diff = -0.295, critical diff = 0.094, $p < 0.0001$) (Fig. 4.2). Similar analyses evidenced the persistence of framing effects for problems that concerned health issues, $F[1, 80] = 38.816, p < 0.0001$, (post-hoc: mean diff = -0.493, critical diff =

0.138, $p < 0.0001$) and objects and nature issues $F[1, 80] = 31.337$, $p < 0.0001$ (post-hoc: mean diff = -0.354, critical diff = 0.126, $p < 0.0001$). For financial issues related problems, participants did not exhibit framing effect, but we observed a general tendency towards risk aversion in both frames of the financial problems (post-hoc: mean diff = -0.113, critical diff = 0.129, $p = 0.0857$).

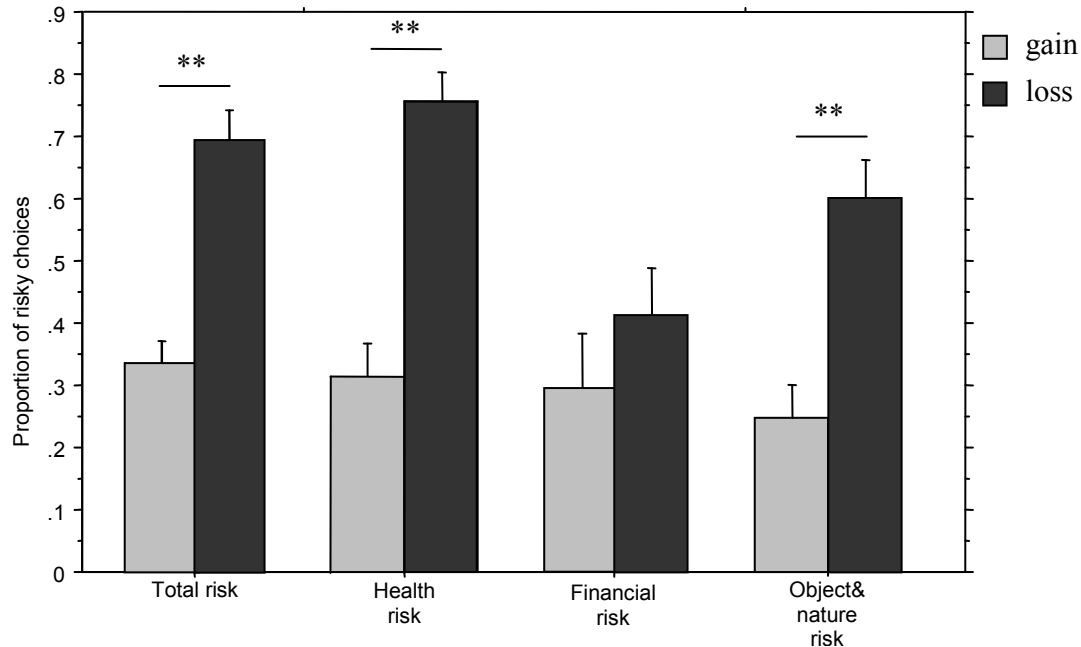


Fig. 4.2. Proportion of risky choices depending on the problem domain and framing of alternatives

ER strategies and behavioural performance

In a logistic regression analysis we tested the effects of the ER strategies on the participant's preference for the risky alternative. For the problems in which at least one ER strategy had a significant effect we found that individual differences accounted for up to 49% of the total variance. We tested separately the association between ER strategies and selection of risky choice for each problem presented in gain frame as well as for each problem presented in loss frame. The main results regarding significant predictors in gain frame are presented in Table 4.5. In Table 4.6 we present the main ER strategies that act like significant predictors for outcome selection in loss frame.

Table 4.5.

ER strategies that significantly predict the selection of risky choices in the gain frame

		B(SE)	Wald	Exp(B)	95% CI for		R ²
					Exp(B)		
					Low	High	
S1	<i>Self-blame</i>	-0.554 (0.278)	3.971*	0.575	0.333	0.991	0.22
F1	<i>Acceptance</i>	0.620 (0.289)	4.591*	1.859	1.054	3.278	0.49

	<i>Putting into perspective</i>	-0.575 (0.284)	4.103*	0.562	0.322	0.982	
F2	<i>Acceptance</i>	0.984 (0.475)	4.281*	2.674	1.053	6.79	0.48
	<i>Refocus on planning</i>	-1.842 (0.797)	5.346*	0.159	0.033	0.755	
F3	<i>Suppression</i>	1.565 (0.751)	4.343*	4.785	1.098	20.858	0.31
	<i>Positive reappraisal</i>	-0.595 (0.3)	3.932*	0.552	0.306	0.994	
NO4	<i>Positive reappraisal</i>	0.580 (0.268)	4.676*	1.786	1.056	3.022	0.35

Note: * $p < 0.05$, R^2 Hosmer - Lemeshow.

Table 4.6.

ER strategies that significantly predict the selection of risky choices in the gain frame

		B(SE)	Wald	Exp(B)	95% CI for		R^2
					Exp(B)		
					Low	High	
S2	<i>Rumination</i>	0.338 (0.172)	3.860*	1.402	1.001	1.965	0.34
NO1	<i>Suppression</i>	-1.142 (0.549)	4.32*	0.319	0.109	0.937	0.27
NO4	<i>Acceptance</i>	-0.562 (0.236)	5.644*	0.57	0.359	0.906	0.33

Note: * $p < 0.05$, R^2 Hosmer - Lemeshow

General discussions

In the present study we aimed at investigating the relations between eleven ER strategies and predisposition to framing effects for three domains related to human life. Our main results show that individual differences in ER strategies account for a significant part of participants' predisposition towards framing effects.

The decisional outcome, evaluated through the frequency of selection of the risky choice, indicated that participants manifested framing effects for the problems pertaining to the health and nature and objects domains. This result is in agreement with other previous studies, showing the same decisional pattern (Bloomfield, 2006; Schneider, 1992; Petres & Levin, 2008). For the financial domain, there was no framing effect due to the fact our participants were more inclined towards risk aversion, irrespective of the frame. One explanation regarding the lack of framing effect in our sample might be related to the general pattern of sex differences in risk taking. It is widely accepted that women are more risk-averse than men and this may have biased our results. Nevertheless, our study does bring in the attention focus of researchers the fact that framing effects might be sensitive to decision-making domains. That is, different domains yield different decisional outcomes (Kusev et al., 2009; Mandel & Vartanian, 2010; Kühberger, 1998).

The most important empirical contributions of the present study are related to the impact of individual differences in ER on susceptibility to framing. Our results show that there are significant ER predictors that act towards reducing the framing effect – thus increasing economic rationality, as well as there are ER strategies that increase the magnitude of the framing effect. The association between ER strategies and framing differs according to the domain upon decision are made on. The total variance in framing susceptibility that is explained by ER strategies is similar to the one reported in studies that have investigated individual differences in personality traits in these types of decisional situations (Lauriola et al., 2005; Levin, Schneider & Gaeth, 1998).

Summing up, this is the first experimental study that investigated the role played by ER strategies in susceptibility to framing, in various problems relevant to three different human life domains. Our results offer further support to the recent idea that including emotions and regulatory strategies in experimental context designed to measure decision-making, one might obtain better suited models that predict and explain decisional outcomes.

Chapter 5 Emotion regulation and fairness

Cooperation between genetically unrelated strangers has evolved as an adaptive mechanism for the survival of the species, since many objectives are achieved more efficiently if people cooperate. However, successful cooperation requires complicated decisions on how resources should be divided among collaborators (Van den Bergh & Dewitte, 2006). For this purpose, fairness norms are particularly important. Over the last several decades, economic games have advanced our understanding of essential aspects of human decision-making, such as fairness-based altruism, strategic cooperation, and betrayal aversion (Aimone & Houser, 2008; E. Fehr & Rockenbach, 2003; Haselhuhn & Mellers, 2005; Kiyonari & Barclay, 2008). One example of such a game is the Ultimatum Game (UG), a simple bargaining task in which a proposer shares an amount of money with a responder, under the rule that if the latter accepts the offer, the amount is split according to the proposal. If, however, the responder rejects the offer, neither participant receives any money.

The UG illustrates the tension between self-interest and reciprocity and equity motives in a social decision situation (Güth et al., 1982). Here we use an UG to investigate the role of emotion regulation on inequity aversion. The standard form of the UG involves two players. One of them, known as the proposer, has to make a monetary offer to the second player, the responder, concerning an amount of money that the two must split between them. The responder can either accept or reject the offer. If the offer is accepted, then the money is split as proposed. But if the responder rejects the offer, then neither player receives anything. Both players are fully aware of the rules and consequences of the game. The UG is typically played with real money, provided by the experimenter. Based on the two major economic assumptions regarding human nature, namely the decision maker's rationality and his/her self-regarding preferences (Camerer & Fehr, 2006), the normative solution for this decision-making task would be for the proposer to offer as little money as possible and for the responder to accept any nonzero offer. Nevertheless, the large majority of the proposers offer about 50% of the pot to the

responders, and responders accept roughly only half of the unfair offers, defined as 20% or less of the total amount of money (Camerer, 2003). Responders are more likely to reject unfair offers made by human proposers than equally unfair offers made by computers. Not surprisingly, this tendency (i.e., inequity aversion) is supported by activation of socio-emotional neural circuits (Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003). As a result, the UG offers a window into how emotions and social framing influence decision-making.

Studies in behavioural economics and neuroeconomics demonstrate that task-related and incidental emotions impact UG behaviour. Responders associate unfair offers with anger, sadness, irritation, or contempt (Bosman, Sonnemans, & Zeelenberg, 2001; Pillutla & Murnighan, 1996), while they associate fair offers with happiness (Tabibnia, Satpute, & Lieberman, 2008). The rejection of *unfair* offers is associated with activation of the insula, which scholars have linked to the experience of anger and disgust (Sanfey et al., 2003). In contrast, the acceptance of unfair offers activates the dorsolateral prefrontal cortex, which is involved in self-regulation (Mitchell et al., 2007). The acceptance of *fair* offers activates reward areas of the brain, such as the ventral striatum, the amygdala, and the ventromedial prefrontal cortex (Sanfey et al., 2003; Tabibnia et al., 2008). Finally, the UG is also influenced by incidental emotions. For example, laboratory-induced sadness, but not amusement, reduces the acceptance rate of unfair offers (Harle & Sanfey, 2007). Anxiety has also been investigated in decision-making under uncertainty and risk (Miu, Heilman, & Houser, 2008; Miu, Miclea, & Houser, 2008; Preston, Buchanan, Stansfield, & Bechara, 2007), but its effects on UG behaviour are currently unknown.

Recent studies have begun to uncover factors that may serve as potential mediators of the effects of emotion on decision-making. For example, factors previously shown to influence UG behaviour include whether a participant relies on his/her emotions, or communicates his/her emotions to the proposer (Stephen & Pham, 2008; Xiao & Houser, 2005). Scholars have also acknowledged that ER might mediate the effects that task-related and incidental emotions have on UG and other types of decision-making (Crockett, Clark, Tabibnia, Lieberman, & Robbins, 2008; Kahneman & Frederick, 2007). ER deals with the processes controlling which emotions people have, when they have them, and how they experience and express them (Gross, 2002; Ochsner & Gross, 2005). Different ER strategies have been identified, and the process model of ER distinguishes them according to the stage of the emotion-generative process that they impact (Gross, 2002).

Study 6

Since numerous studies in behavioural economics and neuroeconomics demonstrate that emotions have an impact on UG behaviour, it is reasonable to assume that also ER might influence decision-making. Even though this line of research is still in its infancy, scholars have already acknowledged that ER might mediate the effects that task-related and incidental emotions have on UG and other types of decision-making (Kahneman and Frederick 2007; Crockett, Clark et al. 2008). For instance, one study found that individual differences in ER help to explain 55% of the variance in

negotiators' profit in a simulated negotiation (Yurtsever 2008). However, only recently was directly addressed a possible mediating effect of ER on the complex relation between emotion and decision-making.

The present study focuses on the effects of individual differences in cognitive reappraisal and expressive suppression on behaviour in a binary UG, where offers must be either unfair or hyper-fair. Using a binary UG allowed us to increase the number of proposers making extreme offers (which is otherwise below 15% in typical Romanian samples) (Heilman, Miu, Opre, & Houser, 2006), while also contrasting two conditions clearly differing in their chance of rejection.

In order to test the effects of ER in an emotionally arousing situation, the experiment was conducted immediately prior to an exam. This approach to inducing anxiety is advantaged by high ecological validity, and has been extensively used in research in the cognitive psychology of anxiety (Mathews & MacLeod, 2005; Williams, Mathews, & MacLeod, 1996).

The literature on ER is still new, and we are not aware of any previous studies directly informing the role of ER in UG behaviour. Indeed, our study is the first in this area and, consequently, in part unavoidably exploratory. Nevertheless, it is natural to hypothesize that habitual ER users would be generally more tolerant of inequality, and thus display an increased willingness to accept unfair offers.

Materials and methods

Participants

The study included 520 participants ($N = 455$ women) selected from the Babes-Bolyai University campus, all of whom signed an informed consent agreement. They were randomly assigned to play either the proposer or responder role. The participants received a fee for agreeing to take part in the study, in addition to the amount they earned in the UG. Therefore, they received between 10Ron and 38Ron.

ER and SA questionnaires

Gross and John's ER Questionnaire (ERQ) was used. This is a brief, 10-item questionnaire that quantifies the habitual use of cognitive reappraisal and expressive suppression (Gross & John, 2003). We also used the state portion of Spielberger's State-Trait Anxiety Inventory (STAI-S; Spielberger, 1983; for the Romanian version, see H. Pitariu & C. Peleasa, 2007). ERQ was administered several days before the experiment, whereas STAI-S was administered immediately before or after playing the UG, in a balanced fashion.

UG procedure

The proposers and responders were separated in different rooms and remained anonymous to each other. However, participants clearly understood that the bargaining partner was a person waiting in another room. The proposers were instructed to choose between splitting 35Ron so that they keep 28Ron and give only 7Ron to the responder (unfair offers), or vice versa (hyper-fair offers). The standard rule was communicated to all players. If the responder accepted the offer, money was split according to the offer; in case of rejection, neither of the two players received anything.

Data analyses

We planned to compare measures related to UG behaviour in high vs. low scorers on SA, expressive suppression or cognitive reappraisal, in order to check for the direct

effects of these variables. However, considering the possibility that the effects of ER might differ as a function of the emotional state, the comparisons between high and low scorers on expressive suppression or cognitive reappraisal were separately repeated for the anxious and non-anxious conditions. Additionally, we compared high scorers on expressive suppression or cognitive reappraisal with one another to investigate the possibility that the habitual use of any ER strategy would affect UG behaviours.

Results

In Table 5.1 we present the demographic data of our sample. There were no significant differences between proposers and responders in regard to their age, state anxiety levels, or use of reappraisal and suppression.

Table 5.1
Demographic data

	Sex	Age (mean ± sd)	SA (mean ± sd)	Reappraisal (mean ± sd)	Suppression (mean ± sd)
Proposers	N = 231	20.5033 ±	43.5098 ±	5.1160 ±	3.1778 ±
	women	4.17	11.51	1.02	1.16
Responders	N = 224	20.4868 ±	41.6769 ±	5.0965 ±	3.2991 ±
	women	3.83	11.16	0.97	1.29

Proposers

Overall, significantly more participants made hyper-fair rather than unfair offers ($\chi^2 = 4.985$, $p < 0.05$). In order to test for a moderating effect of SA on the ER – offer type relation, we included SA, reappraisal and suppression in a logistic regression. SA, reappraisal or suppression did not significantly predict the offer type, nor did the interaction variables (SA*reappraisal and SA*suppression).

Next, we used a median split to compare the frequencies of unfair and hyper-fair offers according to SA, expressive suppression and cognitive reappraisal. There were no significant differences in the frequencies of unfair and hyper-fair offers in high vs. low SA, and habitual vs. non-habitual suppressor or reappraisers (Table 5.2)

In order to analyze the possible interactions of SA and ER, the comparisons between habitual and non-habitual suppressors and reappraisers were separately repeated in the anxious and non-anxious groups (Table 5.3). These analyses indicated that in high SA, habitual suppressors made significantly more unfair offers than non-habitual suppressors ($\chi^2 = 4.89$, $p < 0.05$). No other difference was found significant.

Table 5.3

Anxious vs. non-anxious proposers: Comparisons of proposers' offers by cognitive reappraisal and expressive suppression

		SA			
		Low		High	
		<i>Reappraisal</i> (low vs. high)	<i>Suppression</i> (low vs. high)	<i>Reappraisal</i> (low vs. high)	<i>Suppression</i> (low vs. high)
Offers	Unfair	$\chi^2 = 0.02$ (n.s.)	$\chi^2 = 1.04$ (n.s.)	$\chi^2 = 0.01$ (n.s.)	$\chi^2 = 4.89$ ($p < 0.05$)
	Hyper-fair	$\chi^2 = 0.23$ (n.s.)	$\chi^2 = 1.47$ (n.s.)	$\chi^2 = 0.13$ (n.s.)	$\chi^2 = 1.17$ (n.s.)

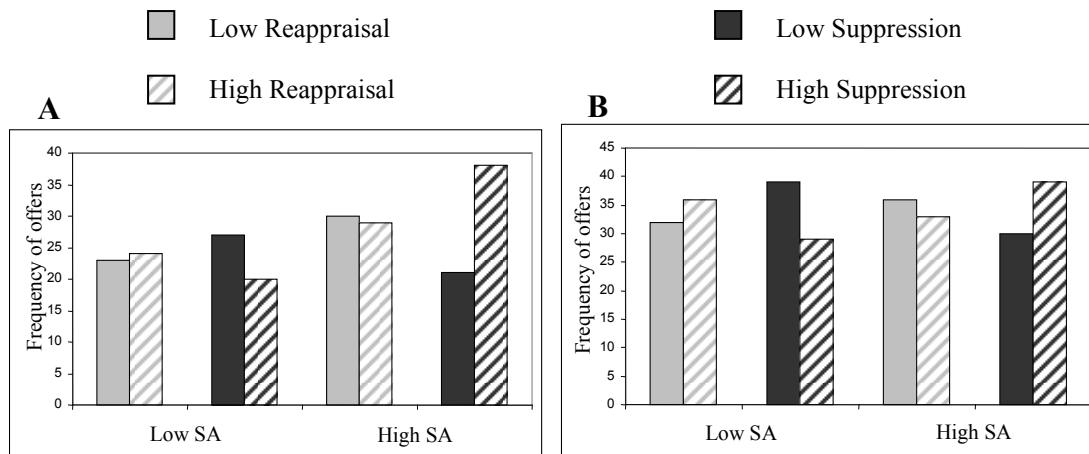


Fig. 5.1. (A) Frequency of unfair offers, depending on ER strategies and SA; (B) Frequency of hyperfair offers, depending on ER strategies and SA

Responders

Significantly more responders accepted rather than rejected the offer they received ($\chi^2 = 71.479$, $p < 0.001$). The acceptance frequency for hyper-fair offers was significantly higher than the acceptance frequency for unfair offers ($\chi^2 = 7.03$, $p < 0.01$), whereas there were no differences between rejection rates for the two types of offers ($\chi^2 = 1.19$, n.s.). Next, we tested a potential moderating impact of SA on the effect of ER on acceptance rates. The main effects of this regression analysis are presented in Table 5.4.

Table 5.4

Moderation analysis using logistic regression

		B(SE)	Wald	Sig.	95% CI for Exp(B)		
					Exp(B)	Lower	Upper
Block 0	Constant	2.494** (0.245)	103.432	0.000	12.111		
	SA	0.054* (0.027)	4.161	0.041	1.056	1.002	1.112
Block 1: Method=	Reappraisal	-0.089 (0.269)	0.110	0.740	0.915	0.540	1.549
Enter	Suppression	0.351 (0.209)	2.803	0.094	1.420	0.942	2.140
	Constant	2.677** (0.290)	85.326	0.000	14.536		
	SA	0.071* (0.030)	5.491	0.019	1.074	1.012	1.140
	Reappraisal	0.098 (0.294)	0.112	0.738	1.104	0.620	1.964
Block 2: Method=	Suppression	0.324 (0.232)	1.938	0.164	1.382	0.876	2.180
Enter	SA*Reappraisal	0.055* (0.022)	6.061	0.014	1.057	1.011	1.104
	SA*Suppression	-0.008 (0.019)	0.180	0.672	0.992	0.995	1.030
	Constant	2.872** (0.331)	75.270	0.000	17.679		

Note: $R^2 = 0.1016$ (Hosmer & Lemeshow), 0.053 (Cox & Snell), 0.128 (Nagelkerke). Model $\chi^2 (5) = 12.235$, $p = 0.024$.

* $p < 0.05$; ** $p < 0.01$

Next, we analyzed the parameters of the model in Block 2, including the previous predictors and the interaction effects between SA and reappraisal, and SA and suppression, respectively. The new model is a significant improvement from the baseline model ($\chi^2 (5) = 12.931$, $p < 0.05$) and also this improvement is significant compared to the previous model ($\Delta\chi^2 (1) = 7.137$, $p < 0.01$). This difference indicates that the inclusion of the interaction variables significantly increases the model's ability to predict the acceptance of an offer. The interaction variable that is accountable for this effect is SA*Reappraisal. The Exp(B) coefficient suggests that the odds of accepting an offer increase when the interaction variable increases by one unit. Also, SA remains a significant predictor for acceptance rates. The new model's explanatory power reaches 10% of the entire variance in acceptance rates ($R^2 = 0.1016$ (Hosmer & Lemeshow), 0.053 (Cox & Snell), 0.128 (Nagelkerke)). In Figure 5.2 we present the main interaction effects.

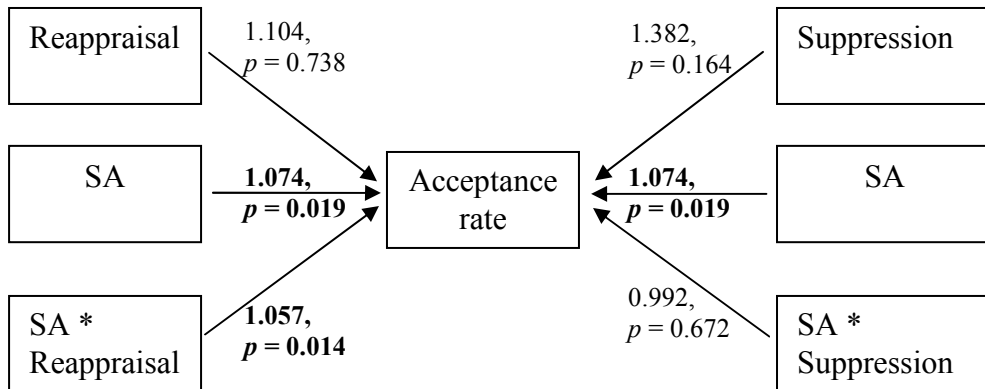


Fig. 5.2. AS and ER effects on acceptance rate of unfair offers. Values represent $Exp(B)$ coefficients and their significance threshold.

We further analysed the moderation effect on acceptance and rejection rates of unfair offers (Fig. 2.3). Our results revealed that high SA responders have a lower rejection rates when the habitually use reappraisal ($\chi^2 = 4.5, p < 0.05$). When looking at acceptance rates of unfair offers, we found an interaction between reappraisal and SA. Non-habitual reappraisers accept more unfair offers when they are in high SA states. On the other hand, habitual reappraisers accept fewer unfair offers when they are in high SA.

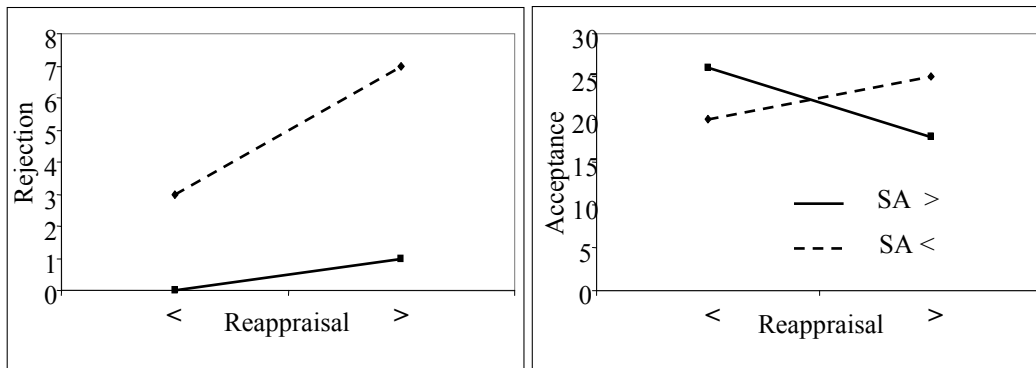


Fig. 5.3. SA and reappraisal interaction on rejection and acceptance frequency of unfair offers.

General discussions

The present study presents new results on the impact of ER strategies on decisional behaviour in UG, for both players. For the proposers, SA interacts with the use of suppression to modulate decisional behaviour. In high states of SA, habitual suppressors make significantly more unfair offers compared to non-habitual suppressors. For the responders, their behaviour was influenced more by their use of reappraisal as a

habitual ER strategy. Low reappraisers who find themselves in high states of anxiety display inequity tolerance through their high acceptance rates of unfair offers.

In light of previous observations that in Romanian samples (Heilman et al., 2006), the great majority of UG players made 50/50 offers, and considering the focus of our hypotheses on emotionally-arousing other-than-fair offers, we used an UG in which proposers could only make unfair and hyper-fair offers. This created opposing situations in which the conflict between inequity aversion goals and self-interest goals was high (A. Falk et al., 2008). In proposers, unfair offers indicate that self-interest goals dominate decisions, despite increased risks of having the offer rejected. These offers are likely to elicit rejections, which are driven by the responder's aversion to inequity and the need to sanction it. However, the norm of economic rationality is that any gain, however small, is better than nothing. Therefore, efficient ER strategies might be key to enabling one to accept unfair offers (Crockett et al., 2008).

Cognitive reappraisal acts before an emotion develops (e.g., the anger, sadness, irritation or contempt elicited by unfair offers; see (Bosman et al., 2001; Pillutla & Murnighan, 1996) and is efficient in down-regulating the intensity of negative emotions. In contrast, expressive suppression acts after emotions have developed and takes increasing effort to actively inhibit prepotent emotional responses (e.g., the need to sanction inequity), therefore contributing to cognitive load (Gross, 2002). We predicted that habitual use of either one of the two ER strategies would be associated with increased acceptance rates of unfair offers, thus making the responders more rational in economic terms. The present results, however, indicate that only the habitual use of expressive suppression increases the probability of accepting unfair offers, both in comparison to the non-habitual use of suppression, and the habitual use of reappraisal. This may be due to more active monitoring of internal states (e.g., negative emotions elicited by unfair offers), which is associated with the increased perfusion of a network of neural structures that includes the ventromedial, but also dorsolateral prefrontal cortex, and the insula (Ablner, Hofer, & Viviani, 2008). Note that these areas are involved in responding to unfair offers (Knoch, Pascual-Leone, Meyer, Treyer, & Fehr, 2006; Sanfey et al., 2003). Even so, our results suggest this effect may be limited to situations that do not involve intense negative emotions such as anxiety.

A novel advantage of our study is that our decision task required choices between extremely generous or extremely selfish alternatives. This reflects many naturally occurring social decision situations where a "middle-ground" is not available. For example, one either attends or not the inconvenient social event; one assists or not the friend of a friend who needs a place to stay for a time; one tolerates or not the rude comment received during a gathering of colleagues. Of course, it would be valuable to explore the robustness of our results to alternative decision-making environments.

One way in which this study is limited is that we did not control the incidental use of an ER strategy. In particular, it is possible that habitual suppressors and reappraisers used expressive suppression and cognitive reappraisal, respectively, to regulate their emotions during the UG (Gross & John, 2003; Heilman et al., 2009; John & Gross, 2004). In addition, it is increasingly clear that individual differences in ER impact cognition, brain function, and possibly anxiety and affective disorders (Drabant, McRae, Manuck, Hariri, & Gross, 2009; Magar et al., 2008; Miu & Visu-Petra, 2009), raising the importance of documenting their effects on decision-making (Paulus, 2007). The effects

of expressive suppression that we identified in this study could profitably be extended to studies on the incidental use of ER.

In future studies we plan to further investigate the effects of ER strategies on decisional behaviour in the UG, in conditions that include inducing positive or negative emotions and the control of property rights.

Chapter 6 Emotion regulation and decisional processes: Final conclusions

It is well-established that emotion plays a key role in human social and economic decision making (see, e.g., Elster, 1998; Loewenstein, 2000; Peters, Västfjäll, Gärling, & Slovic, 2006). People evaluate objective features of alternatives such as expected return in a subjective way (Edwards, 1962; Kahneman & Tversky, 1979), and emotions are understood to influence these subjective evaluations (Loewenstein & O'Donoghue, 2004; Naqvi, Shiv, & Bechara, 2006; Slovic, Finucane, Peters, & MacGregor, 2007). The recent literature on emotion regulation (ER), however, highlights that humans typically make efforts to control emotion experiences (Gross, 2002). This leaves open the possibility that decision effects attributed to acute emotions may be mediated by ER strategies. If so, this raises the additional possibility that different regulation strategies could have different decision implications. Only very recently, however, have scholars begun to investigate these possibilities. We here report data from both designed and naturally occurring environments providing convergent evidence that ER strategies modulate decision making. In particular, we find that the decision effects of emotion vary according to the way in which a person regulates the emotion experience.

Various theoretical approaches have indicated that contrary to traditional thinking in psychology and economics (Neisser, 1967; Simon, 1956), emotions play an active role in some forms of decision making. Regardless whether they have been assimilated to the “goodness” or “badness” of alternatives for action (Slovic et al., 2007), attributed to activation in basic appetitive or defensive motivational systems (Bradley & Lang, 2007; Loewenstein & O'Donoghue, 2004), or reduced to somatic markers associated with current or past behavioral outcomes (Bechara, Damasio, & Damasio, 2000), emotions have been consistently shown to influence decision making.

In the emerging neuroeconomics literature, brain lesion, functional neuroimaging and neurophysiological studies in animal models and humans have begun to shed light on the neural foundation of emotion and decision (Coricelli, Dolan, & Sirigu, 2007; O'Doherty & Bossaerts, 2008; Rangel, Camerer, & Montague, 2008; Seymour & Dolan, 2008). These studies suggest that humans can anticipate the emotional impact of potential future decisions using processes that involve the amygdala as well as the ventromedial prefrontal cortex (Bechara, Damasio, Damasio, & Lee, 1999; De Martino, Kumaran, Seymour, & Dolan, 2006; Weller, Levin, Shiv, & Bechara, 2007). This type of anticipation can be adaptive, in that emotions such as anxiety or disgust have been shown to impair decision making (Lerner, Small, & Loewenstein, 2004; Preston, Buchanan, Stansfield, & Bechara, 2007), even when physiological responses properly signal disadvantageous alternatives (Miu, Heilman, & Houser, 2008).

The intrinsic role of emotion in decision is all the more important as the value of prospects (i.e., actions with uncertain rewards) is computed in “emotion-cognition brain hubs” (Pessoa, 2008) such as midbrain dopaminergic regions and their targets (i.e., ventral and dorsal striatum, ventromedial and ventrolateral prefrontal cortex, anterior cingulate cortex). Therefore, neuroeconomists have emphasized that the interaction of emotion and decision making is profitably studied in environments that include risk (where the decision maker has perfect information regarding the stochastic relationship between actions and outcomes) and uncertainty (where the decision maker does not have full information about the stochastic environment, see, e.g., Rangel et al., 2008).

Because ER is widespread in our daily lives, it is possible that it might actually mediate the involvement of emotion in economic decision making. Most of the previous studies on emotion and decision making have not controlled for ER. Therefore, effects on economic decision making, ranging from “coloring” the content of thoughts to interfering with information processing, which have been previously attributed to acute emotions might actually be mediated by ER strategies such as cognitive reappraisal or expressive suppression.

The important role of ER in decision making is supported by at least four lines of evidence: (1) emotions are frequently regulated, in a spontaneous or incidental manner; the ubiquity of ER in situations that trigger emotions makes difficult the isolation of the direct and specific effects of emotion; (2) the distinct effects of specific emotions on decision making are explained by differences in the underlying pattern of appraisals, particularly on the certainty and control dimensions (Lerner & Keltner, 2000; also see the next paragraph); by effectively down-regulating emotion experience, ER contributes to an increased sense of emotional control that might influence decision making; (3) recent neuropsychological studies indicated that certain brain lesions (e.g., ventromedial prefrontal cortex) have detrimental effects on both economic behaviour (e.g., bargaining behaviour) and emotion regulation (e.g., Koenigs & Tranel, 2007); at the same time, pharmacological manipulations of serotonin signalling, which very likely affected prefrontal functioning, influence both inequity aversion in economic bargaining, and ER (e.g., Crockett, Clark, Tabibnia, Lieberman, & Robbins, 2008); and (4) both ER, and decision making dimensions that are critically influenced by emotions (e.g., risk taking, susceptibility to framing, bargaining behaviour) depend on similar emotion-cognition brain hubs (Pessoa, 2008), such as increased functional coupling prefrontal-amygdala circuits (e.g., Goldin et al., 2008; DeMartino et al., 2006). A recent review documented the common neural mechanisms that underlie ER and decision making, by focusing on the involvement of ventrolateral, medial, dorsomedial and dorsolateral prefrontal cortex in both ER strategies and reversal learning (i.e., the capacity to alter choice behaviour when the value of response options change) (see Mitchell, 2011).

There are at least two mechanisms by which ER can influence economic decision making. One, an “emotional” route, stems from differences between reappraisal and suppression in their effectiveness in mitigating the experience of negative and positive emotions (Gross, 2002). The second, a “nonemotional” route, stems from differences in the level of effort (cognitive load) required to implement reappraisal or suppression, which could perhaps be related to differences between their respective contributions to ego depletion (Baumeister, 2003; Richards & Gross, 1999). For instance, in comparison to cognitive reappraisal that diminishes emotion at an early stage and without the need of sustained effort over time; expressive suppression instead involves increased efforts to actively inhibit prepotent emotional responses (Gross & Thompson, 2007). Richards and Gross (1999, 2000) have invoked the “nonemotional route” (i.e., differences in computational resources taken away by ER from online information processing) for explaining why expressive suppression, but not cognitive reappraisal, impairs declarative memory. In one of our studies (Heilman, Crisan, Houser, Miclea, & Miu, 2010), we tested the influence of two ER strategies (i.e., cognitive reappraisal and expressive suppression) on the effects of negative and positive on economic decision making under uncertainty and risk. The regulation of negative affect allowed us to contrast cognitive

reappraisal, which effectively reduced the experience of emotion, and the ineffective expressive suppression. Cognitive reappraisal, but not expressive suppression reduced the effect of negative emotions on economic decision making. The regulation of positive affect offered a situation in which both cognitive reappraisal and expressive suppression are effective in reducing the experience of emotion, so the only difference that remained was in the cognitive load associated with each of these ER strategies. In this condition, both reappraisal and suppression influenced the effects of positive emotions on decision making. Therefore, this study suggests that ER impacts economic decision making by its effects on reducing the experience of emotions (the emotional route), rather than ego-depletion.

In the following paragraphs we will summarize the most important contributions put forward in this thesis. More importantly, for each chapter in the thesis there are several theoretical and empirical implications outlined, as well limits of the present studies and future research directions.

Chapter 1 offered the theoretical framework for our own investigative projects. In this theoretical chapter, the following main ideas were developed:

- A critical analysis of current theories of interactions between emotions and decisional processes.
- We have provided a working definition for ER strategies as well as described the most articulate theoretical model that explains the action mechanisms of ER strategies.
- We have provided with a thorough description of neuronal underpinnings of ER and decision-making.

Chapter 2 offers a methodological contribution by presenting preliminary data on the process of translation and adaptation for two instruments that measure ER strategies and for one instrument that evaluates attitudes towards risks.

- We present the procedure for the translation and adaptation for young adult population of the ERQ (Study 1.1).
- We present the procedure for the translation and adaptation for young adult population of the CERQ (Study 1.2).
- We present the procedure for the translation and adaptation for young adult population of the DOSPERT (Study 1.3).
- Psychometric properties for the 3 instruments are presented and they are similar with those presented for the original questionnaires.
- The existence of the Romanian versions of these 3 questionnaires facilitates future studies regarding regulatory processes or assessment of risk-taking.

Chapter 3 included three studies that investigated the impact of individual differences in ER on decision making under risky or ambiguous conditions. Our main contributions can be summarized as follows:

- A systematic review of previous studies that have investigated emotion-related aspects in decisional situations.

- Creating the computerized versions of the decisional task that made their application easier and more reliable.
- Our results show, for the first time in the scientific literature, that instructed reappraisal of fear and disgust significantly decreases their emotional impact and promotes risk seeking decisions (Study 2).
- In Study 3 we confirmed our results from the previous study and further extended them so that to also include positive emotions.
- Naturally occurring emotions have higher salience compared to experimentally induce emotions, and we have tested a way to manipulate natural positive and negative emotions.
- In Study 4 we present the current debate on the role of declarative knowledge in supporting adaptive decisional performance.
- Moreover, our empirical results indicate that declarative knowledge plays a major part in guiding behavioural performance.
- We used several different measures for individual differences in ER strategies and provide empirical support for their effects on decision making.
- Habitual use of reappraisal leads to better decisional outcomes compared to the consequences of frequent use of suppression.

Chapter 4 was focused on investigating individual differences in reappraisal and suppression and their effects on susceptibility to framing effects, on three important domains (i.e., health, financial and nature and objects).

- We start the chapter by presenting the relevant scientific literature for the topic of individual differences in framing effects.
- From a methodological point of view, Study 5 has the merit of having simultaneously investigated three important decisional domains that have created much debate in the literature. Moreover, the decisional problems that we used benefit from large ecological validity through their resemblance with real-life decisions.
- Our results relating the use of different ER strategies and their association with susceptibility to framing might explain some of the discordant results from previous studies that have not investigated these person-related factors.
- ER strategies account for a large proportion of the variance of framing effects.

Chapter 5 was dedicated to the investigation of ER differences associated with decisional fairness. In addition, we also investigated the interaction between state anxiety and the regulatory processes and their overall effect on decision in the ultimatum game.

- The chapter starts with the presentation of the most relevant results regarding decisional behavior in the UG.
- The binary version of the UG that we used in Study 6 offered us the opportunity to directly investigate decisional performance in real-life situations that do not allow for an equal split of financial resources.
- Having participants play the UG right before an exam was proven to be a reliable method to induce real anxiety states.

- Our main results support a moderating role of anxiety on the reappraisal-decision making performance.

Chapter 6 presents the reader with a synthetic perspective over the theoretical, methodological and empirical contributions of our personal investigations. Also, throughout this final chapter we make references about how our results might be included in current theories and models of decision-making.

In conclusion, emotions clearly do serve important functions in decision making, but they might also lead to biased judgement and reckless actions (Averill, 1983; Berkowitz, 1990; Tangney et al., 1996; Loewenstein & Lerner, 2003). Future research is still needed to establish the contexts in which emotions have a positive impact on decisions and when they become less adaptive. Moreover, it results from our work that emotions might be controlled by using different ER strategies. These regulatory process also have specific effects on decision making, in various contexts. In order to understand and correctly predict decisional behaviour, emotions and their control mechanisms should be included in decisional models.

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