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Clinical Implications of Counterfactual Thinking and of the Hindsight  
Bias Phenomenon in Affective Disorders

*Summary*

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## Argument

The oldest origins of counterfactual thinking are to be found in philosophy. Plato and Aristotle analyzed the epistemological status of conditional suppositions and of ideal forms, invisible but still achievable. Originile cele mai vechi ale gândirii contrafactuale se regăsesc în filosofie. These ideas were more rigorously adopted by the German philosopher Leibniz in the 17<sup>th</sup> century. He states that alternative reality is possible as long as it does not contradict the formal laws of logic. These, there may be an infinite number of possible worlds. The traditional start point, identified in the history of the research of social cognition upon counterfactual thinking was a work by Danny Kahneman and Amos Tversky in 1982. They inferred that many of the directions that the theoreticians' research in this field was going to take and touched upon important aspects like: the determinants of counterfactual thinking, its link to perception of causality, and consequences on the affective level. It is also then that a metaphor is born, that of the "mental simulation" of initial conditions and then the unreeling of a mental scenario towards other finalities, similarly to computerized programs.

The next important moment in the developing of the concept of counterfactual thinking was the publication of the *norm theory* in 1986. Starting from this theory, Kahneman and Miller described the mechanism of building comparison standards and criteria. The authors defined the concept of norm as representing the combination of previous representations of an event, the images and the emotions that accompany it and its ulterior representations. The difference between an action and the norm which it evokes, determines the norm of the respective action. Thus, the further the action is from its norm, the more it is perceived as being abnormal.

The researchers in the field of social psychology have tried to explain the nature of the type of thoughts "if...then", "what if" and centered on two questions: "Which are the social, cognitive, affective, and motivational determinants of counterfactual thinking?" and "Which are the functional consequences of counterfactual thinking?". A possible explanation connected to these questions is offered by Tversky and Kahneman's idea according to

which counterfactual simulations have the role of re-establishing normality because people tend to mentally rebuilt results that they view as abnormal. On the other hand, the emotional response that people give regarding certain events, is important because counterfactual thinking has the role of emotional regulator as well. Among the authors that have brought significant contributions to the developing of this concept we mention Roesse, Byrne, Walsh, Kahnemann or Tversky. An important idea related to counterfactual thinking refers to the relations and causal ascriptions that it involves in assessing certain situations. The causal selection implies certain cognitive processes that are necessary in mental representation.

In this work, we have proposed to place the wide concept of counterfactual thinking near the hindsight bias effect, a cognitive process that refers to people's tendency to perceive events and situations as being unavoidable, as compared to the moment previous to finding out the result.

In other words, it refers to a retrospective distortion determined by the cognitive assimilation of new information overlapping an old one. The objective of the work is to underline this causal relation between counterfactual thinking and the hindsight bias effect by relating to the context of the relationship established between patient and psychotherapist.

The effects on the social, economic, and political level that counterfactual thinking and the hindsight bias effect have, have a also an echo in the context of clinical psychology and psychotherapy. The results that have been recorded so far, corroborated with those in this work, contribute in the long run to the identifying of new ways of approaching emotional affective disorders and implicitly to the treatment from an innovative therapeutic perspective, of patients who present symptoms pertaining to these disorders.

## Chapter I. Counterfactual Thinking

### I.1. The definition of counterfactual thinking and typologies

Roese (1997) defines counterfactual thoughts as mental representations of alternatives regarding the past, not only with benefits but also with emotional consequences upon the individual, of some past real events, after the moment in which a decision has been made. In other words, counterfactual thinking represents the result of the comparison between real circumstances of an event and the alternatives that may have change the denouement of the event. Counterfactual thoughts take the form of conditional sentences in which both the preceding element, “if”, and the consequence of a “then” action are specified. The term “counterfactual” means contrary to facts and may be explained by conditional constructions like “what could have been if...” “if...then”. Counterfactual processing plays an essential role in interpreting the new experiences, being, at the same time, an active way of learning, by imagining some alternative endings specific to an event that has taken place. (Roese și Olson, 1996).

Counterfactual thoughts may be classified according to a variety of criteria.

a) According the *comparison direction*. Markman et.al. (1993) have established the difference between *ascendant* and *descendant* counterfactual thoughts. *Ascendant counterfactual* thoughts specify results that could have been better than the real ones. Ascendant counterfactual thoughts bring preliminary information on hypothetical alternatives that help planning future activities in order to determine changes of conduct. *Descendant counterfactual* thoughts specify results whose effects create mainly positive emotions because the comparison is made between the factual result and the alternatives that underline possible effects that may be worse than the real result.

b) According to the *structure* criterion, which refers to the possibility of adding or eliminating of an antecedent during the events with the aim of changing the real situation, we may differentiate between *additive* and *subtractive counterfactual* thoughts.

c) Roese și Olson (1997) have made the difference between internal counterfactual thoughts (*based on one’s own actions*) and external (*based on*

*the others' actions*). These cognitions are based on the ascribing ways used in the process of reassessing an ending and also by individual characteristics.

## **I.2.Explicative models of counterfactual thinking**

### ***I.2.1. The prevention model***

The prevention model (Mendel, Lehman, 1996) stresses on counterfactual conditionals in three key respects. First, the interest point is changed from generative causes to the causes that inhibit counterfactual thoughts. Secondly, the model is centered on the assessment of sufficient conditions rather than on the necessary ones and finally, counterfactual thoughts refer to hypothesis regarding counterfactual possibilities, i.e. what could have been rather than what was. Mainly, this explicative model pinpoints the problematic of causal ascription within the dynamic of counterfactual thinking.

### ***I.2.2. The SPA (Spellman Probability Account) Model***

The SPA (Spellman et.al. 2001) model explains the denouement of the events (Y) through a causal chain (X) of a number of alternatives of the events in a specific situation. This model is mainly probabilistic, based on causal deductions but at the same time, it may influence the causal explanations when the counterfactual alternatives affect the subjective probabilities. More specific, the SPA model postulates the idea that it is easy to imagine counterfactual alternatives by relating to real situations when the subjective probabilities mediate the causal explanations. al mai multor alternative ale evenimentelor într-o situație specifică.

### ***I.2.3. The JDT (Judgment Dissociation Theory) Model***

This model (Mandel, 2003) describes the way in which counterfactual thinking, the causal inferences and the estimation of probabilities differ from one another. Starting from the idea of the functionality of counterfactual thinking (Roese, Olson, 1997), the JDT model supports the idea according to which the three cognitive processes mentioned above have an essential role in

predicting, controlling, and explaining some various situational contexts. The key element of the JDT model is represented by the manner in which the denouement of a situation is conceptualized. This conceptualization of cause selection is determined by the *principle of actuality* (Mandel, 2003), which underlines the importance of the antecedents that have led to a certain denouement.

#### ***1.2.4. The REM (Reflection and Evaluation Model) Model***

According to the REM (Markman, McMullen, 2003) model, the consequences of simulating the comparison direction of the counterfactual thoughts are moderated by strong tendencies of involvement in processing reflexive or evaluative information. This interaction between the direction and the manner of counterfactual thinking produces consequences on affective, motivational, and behaviorist levels.

The main assertion of the model is that two distinct modalities of the mental simulation take place during the comparative thinking. The first modality is reflection, a cognitive process characterized by comparing the alternative to a standard. The second modality is the evaluation, which represents the use of information regarding a standard as a reference point in order to be able to make the comparison with a real situation.

### **I.3. The mechanisms of counterfactual thinking**

*a) The contrast effects* appear when a reasoning becomes extreme by the juxtaposition of a standard or an anchor (Roese, 1997).

*b) The causal inferences* appear in the situation in which a counterfactual conditional may illustrate a causal link between a previous behavior and a wished for result (Roese, 1997).

*c) The ways with specific content* imply the transfer of information from the counterfactual inference to counterfactual intentions, which influence the behavior. This mechanism has a content in the sense that the particular information contained by the counterfactual thought is directed towards a behavioral intention (Epstude, Roese, 2008).

*b) In the mechanism with neuter content, there takes place an activation of more general style of processing information or the motivation to invest a greater effort which would determine the behavior change. Thus, the cognition generated by a counterfactual thought can facilitate the link from the moment of identifying the problem to its solution.*

#### **I.4. Counterfactual thinking and depressive-anxious disturbances**

Markman and Miller (2006) discovered that, in case of severe breakdown, the persons generate less useful counterfactual thoughts regarding ulterior functional behaviors. In other words, the persons suffering from severe breakdown center on counterfactual thoughts that do not have a functional character, although they do not appear as effects of negative affects, which could determine the wish of behavioral change

Quelhas et.al. (2008) have highlighted a few edifying directions regarding the role of counterfactual thinking in breakdown. The depressive and non-depressive have the tendency of generating more ascendant than descendent counterfactual thoughts, the ascendant being more frequent with the non-depressive. Also, in the case of ascendant counterfactual thoughts, there appears a greater perception of control than in the case of the descendant ones. The depressive as well as the non-depressive activated mainly ascendant alternative thoughts. The link between ruminations and anxiety, which has been highlighted by Kocovski et.al. (2005), revealed, by following up a study, the fact that the persons with a high level of social anxiety manifested the tendency to generate ruminations when they were confronted with fictional social situations. In a study made by Roese et. al. (2009), it has been discovered that counterfactual thoughts constitute a predictor of breakdown and anxiety than ruminations which is better than the ruminations.

Callander et.al. (2007) in their turn, made a study applied on feminine subjects who had suffered the trauma of a miscarriage. They concluded that anxiety, as a personality feature, correlates positively with the fluency, frequency, and duration of ascendant counterfactual thoughts.



## **I.5. Counterfactual thinking and traumatic events**

Post traumatic stress may often be a triggering factor for counterfactual thinking because traumatic experience can generate mental alternatives by which the negative event could have been avoided. Gilbar and Hevroni (2007) have obtained results regarding the direction of counterfactual thoughts after a trauma, suggesting correlations between ascendant counterfactual thinking and the coping mechanisms centered on emotions.

Related to the effect of descendant counterfactual thoughts in post traumatic stress disorder, Sanna (1998) suggested that these are useful for a short period after the traumatic event and not in the long run even if they contribute to the decreasing of the stress level. Dagleish (2004) stresses on this idea, observing that the main characteristic of counterfactual thinking is regularity rather than the comparison direction of alternatives.

## **I.6. Counterfactual thinking and schizoaffective disorders**

Hooker et.al., (2000) have tested the hypothesis according to which the psychotic disorders hinder the functional generation of counterfactual thoughts. The results of the study confirmed the fact that the patients diagnosed with schizophrenia generated less counterfactual thoughts based on personal negative experiences comparing to the subjects from the control group.

Counterfactual thinking plays the role of the function through which we interpret the events as being true or possibly true (Sledge, 2000). In other words, it represents the ability to appreciate two different realities as being possibly true, two sets of associations which are similar but different regarding reality.

## **Chapter II. The Hindsight Bias Effect**

### **I.1. Defining the hindsight bias effect**

This effect may be defined by people's tendency to post factum exaggeration regarding the predictability of some events that have already taken place and which, regarded retrospectively, seem much more probable

than they seem before their occurrence. In other words, it refers to people's tendency to make a posteriori estimations that are much closer to the real result, at the same time, viewing the motives that have led to that result as logical and credible. A phrase that defines the hindsight bias effect is "*I knew that it would happen like this*" (Fishhoff, 1975, Hawkins,1990), referring to the capacity of predicting the events after their occurrence. Hawkins and Hastie (1990) have named this effect a reevaluation process, the result being a modification of perception on causal relations and an exaggeration of the belief that the present result was predictable before occurring as well.

The hindsight bias effect is being studied by two different experimental designs (Fischhoff, 1975), the hypothetical design and the memory design.

*The hypothetic design* consists of questions in which the solution is presented from the very beginning of the experiment. The participants are then asked to estimate, without taking into account the given solution, as if they did not know the correct answer. Due to this anchor value, the subjects' estimations from the experimental group favor the given solution.

*The memory design* consists of situations in which the participants first make an estimate and after a period of time set by the researcher, the solution is presented before they can remember the estimation made previously. This model shows a biased system of estimations related to the given solution.

## **II.2. Explicative models of the hindsight bias effect**

### **II.2.1. The SARA (Selective Activation Reconstruction Anchoring) mode**

The SARA (Pohl et. al.,2003) model supposes that each person has a number of pieces of specific information about elements (called "images") that are associated with the given question to which an answer is waited for. This knowledge is used in order to generate an estimation, to codify an anchoring and later to recollect the original estimation The model supposes that all the cognitive processes involved in the retrospection heuristics are based on a process of probabilistic sampling, namely the processes that

generate an estimation by codifying new information which rebuilds an estimation generated previously (Pohl et.al. 2003).

### **II.2.2. The RAFT (Reconstruction After Feedback) mode**

The RAFT model explains the hindsight bias effect as a double product of adaptive learning (Hawkins and Hastie, 1990). By unconscious associative deduction, some of the unknown values of the clues or the erroneous values of the clues are replaced probabilistically with “appropriate” values. The RAFT (Hoffrage et.al, 2000; Hertwig et.al., 2003) model was proposed in order to explain the retrospection heuristics by pairs of comparisons of the objects from the point of view of the quantity criterion. To generate a comparative estimation by using the fundament of knowledge, the clues from the fundament of knowledge may be categorized according to their ecological validity and it is esteemed that people rely on the first valid clue that differentiates the two objects. (Blank, Nestler, 2007).

### **II.3. The hindsight bias effect, the confirmation error, and the diagnosis error**

In medical literature (Bowen, 2006; Swartz, 2006), the ideal diagnostic consists of three stages: a) gathering the data about the patient; b) generating a hypothesis regarding the presumptive diagnostic according to symptoms ; c) the validation of the first hypothesis and the elimination of the alternative hypothesis.

Doctors’ and psychologists’ diagnosis errors may have bad consequences on the patient’s evolution because their result may determine a chain of wrong decisions regarding the patients’ ulterior treatment. Maintaining a wrong initial diagnostic even after finding out the final diagnostic, is a tendency that is called *confirmation error* (Mendel, R.,et.al.,2011). It is supposed that this tendency appears because of the medical personnel’s unconscious wish of validating their initial diagnostic and avoiding the reevaluation of the situation which would disapprove of the initial decision. It also occurs because of the need to confirm the initial ideas

being thus responsible for many of the decisional errors. (Crosskerry, 2002, apud.Mendel,et.al.,2011).

#### **II.4. Causal implications between counterfactual thinking and the hindsight bias effect**

Roese și Olson (1996) have identified three assertions regarding the causal link between counterfactual thinking and the hindsight bias effect:

- Counterfactual thoughts intensify the retrospective bias
- The causal deductions underline a positive relation between counterfactual thinking and the hindsight bias effect
- The retroactive bias extends over the prescriptive counterfactual reasoning

### **Chapter III. The Therapist's Personality and Research in Psychotherapy**

Buckman și Barker (2010), investigated the influence of personality traits on the therapeutic orientation of clinician psychologists. Clinician psychologists' adoption of one of the orientations (psychodynamic therapy, systemic therapy, cognitive behaviorist therapy) is determined by three theoretical models. *The first model* refers to the model of the practice based on empirical proofs. This model postulates the idea according to which a patient's treatment is selected based on certain previous situations in which that treatment proved its efficiency. *The second model* refers to the situations in which the therapist chooses the manner of intervention that fits best the case being investigated. Finally, *the third model*, developed by Stoltenberg and Delworth (1987, apud Buckman and Barker, 2010) refers to the way in which the inexperienced psychotherapists go through various stages, from inflexibility regarding other theoretical orientations to an integrative approach of a number of theoretical models respecting however the basic orientation.

## **Experimental research – general objectives**

- The influence of normal and pathological personality traits on counterfactual thinking and the hindsight bias effect.
- The functional character of counterfactual thinking related to the therapeutic relation, which may decrease the force of the errors of the hindsight type in the decision making process
- The extent to which certain affective disorders can predict the manifestation of counterfactual thinking and of the hindsight bias effect.
- The role of counterfactual thinking in the process of therapeutic change.
- The use of counterfactual thinking in psychotherapy for emotional regulation and behavioral change in patients with affective disorders.

## **Chapter IV. Study 1. Clinical Predictors of Counterfactual Thinking and the Hindsight Bias Effect**

### **IV.1. Objectives**

- The highlighting of the functional role (emotional regulation/behavioral change) of counterfactual thinking in the case of patients suffering from affective emotional disorder
- The causal relation between counterfactual thinking and the hindsight bias effect
- Testing the capacity of patients suffering from affective disorder to manifest counterfactual alternatives and to estimate retrospectively the probability of certain events according to the intensity of the symptoms

## • **IV.2. Research hypothesis**

1. Affective and personality disorders are significant predictors of counterfactual thinking.
2. Affective and personality disorders are significant predictors of the hindsight bias effect.
3. The experimental condition influences the subjects' retrospective estimations (hindsight bias) regarding the situation presented:
  - a) Those who will hear the positive scenario will estimate retrospectively greater probabilities of the positive ending as compared to the subjects in the control group.
  - b) Those who will hear the negative final scenario will estimate retrospectively greater probabilities of the negative ending as compared to the subjects in the control group.
4. There are significant correlations between counterfactual thinking and the hindsight bias effect, in the sense that the tendency of generating counterfactual thoughts will implicitly intensify the probability of the retrospective estimations of the denouement.

## **IV.3. Methodology**

a) For the manipulation of the hindsight bias effect we used a recording (lasting for minutes and 30 seconds) of a feminine character's monologue, who recounts a series of recent negative events in her life. After listening to the monologue, the subjects in the control group had the task of answering two questions regarding the chances for the person in the scenario to develop a breakdown or to overcome the problem through psychotherapy. The subjects from the "positive ending" experimental group listened, after the initial monologue, an audio fragment in which it was suggested that the character in the presented situation had overcome the negative events due to psychotherapy meetings and the ones from the "negative ending" experimental group listened to a follow up fragment in which it was suggested that the person had developed a breakdown. The efficiency of the monologue was

verified by two questions regarding the emotional impact and the credibility of the monologue.

b) For investigating the patients' **clinical and pathological tendencies** we have used the multi-axis inventory MCMI III elaborated by Millon (1997). The MCMI III inventory is comprised of 175 de items which measure the affective and personality disorders on Axis I and II from DSM.

c) For measuring the counterfactual thinking, we have used the **CTNES** (Counterfactual Thinking for Negative Events Scale) questionnaire made by Rye et. al.(2008). Before filling in the questionnaire, the subjects were asked to establish the segment of life in which the specific past event which determined those counterfactual thoughts, could be ascribed to. The selected specific fields were: education, family, profession, health, financial, affective/personal).

### **IV.3. Participants**

300 subjects participated in this study. They were patients of *Socola Clinical Hospital of Psychiatry* Iasi and also out patients under psychotherapy. 172 subjects were female and 128 male. The distribution according to age consisted of 5 intervals: 18-25, 26-35, 36-45, and over 65 years old. Thus, 38,7% of the patients were between 46-55 years old, the average being 43.

### **IV.4. Results**

For the **ascendant counterfactual thinking** we tested the efficiency of a predictive model of 5 predictors (major breakdown, post-traumatic stress disorder, anxiety, schizoid, schizotypal). After the statistic processing two of them were excluded while the predictors *major breakdown*, *schizoid*, and *schizotypal* formed a significant regression model  $F(3,299)= 7,26$ ;  $p<0,001$ , able to explain a proportion of 7% ( $R^2 = 0,069$ ) from the criterion variance.

For the **descendant counterfactual thinking**, we tested the efficiency of a predictive model made of the same predictors. After the statistic processing, three of them were excluded while the predictors *major breakdown* and *post-traumatic stress disorder* formed a significant regression

model  $F(2,298) = 14,92$ ;  $p < 0,001$ , able to justify a proportion of 9,1% ( $R^2 = 0,091$ ) from the criterion variance.

For the **retrospective estimation of the positive ending** we selected only the subjects' answers belonging to the condition "positive ending" and we tested the efficiency of a predictive model made of 5 predictors. After the statistic processing, three of them were excluded, while the predictors *schizoid* and *anxiety* formed a significant regression model  $F(2,99) = 11,10$ ;  $p < 0,001$ , able to justify a proportion of 18% ( $R^2 = 0,18$ ) from the criterion variance.

For the **retrospective estimation of the negative ending** we selected only the subjects' answers belonging to the condition "negative ending" and we tested the efficiency of a predictive model made of the same predictors. After the statistic processing, three of them were excluded, while the predictors *schizotypal* and *major breakdown* formed a significant regression model  $F(2,99) = 8,10$ ;  $p < 0,001$ , able to justify a proportion of 14% ( $R^2 = 0,14$ ) from the criterion variance.

The T test for independent samples generated the following results for the comparison between the "positive ending" experimental group and the control group  $t(198) = 8,02$ ;  $p < 0,001$ . The average of the retrospective estimations from the "positive ending" group ( $M = 5,16$ ) differs significantly from the retrospective estimations from the control group ( $M = 3,82$ ).

The T test for independent samples has shown that the average of the retrospective estimations from the "negative ending" group ( $M = 4,78$ ) differs significantly from the retrospective estimations from the control group ( $M = 4,28$ )  $t(198) = 3,37$ ;  $p < 0,001$ .

We have identified a significant positive correlation between the ascendant counterfactual thinking and the retrospective estimation of the positive ending  $r = 0,30$ ;  $p = 0,002$ , which means that there is a directly proportional relation between the two variables. The variance proportion was  $r^2 = 0,09$ , which means that the relation occurs in 9% of the subjects from the *positive ending* experimental group.



## **Chapter V. Study 2. The Psychotherapist's Personality in the Cognitive Dynamic of Counterfactual Thinking**

### **V.1. Objectives**

- Presentation of the personality traits that influence the direction of generating counterfactual thoughts and their intensity related to negative events in from the personal past
- Highlighting the retrospective errors which, in psychologists and psychotherapists' case may affect the decision regarding the patients' treatment, the use of certain specific techniques, trust in healing possibilities as well as the ceasing of some treatments.

### **V.2. Research hypothesis**

1. The psychotherapists' personality traits and the experimental condition produce interaction effects in the process of influencing the retrospective estimations regarding the probability of the denouement.
2. Finding out the denouement of the scenario will influence the subjects' retrospective estimations regarding the situation presented.
3. The psychotherapists' personality traits influence their ability of generating counterfactual alternatives
4. The psychotherapists' personality traits influence the retrospective estimations regarding the denouement of the scenario
5. The tendency of generating counterfactual thoughts will implicitly intensify the probability of the retrospective estimations of the denouement.

### **V.3. Methodology**

a) For the manipulation of the hindsight bias effect we used the same recording as in the first study and the same items..

b) For investigating the psychologists' personality traits we used the NEO-FFI personality inventory elaborated by Costa and McCrae (1989). This is a short version consisting of 60 items, of the developed from NEO Pi-R which

contains 240 de items. The NEO-FFI inventory is made of 12 items for each of the five personality fields: neurosis, extraversion, openness, agreeableness, and dutifulness.

c) For measuring the counterfactual thinking, we have used the **CTNES** (Counterfactual Thinking for Negative Events Scale) questionnaire made by Rye et. al.(2008).

#### **V.4. Participants**

150 subjects participated in this study. They were clinician psychologists and psychotherapists selected from the data base of the Psychologists' College from Romania. Their distribution according to gender was the following: 114 female subjects and 36 male subjects. The distribution according to age consisted in 5 intervals: 18-25, 26-35, 36-45, and over 65 years old. These stages were established according to the most frequent specific ages corresponding to the attestation levels of the psychologists within the Psychologists' College. The distribution according to age had an average of 34 years old and the standard deviation was around 8 years.

#### **V.5. Results**

- the effect of interaction between the experimental condition and the extraversion upon the *retrospective estimation of the efficiency of psychotherapy* was significant statistically:  $F(1,99) = 4,47$ ;  $p = 0,03 < 0,05$ .

In order to compare the two conditions (control and positive ending) we shared the distribution according to the *extraversion* variable and we used T tests for independent samples in order to compare the differences between the control group and the experimental one for each level of the extraversion variable.

For the introverted subjects the results have shown that there is no significant difference between the introvert subjects in the control group ( $M=4,45$ ) and those from the positive ending group ( $M=4,84$ ) regarding the *retrospective estimation of psychotherapy efficiency*  $t(54) = 1,69$ ;  $p = 0,09 > 0,05$ .

For the extroverted subjects the results have shown that there is no significant difference between the introvert subjects in the control group (M=4,65) and those from the positive ending group (M=4,33) regarding the *retrospective estimation of psychotherapy efficiency*  $t(42) = 1,44$ ;  $p = 0,15 > 0,05$ .

- the effect of interaction between the experimental condition and dutifulness upon the retrospective estimation of the efficiency of psychotherapy was significant:  $F(1,99) = 4,77$ ;  $p = 0,03 < 0,05$ .

In order to compare the two conditions (control and positive ending) we shared the distribution according to the *dutifulness* variable and we used T tests for independent samples in order to compare the differences between the control group and the experimental one for each level of the dutifulness variable.

For the subjects with a low level of dutifulness, the results have shown that there are no significant differences between the subjects with a low level of dutifulness from the control group (M=4,80) and those from the positive ending group (M=4,33) regarding the *retrospective estimation of psychotherapy efficiency*  $t(45) = 1,79$ ;  $p = 0,08 > 0,05$ .

For the subjects with a high level of dutifulness, the results have shown that there are no significant differences between the subjects with a low level of dutifulness from the control group (M=4,50) and those from the positive ending group (M=4,72) regarding the *retrospective estimation of psychotherapy efficiency*  $t(51) = 1,18$ ;  $p = 0,24 > 0,05$ .

The comparison between the *positive ending* experimental group and the control group  $t(98)=0,61$ ;  $p=0,53 > 0,05$  has shown the retrospective estimations average of the *positive ending* group (M=4,66) does not differ significantly from the retrospective estimations average in the control group (M=4,56).

The comparison between the *negative ending* experimental group and the control group  $t(98)=0,56$ ;  $p=0,57 > 0,05$  has shown the retrospective estimations average of the *negative ending* group (M=4,58) does not differ significantly from the retrospective estimations average in the control group (M=4,48).

-  $t(148) = 3,23$  ;  $p = 0,002 < 0,05$ . It results that there are no significant differences among the subjects with a low level of neurosis ( $M=32,85$ ) comparing to those with a high level of neurosis ( $M=38,43$ ) regarding the *ascendant counterfactual thinking*

-  $t(148) = 2,00$ ;  $p = 0,04 < 0,05$ . It results that there is a significant difference among the subjects with a low level of agreeableness ( $M=34,37$ ) comparing to those with a high level of agreeableness ( $M=38,19$ ) regarding the *ascendant counterfactual thinking*.

-  $t(148) = 2,02$ ;  $p = 0,04 < 0,05$ . It results that there is a significant difference among the subjects with a low level of dutifulness ( $M=12,09$ ) comparing to those with a high level of dutifulness ( $M=12,78$ ) regarding the *ascendant counterfactual thinking*

No correlations between counterfactual thinking and the hindsight bias effect have been discovered, regarding the denouement of the situation and the typology of counterfactual thoughts.

## **Chapter VI. Study 3: Individual Differences in Generating Counterfactual Alternatives and the Persistence in Time of the Hindsight Bias Effect**

### **VI.1. Objectives**

- The central objective of this study refers to the influence of the testing moment upon the hindsight bias effect as well as of the interaction between the subjects' personality traits and the repeated measuring of the retrospective estimations.
- Presenting the personality dimensions that influence the direction of generating counterfactual thoughts and their intensity related to negative events from the personal past
- In the conditions of a study with repeated measurements, the hindsight bias effects will manifest more intensely and thus we can explain

easier the causal relations and the cognitions involved in the process of generating counterfactual alternatives

## **VI.2. Research hypothesis**

1. The interaction between the testing moment (before finding out the ending/after finding out the ending) and the subjects' personality traits influences the retrospective estimations of the denouement probabilities.
2. The testing moment (before finding out the ending/after finding out the ending) influences the retrospective estimations of the denouement probabilities.
3. Finding out the denouement will influence the subjects' retrospective estimations regarding the situation presented.
4. There are effects of interaction between the experimental condition and the personality traits upon the hindsight bias effect.
5. Personality traits influence their capacity of generating counterfactual alternatives
6. Personality traits influence the retrospective estimations regarding the denouement of the scenario
7. The tendency of generating counterfactual thoughts will implicitly intensify the hindsight bias effect.

## **VI.3. Methodology**

- a) For the manipulation of the hindsight bias effect we used the same recording as in the first study and the same items.
- b) For investigating the psychologists' personality traits we used the NEO-FFI personality inventory elaborated by Costa and McCrae (1989), used in the second study as well.
- c) For measuring the counterfactual thinking, we have used the **CTNES** (Counterfactual Thinking for Negative Events Scale) questionnaire made by Rye et. al.(2008).

## VI.4. Participants

150 students participated in this experiment. They were 3rd year students of the Faculty of Psychology of the „Alexandru Ioan Cuza” University from Iași, 135 female subjects and 15 male subjects. The distribution according to age had an average of 21 years and the standard deviation of 1 year. Regarding the source of regret, 53% of the subjects attributed the main negative event based on which they generated counterfactual alternatives, to the affective/personal field. 29% of the subjects mentioned familial regrets, 9% educational, 6% related to health and 3% professional regrets.

## VI.5. Results

The initial level of the hindsight bias effect modified significantly in the second moment of the testing both for the subjects in the positive ending group and those from the negative ending group for all the 5 personality dimensions, having thus a main effect of the testing-retesting variable.

The retrospective estimations average of the *positive ending* group ( $M=4,86$ ) differs significantly from the retrospective estimations average of the control group ( $M=4,28$ ).

The retrospective estimations average of the *negative ending* group ( $M=4,70$ ) differs significantly from the retrospective estimations average of the control group ( $M=4,28$ ).

We identified an interaction effect between the testing moment and the level of neurosis,  $F(1,48)= 6,21$ ;  $p= 0,01<0,05$ .

For the subjects with a low level of neurosis  $t(28) = -5,74$ ;  $p < 0,01$  there were significant differences between the initial level and the final level of HB, in the “negative ending” experimental condition. Also, we have noted the presence of a positive correlation between the two moments of the testing  $r= 0,72$ ;  $p < 0,01$

For the subjects with a high level of neurosis  $t(20) = -2,02$ ;  $p = 0,05$  there were significant differences between the initial level and the final level of the estimations of the probability of the denouement, in the “negative

ending” experimental condition. Also, we have noted the presence of a positive correlation between the two moments of the testing  **$r= 0,68$ ;  $p< 0,01$**

The result confirm the presence of significant differences among the subjects with a low level of neurosis  $t(148)= - 3,15$  ;  **$p= 0,002< 0,05$** , (M= 41,48) as compared to those with a high level of neurosis (M= 46,73) regarding the *ascendant counterfactual thinking*.

The result confirm the presence of significant differences between the subjects with a low level of openness  $t(148)= - 2,96$  ;  **$p= 0,004< 0,05$** , (M= 13,06) and those with a high level of openness (M= 15,16) regarding the *descendant counterfactual thinking*.

Also, there are significant differences between the subjects with a low level of openness  $t(148)= - 1,92$  ;  **$p= 0,05$** , (M= 42,39) and to those with a high level of openness (M= 45, 66) regarding the *ascendant counterfactual thinking*.

The T test for independent samples has generated the following results:

-  $t(148)= -2,73$ ;  **$p= 0,007< 0,05$** . there is a significant difference between the subjects with a low level of agreeableness (M=41,72) and those with a high level of agreeableness (M=46,35) regarding the *ascendant counterfactual thinking*.

-  $t(148) = -3,52$ ;  **$p< 0,01$** . It results that there is a significant difference between the subjects with a low level of dutifulness (M=41, 50) and those with a high level of dutifulness (M=47,37) regarding the *ascendant counterfactual thinking*.

The only identified significant correlation was that between the variable descendant counterfactual thinking and the retrospective estimation of the positive ending  **$r= 0,29$ ;  $p= 0,03$** . The variance proportion  $r^2=0,08$ , points to the fact that the relation we found occurs in 8% of the subjects in the *positive ending* experimental group.

## General conclusions

The aim of these studies was that of explaining and understanding the dynamic of counterfactual thinking and of the hindsight bias effect as well as of the differences between them when we relate to persons suffering from psychical disorders, to normal persons, and also to the therapists who interact and treat various pathologies.

The results of the first study demonstrates that in the case of persons suffering from effective disorders, the generating of counterfactual alternatives and the estimation of probabilities of certain problematic situations are made differently as compared to the cognitive dynamic of normal persons. They support the thesis of the influence of the clinical personality patterns in generating counterfactual thoughts and of causal effects between them and the hindsight bias effect. Thus, we have noted that major breakdown, the post traumatic stress, and the schizoid and schizotypal personality disorders have been significant predictors of the variant of counterfactual thinking criterion.

Regarding the hindsight bias effect, we have observed that the patients with depressive-anxious and schizoid tendencies exaggerated the probability of the denouement post factum and consequently they manifested the hindsight bias effect.

The hindsight bias effect was present in both experimental groups, this being highlighted by the comparison with the control group.

The correlation between counterfactual thinking and the hindsight bias effect has confirmed the hypothesis that counterfactual thoughts intensify the retrospective bias.

The results of the second study, which had participants from among psychologists, has not highlighted the hindsight bias effect in any of the two experimental groups, which contravenes to the results of the first study as well as to previous research.

Neurosis had a significant effect upon the ascendant counterfactual thinking, which may be explained by learned helplessness theories which state that persons with depressive, neurotic tendencies have the tendency to make internal and stable global ascriptions when they are confronted with the



negative ending of a situation. On the level of therapeutic alliance, the psychologists who obtain these results will manage difficult situations harder and will be predisposed to counter-transfer tendencies due to the reactivity specific to neurosis.

Agreeableness was also a factor with significant influence upon counterfactual thinking.

The dutifulness factor had in its turn a significant influence upon ascendant counterfactual thinking.

In the third study, the experimental manipulation allowed us to undergo a repeated measurement of the intensity of the hindsight bias effect and to note that it varies from one measurement to another, according to the anchor value, to the received feedback. Thus, we have observed the manifestation of the hindsight bias effect by the comparison between the two measurements.

The subjects who got high scores of dutifulness generated both descendant and ascendant counterfactual alternatives.

An waited for result was represented by the influence of agreeableness upon counterfactual thinking, as the low level of agreeableness may be the expression of certain pathological tendencies like antisocial, dependant or interpretative.

A causal relation between counterfactual thinking and the heuristics of retrospection has been highlighted in the third study as well. In our case, we have identified a link between descendant alternative cognitions and the post factum exaggeration of the positive ending in which the person in the scenario overcomes the negative events through psychotherapy.

The experimental research undergone in this work have confirmed a series of results obtained by previous research regarding counterfactual thinking and the hindsight bias effect, managing, at the same time, to contribute regarding the understanding of these concepts through personality from normal to pathological.

### **Limits:**

- a) The three studies are not equal from the point of view of the subjects' number, this fact being a consequence of the conditions of questionnaire application and the specific of the samples used.

- b) Only one study permitted the repeated measuring of the hindsight bias effect. That is why future research will be able to investigate the same effects, but longitudinally, using a compact lot of patients who would answer to the samples used in various moments of the therapeutic process.
- c) The number of the subjects represents a limit, this being important for a better generalization of the results.
- d) The number of the affective disorders studied in this work is reduced and thus the results do not have an exhaustive character which would include all the co-morbidities that could affect the functionality of counterfactual thinking.
- e) Another limit is represented by the professional experience of the psychologists that participated in the second study. A significant lot with equal groups from the point of view of the professional level would have created a new variable with possible influences upon the causal processes of generating counterfactual thinking. Future research could propose tools that would measure this effect more precisely and that would not be dependent of the cultural differences of the respondent subjects.
- f) Another limit is represented by the inequality between the male and the female subjects from all the three studies, thus, future studies could go towards identifying the gender differences in generating counterfactual thinking.

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