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The Psychology of Counterintentional Effect

Foreword

The present research is aiming to develop our understanding of intentional states and their counterintentional effects. The counterintentional effect or error is an effect opposite to but initiated by an intention of the subject to control a state or behavior. It refers to those situations when, trying to obtain something we not only fail but moreover, the greater our desire to succeed, the more likely we are to obtain an opposite effect. For example, the more we want to sleep or to get relaxed, the more aroused we become. The more we want to forget or to avoid thinking of something, the more vivid or intrusive that memory becomes. The situations when the mere intention to control our emotions, our states of mind not only fail but produce massive contrary effects are ubiquitous. D. Wegner (1994, 1997) elaborated the most articulated and comprehensive theory accounting for the counterintentional effects. According to his theory called the “ironic theory of mental control” the counterintentional errors or “ironic effects” are inherent to the architecture of mental control mechanisms. Mental control is accomplished, in this view by the interaction of two processes: an intentional operating process that is conscious, effortful and interruptible and an ironic monitoring process that is unconscious, less effortful and uninterruptible. Whereas the former is targeted to achieve the intended state, the latter is tuned to detect failures of the operating process and to bring them to consciousness. The counterintentional effect occurs because the monitoring process is less sensitive to the mental load than to the operating process. Under stress, time urgency or mental load, operating processes fail and the monitoring processes, more resistant to interference, searching for opposite contents than those entailed by the operating processes, produce counterintentional errors. However, Wegner’s model is difficult to refute (Shoham and Rohrbaugh, 1997), though it could not account for some well-known phenomena (e.g. attention deficit disorders) and has a problematic ecological validity.

Undertaking a critical analysis of Wegner's approach and using intentional forgetting as a case study, we propose an alternative theory of counterintentional effects. We claim that the implementation of an intentional state involves three categories of processes: (a) an activator mechanism, aiming to activate mental contents congruent to the intended state; (b) an inhibiting mechanism, tuned to deactivate the irrelevant or no longer relevant information; (c) a metacognitive mechanism, which evaluates the functioning of the prior two mechanisms as well as the subject's personal efficacy. Our theory is more comprehensive, easier to refute and consistent with recent findings on cognitive inhibition. It generates two predictions, that counterintentional effect is higher for those groups with low self-efficacy and defective inhibitory mechanisms, which were validated through a series of experiments. Several practical consequences for improving intentional mental control will be drawn at the end to conclude our investigations.

1. Counterintentional Effects: Theories and Data

1.1. Historical Perspectives

Anyone can certify, relying on daily experiences, that an intention to do something or to induce a certain state of mind often produces a counterintentional effect, i.e. an effect totally opposed to the desired one. For instance, our intentions to avoid thinking of food when on a diet, to sleep when we have insomnia, to stop worrying, to relax or avoid prejudice not only fail but produce opposite, aggravating outcomes. The harder we try to reach these states, the higher the probability that we will obtain an opposite effect. In general, humans' intentions to control mental states or behaviors are difficult enterprises, if not disappointingly ineffective. A quick review of the literature reveals that psychologists considered, from the early days of scientific psychology, the unpleasant, counterintentional effects of one's attempts at mental control.

The perversion of will. S. Freud (1982-1983/1950), analyzing a hysterical patient, mentioned for the first time in scientific literature the counterintentional error under the label of "the counter-will effect". He was treating a woman, who was having difficulties in breast-feeding her newborn child, "because her desire to succeed was accompanied by antithetic ideas". He noticed that when it came to the carrying out of the

intention, the inhibited antithetic idea could put itself into effect just as easily as does a volitional idea in normal circumstances. The antithetic idea establishes itself, so to speak, as a (p.122) counter-will. He maintained that the

Emergence of counter-will is chiefly responsible for the demonic characteristics which hysteria so often exhibits—the characteristic that is, of the patients not being able to do something precisely when and where they want to most passionately, of doing the exact opposite of what they have been asked to do, and of being obliged to cover everything they most value with abuse and suspicion. (pp. 126-127)

This “weakness of will” or “perversion of will” (p. 123) was considered by the founder of psychoanalysis as the landmark of hysterical neurosis. He was failing to recognize the presence of the same effect for the normal population. Moreover, he associated, in an ambiguous way, the idea of counter-will with that of repression, the leading mechanism of symptom formation.

It is the suppressed, the laboriously suppressed group of ideas that are brought into action in these cases, by the operation of sort of counterwill, when the subject has fallen a victim to hysterical exhaustion. (p. 126)

In brief, Freud has the merit of mentioning for the first time in a professional manner the presence of counterintentional effect under the name of “counter-will” or “perversion of will”, and suggesting a connection between this phenomenon and repression. However, he attributed it uniquely to hysterical neurosis and did not consider the possibility that counterintentional error might occur in normal people.

The law of reversed effort. At about the same time, several French psychologists and psychiatrists, under the influence of Charcot, were trying to elaborate the principles of suggestion and autosuggestion. Among them, one of the most influential figures, Charles Baudouin (1921) wrote:

We can concentrate voluntary attention upon any physical or mental modification we please! Yet now, when we concentrate voluntary attention upon the good idea, which we are to substitute for the bad idea, when we devote all our energies to this substitution, what will happen? A reversal of effort, nothing more. The harder we try to think the good idea, the more violent will be the assaults of the bad ideas. (p.122-123)

He offers the example of someone who has just learned to ride a bicycle and sees a big stone lying in the middle of the road; all attempts to avoid it increases the probability the wheel will be directed straight on to the obstacle.

This is something more than a quaint experience. It is an illustration of a law valid for all the obstacles we have to encounter in our paths through life. (pp. 116-117).

Latter on, Baudouin formalizes his discovery, calling it The Law of Reversed Effort:

When an idea imposes itself on the mind to such an extent as to give rise to a suggestion, all conscious efforts which the subject makes in order to counteract this suggestion are not merely without the desired effect, but they actually run counter to the subject's conscious wishes and tend to intensify the suggestion. (Baudouin, 1921, p. 116).

Relying on this law, the practical consequence we can entail is that the best way to succeed in our attempts of controlling our mind is passive concentration. It is a state of consciousness characterized by the lack of any effort to undertake the control, relaxation of attention, avoidance of distracters and passive expectation of the desired outcome. To conclude, Baudouin represents a step forward in the investigation of counterintentionality, by formalizing the law of reversed effect and by acknowledging its presence for normal people.

The ideomotor act. Another French scientist, contemporary with Freud and Baudouin, highlighted the same phenomenon, using a different terminology. This was Michel Chevreul, a chemist who conducted several studies about automatic movements involved in the oscillations of a hand-held pendulum. One of the favorite phenomena of the spiritualist vogue in nineteenth century Europe was the apparently occult movement of a weighted body suspended by a string from the finger. What Chevreul found was the psychological character of such movement, the very fact that these swings are not produced by an occult force but simply by the involvement of the person who holds it. If you are relaxed and you start to imagine the presumptive swing of pendulum, you actually produce it. However, these oscillations appear only if the person does not engage his/her entire will to produce it (Easton and Shor, 1976). The expectation

of the results or "passive concentration" is a sufficient condition to determine, without any voluntary effort or even in opposition to the will, an ideomotor action. There are glimmerings here that the intention to control ones content of conscious might fail if it is too strong and exceeds mental resources. Unfortunately, after these promising approaches dating from the beginning of our century, counterintentional effect was, until recently, completely ignored by main trends of contemporary psychology.

The analysis undertaken here concerning the fate of "counterintentional effect phenomenon" in the history of psychology shows a peculiar situation. An initially important discovery, called "law" by Baudouin, considered as the central explanandum of hysteria by young Freud, later on was minimized, neglected and finally forgotten by the scientific community. Among the multitude of factors responsible for this situation we want to invoke only two. On the one hand, the psychodynamic approach, although assimilating the idea of "perversion of will", has consumed its resources in developing the most superficial aspect of S. Freud's theory, i.e. the bioenergetic model. The psychoanalysts renounced to consider the importance of intentional states, or they have conferred to them a minimal significance. Any significant behavior was considered to be an emergence of the libidinal ID rather than of the intentional, dry Ego. They talked about "the return of the repressed", an allusive reference to "counter-will" but, in fact, they approached the phenomenon as an expression of "libidinal energy" rather than as a rebound effect of an intentional attempt to control an unpleasant mental content (Freud, 1936). Moreover, the parochial attitudes of psychoanalytic schools, their endless mutual excommunications and disdain for experimental inquiry led the investigation of counterintentional errors toward an epistemologically blind alley.

On the other hand, the promoters of experimental approach call them behaviorists or earlier cognitive psychologists have consumed huge intellectual resources to banish intentional states like believing, desiring, intending, and grasping meaning. They claimed that there is no place for such states in a rigorous science of mind (Stich, 1983; Dennett, 1987; Churchland, 1988). The mind, in the sense of intentional states, is either an epiphenomenon, outputted by the computational system under certain conditions, in which case it could not be the cause of anything, included a counterintentional effect, or just another way people talk about their behavior (see Bruner, 1990, for a detailed analysis). In short, the initial interest for counterintentional phenomena was buried by endless

terminological disputes and lack of sympathy for experimental investigation inside psychodynamic approach on the one hand, and by the "holy war" of behaviorists and cognitivists against intentional states on the other.

However, the last decades show a renewal of interest for intentional and counterintentional mental states. Perhaps this new trend was influenced by the latest developments in the study of cognitive unconscious, the cognitive approach of some traditional psychodynamic themes (Singer, 1990; Erdelyi, 1985) and reconsideration of culture and meaning in cognitive psychology (Bruner, 1990; Hirst and Manier, 1995). The major impetus for the resurrection of interest in counterintentional effects appears to come from the experimental findings concerning thought suppression. Ironically, the most pervasive outcome of these investigations was that an initial attempt to suppress thoughts could be followed by an unusual preoccupation with the suppression thought domain. Given the relevance of thought suppression studies for the renewal interest in counterintentional effects, a short discussion of these results will be presented bellow.

The basic question of interest for the study of thought suppression may be expressed as follows: What happens when people make a conscious effort to avoid a particular thought? It is useless to note that there are multiple instances in everyday life when we try to suppress an unwanted thought. Trying not to think about an upcoming stressful event, avoiding thought of smoking while trying to quit, or putting persistent thoughts of a lost love out of mind are common experience for many people. Worries of every kind are similarly conscious thoughts that people express the desire not to have. Although the experimental evidences are sketchy yet, there are some indications that the task of conscious thought suppression is difficult for people to achieve. The conscious avoidance of a thought may be perplexing, time consuming and, more important for our purpose, suppression can lead to subsequent intrusion for that thought. For example, in a classical experiment, Wegner and Zanakos (1994) asked subjects to think, during an experimental trial to anything else except a white bear. They found that the experimental group that received this instruction is much more prone to ruminate about white bears than the control group, which encoded the same stimulus but not associated with the instruction to suppress it. Another line of evidence arises in researches that call for people to ignore the information that is relevant for a judgment they must make. Whether people are instructed to ignore the information before they encounter it, or are told to disregard it afterwards, they tend to

incorporate it into subsequent judgments nonetheless. Jurors are influenced by information they have been instructed to disregard, media audiences are influenced by news they are told is untrue, and people judging odds are influenced by information even when they have offered money to ignore it. Consistent with these, but only broadly relevant are the outcome of meta-analysis concerning the efficiency of stop-thinking therapy (i.e. a technique for treating obsession disorder by training people to say STOP—first aloud, latter in an internal language—any time when the obsession content floods into consciousness). According to this meta-analysis, using this therapy or not appears to have the same result.

All in all, former and recent studies testify that our intention to control mental states is a very difficult enterprise which is not only failure-prone, but can set up a counterintentional effect, call it “perversion of will” or “reversed effort”. Under what conditions intentional control is successful and when it induces counterintentional effects? What kind of underlying mechanisms is responsible for the occurrence of such phenomena? What practical conclusions can we draw out of here? These are the leading questions of our inquiry, legitimated now by a historical review of literature, outlined above.

1.2. Preconditions and Conceptual Delineation

We cannot consider any unwanted stream of thought, mood or behavior as an instantiation of counterintentional error. The unwanted or undesirable is not necessarily counterintentional. To avoid confusions and to isolate counterintentional effects from a plethora of similar phenomena, we shall try to specify the pre-conditions, which have to be fulfilled in order to speak meaningfully about counterintentional effects. In our opinion, these are the following three: (1) the existence of an intention to control; (2) the controllability of intended state of mind; (3) a limited character of available resources.

1. Intention to control. We use to say that our thinking or stream of consciousness is goal directed. Indeed, we can count a wide range of situations when we try to solve a problem, to remember information, to set up a new plan, to control our behavior or mood. However, we experience also moments of relaxation, we are daydreaming or we are just bored; boring, specially is an ubiquitous phenomenon when we are not constrained or motivated enough to engage in a meaningful activity. Most of the time our mind is oriented toward the completion of a hierarchy

of goals but any time when no specific goal exist, the free flow of thought can be experienced. During this time (relaxation, boredom, daydreaming, etc.), a particular mental content is semantically scanned. If no goal is specified, a random feature of that content (image, thought, desire, emotion) is sampled and a quick search for feature-relevant information is made, which then may result in retrieving a related thought. This process is repeated until a thought is found that has a specific goal, at which time a goal attainment subroutine is activated. Any mental content and behavior which we experience when we are intention-free will not be considered counterintentional, despite their presumably unpleasantness. It is only when mental control is initiated and ongoing that we can speak about counterintentional errors.

Generally speaking, we may discriminate between two types of intentions to control our states of mind: one to create and another to suppress a certain state of mind. In the first case, when one intends to produce something, initially he/she notices the absence of a desired mental state and then initiates the intention to produce it. For example, I notice that I am distracted and I cannot focus on the ongoing task and then I intend to concentrate, therefore, I decide to induce or to produce a state of concentration. Or, I am tense and then I try to be relaxed, I am sleepless and I try to sleep, etc. In each of these cases the mental resources available are used to implement a motivated mental state. If we are overmotivated, our resources are quickly diminished and we reach an opposite state (we are more distracted or more tense than before); excessive motivation produces counterintentional effects because it consumes too many neurocognitive resources in a short period of time. The second type of intention, intention to suppress, is more difficult to achieve. It is initiated by a former registration of an unwanted mental content or behavior. For example, our mental space is already occupied by a negative memory or we are obsessed by an unpleasant thought and we hardly try to thrust them out from the consciousness. The target of our intention is a mental content already existent which we intend to suppress, not a content, which is still nonexistent, and we want to produce.

Intention to suppress is more difficult to realize and, therefore, more counterintentional prone for two main reasons: negative cueing and exhaustion of resources. If we try not to think of a white bear or to disregard a certain type of information, then we focus our mind on anything else than white bear or that incriminated information. But, in this case there is no single item upon which to focus our attention; there is, for instance, no

one such thing as white bear. Suppression is difficult because thinking without focus is difficult. The person engaging in suppression or self-distraction turns to think to many things. The person's attention may range over a wide mental territory, but in considering such items that a person may find scarcely absorbing could suggest a new line of thought. Trying not to think of a white bear one can decide to think of a red car or to retrieve nice memories, but although those contents can be the focal point for the moment, it turns out on examination not to be so intriguing. The person's attention may drift to something else, or perhaps more commonly, the person consults in memory the most recently occurring definition of his/her behavior, in effect asking "What am I doing?" – which is a strong reminder of the initial thought he/she wants to suppress. This circular process may underlie the difficulty of self-distraction. Trying to suppress a mental content we must concentrate on anything else, which is not very absorbing and always reminds us about the initial content to be suppressed. More and more objects around us and/or belonging to our internal landscape become negatively associated with the target of suppression, i.e. negatively cued. People come to see present stimuli (its room, daily surroundings as well as thought retrieved from the memory) as related to the content to be suppressed. These negative associations make it more accessible and, therefore, the probability of counterintentional effect increases. In sum, the task of suppressing a thought has the effect of producing associations of that thought with many other things immediately available to the person, and these associations function to make the thought more accessible, i.e. they induce a counterintentional effect.

The second reason why suppression is less successful than production of a mental state is because it requires more mental resources. When you try to suppress or disregard something, this "something" is already in your mind and has consumed a part of your scarce mental resources. You have less neurocognitive capabilities to allocate for suppression, whereas this competition does not exist in the case of production.

To summarize, the existence of counterintentional effect requires the presence of an intention, but it is more likely to occur when our intention is to suppress than to create a mental state. Intentional concentration seems to work better than intentional suppression. The moral is that, if we want to succeed it is better to try to induce a state than to suppress the opposite one. This is particularly useful for those mental states, which have well known semantic opposites: happiness and sadness, anxiety and relaxation, love and hate, sleepiness and wakefulness, etc. For example, although

"trying to be happy" or "trying not to be sad" are intentions semantically equivalent, the underlying psychological mechanisms are different. In the first situation one needs to activate mental contents congruent with happiness (searching positive memories and/or positive environmental cues) and inhibit any intruding thought or stimulus. In the second case, one initiated a non-focused stream of thought, negatively cued and has available less neurocognitive resources. The probability of counterintentional effect is higher in the second case than in the first one. Applied more to our domestic life, if we want to change our mood or stream of thought it is better to induce a new state, not to suppress the unpleasant one, and to do it in a new context or environment than in one formerly associated with the unpleasant mood. The relief from old worries one sometimes experiences on traveling to a new environment might be an example of this.

2. Controlability. There are many mental states so difficult to control that no amount of mental capacity can produce the desired state of mind. Trying to make one smart or creative or healthy, for instance, may not work, no matter what the mind does or for how long it does it. We cannot incriminate the occurrence of counterintentional effects when we are facing an actually uncontrollable state. The negative consequence of such an enterprise is an expression of our inherent limited capacity, not of a specific mechanism underlying counterintentional effects. Clear theoretical principle to determine whether a particular state of mind is susceptible to control is difficult to derive, however, despite broad scientific and popular interest in testing the limit of control. The extensive market in self-help books, claiming to offer methods for the control of mind, memory, body, emotion, not to mention hair growing or sexual life, indicates only that we desire to control these things, not that we can. We can however use weak but useful experimental criteria to determine whether intentional mental control in a particular domain can be successful. Most often, this means simply asking people to assume control of some mental state and then measuring that state to learn whether it has been controlled. Observation of the degree or duration of apparent control allows the determination of whether a significant degree of control can be achieved. Therefore, only after we have reasonable evidences that a certain mental state can be controlled, can we meaningfully talk about counterintentional errors, otherwise, any undesirable emerging effects of an attempt to control an uncontrollable state have to be ascribed to our inherent limitations.

3. Limited resources. Neurocognitive resources available are always scarce, which means that any mental process, including intentional control, has to compete with other resource-demanding processes. When intentional mental control is competing with less consuming processes, the probability to succeed is significantly higher than under pressure, time-urgency, additional mental tasks, stress, etc. For instance, we can easier concentrate our attention when we do not stay in a stressful environment, we have not a deadline for achieving concentration and we have not assigned another additional task to perform. Once it is determined that mental control is indeed effective in some domains any additional mental load will increase the probability of counterintentional errors.

To conclude, counterintentional is any effect initiated by an intention to control a state of mind that is in principle, controllable and has opposite consequences than those expected. Any undesirable or unpleasant mentation, which is not initiated by an intention, can be attributed either to our inherent limited resources or to the uncontrollability of that situation. A final remark must be added here, saying that counterintentional effect is not a dichotomous, yes-or-no variable. It can have different values on a continuum, which can range from insignificant negative byproducts of intention to control up to major, opposite consequences, able to overpass the size of intentional effect. For example, if we present a list of words and we ask the subjects to remember only a part of them (to-be-remembered words, TBR), and to forget the rest (to-be-forgotten words, TBF), counterintentional effect may have various sizes, from few intrusions of TBF words in the recall of TBR words to the reversed effect, i.e. subjects recall more TBF words than TBR words.

1.3 Experimental Evidence of Counterintentional Effects

Anecdotal evidence, although seductive, cannot constitute a substantive reason for constructing a scientific theory to account of them. The main purpose of a theory in psychological sciences is to explain and predict a large domain of experimental data concerning a class of phenomena and processes. Therefore, before presenting theoretical models aiming to explain counterintentional effects, we chose to offer a short presentation of accumulated evidence related to them. We limited our investigation to the experimental outcomes of research on intention to suppress or disregard target information in the following domain: (a) ignoring inadmissible

testimony; (b) control of prejudices; (c) mood control; (d) attention concentration; (e) thought suppression; (f) hindsight bias.

Ignoring inadmissible testimony. A jury trial faces frequently situations when the defendant, the prosecutor, one of the eyewitnesses or somebody else, presented an invalid information which has to be ignored. If a judge agrees that a piece of evidence is inadmissible, the judge must either declare a mistrial or try to neutralize the biasing influence of this evidence by instructing jurors to disregard or to ignore it. Are instructions to disregard inadmissible evidence successful? Reviewing the literature, Golding and Long (1998) offer a rather pessimistic answer, which testifies the presence of counterintentional effect:

The great majority of studies investigating psychology and law showed that these instructions are quite ineffective. (p. 66)

To catch the flavor of these investigations we shall present only the classical study of Sue, Smith and Caldwell (1973). In their study they presented mock jurors with a robbery trial summary under one of the three conditions: (a) no evidence critical to judging the defendant's guilt; (b) evidence critical to judging his guilt; (c) evidence critical to judging the defendant's guilt, with an additional instruction to disregard this evidence because it is invalid. The results of this study found that jurors, despite their explicit intentions to disregard invalid evidence, continue to use it unconsciously in determining guilt, especially when other evidence did not clearly indicate guilt or innocence. E. Loftus, investigating the discrediting information in the courtrooms conducted another series of studies. In discrediting studies, a statement is made by a witness that is later discredited by the same witness or by another witness in the trial. Loftus found that discrediting information has no effect on the verdict of the jurors (Loftus, 1974), but her findings have not always been replicated. To sum up, intention to ignore inadmissible or discredited testimony in the court produces a rebound effect, which is a counterintentional error of medium size.

Control of prejudices. People often hold back the expression of their prejudices, either because the situation is not adequate to express these stereotypes, or because they want to present themselves as more ethical or free of preconceptions. The desire to be unprejudiced is, therefore, the starting point for the intention to control. The person who wishes to be less sexist in the judgment of women, for example, must marshal appropriate

thoughts and suppress inappropriate ones repeatedly in daily life. The person who wishes to overcome negative stereotypes about minority groups, try to exert significant mental control whenever topics relevant to the minorities come to mind. This intention to control ones prejudices or counterintentional effects may undermine stereotypes. Under stress, time-pressure, additional cognitive load, intention to control might produce counterintentional errors, favoring expression of hidden stereotypes. To test this idea, Wegner, Erber and Browman (1993) undertook an experiment in the context of sexist remarks. Males and females participants to this study are given the task to complete a series of sentence stems, some of them prompting sexist judgments. For example, subjects hear someone saying: "Women who go out with lots of men are..." and are asked to complete the sentence. An egalitarian sentence completion might be something like "popular", whereas a sexist completion might be something like "slut". One part of the subjects receives the instruction to try not to be sexist, whereas others did not receive any instruction about how to respond. Both groups performed their stem completion task with or without time pressure (i.e. they are pressured to give immediate response, or they are allowed an interval of 10 seconds to deliver the response). The results showed that instruction not to be sexist was effective under no time pressure, i.e. subjects receiving this instruction produced less sexist judgments, but it had the opposite effect under time pressure. People trying to avoid sexism produce more sexist completion when under pressure than people who did not receive such an instruction. Wegner et al. obtained similar results for male and female subjects. Trying hard to control your stereotypes when under pressure exhausts your resources and may produce counterintentional effects.

Mood control. An impressive number of experiments were conducted on effects of intention to control negative moods as sadness or anxiety. These investigations emphasize that there are times in which the attempt to relax has opposite effects. A research of Adler et al. (1987) a group of panic-disorder patients make this point very clear. When these patients listen a tape promoting relaxation, as opposed to a comparison tape containing a reading from a popular novel, they reported more severe panic symptoms and showed an elevated heart rate as well. In a similar study with normal subjects, Wegner, Broome and Blumberg (1993) gave muscle relaxation instructions and registered skin conductance level (SCL), a physiological measure of relaxation. Half of the subjects received an additional mental task during relaxation (i.e. to remember a 7-digit

number), whereas the other half did not. The physiological parameter of relaxation, SCL, decreases with relaxation for the subjects in no-load condition, meaning that relaxation is effective. However, this effect was reversed for the subjects given the memory load. For these individuals, intentional relaxation rendered their SCLs higher than no instruction; they became tenser than before receiving instruction to relax, therefore, they experienced a counterintentional effect.

We can speculate that this kind of counterintentional effects may be implicated in the production of anxiety and its disorders—the chronic failure to relax. Patients suffering of generalized anxiety, panic attacks and phobias are highly motivated to avoid these negative moods and they are frequently engaged in attempts to control anxiety. This intended control in the face of ongoing stress of anxiety itself can produce a self-sustaining system, whose outcome is the continuous aggravation of anxiety through counterintentional effect.

Intentional concentration of attention. Concentration is a difficult task. We never seem to be able to concentrate fully or continuously on an ongoing task, despite our strong motivation to do it. Moreover, when under stress or competing tasks, intention to concentrate produces a counterintentional effect. It was showed by an experiment aiming to study the influence of additional mental load on sensitivity to distracters. Subjects studied a map containing the name of 40 unfamiliar cities and were asked to concentrate their attention on half of the cities, those highlighted in yellow on the map, because a later retention test will cover only those items. During the study period, cognitive load was varied, in that some subjectst were given a 9-digit number to remember at the end of the experiment, whereas others were given no number. After study, all subjects were submitted to a recognition test for the entire map in which they had to recognize in a list whether each one of the cities, as well as 40 other ones, had appeared on the previous map. The results show two things. First, as expected, the recognition performance of those subjects performing an additional mental task was significantly lower. Second, and less expected, subjects under load who were concentrating on the highlighted cities later recognized more of the unhighlighted cities than did those who were not under load. Subjects trying to concentrate under load ended up memorizing the distracters.

Thought suppression Thought suppression involves intentional avoidance of a thought, usually of a traumatic nature. Although it will occupy a central position in our experimental approach of

counterintentional effects, we shall present here a small sample of empirical results reported in literature. The most influential findings belong to the research-team from Virginia University, led by D. Wagner. In a classical experiment he asked participants to report into a tape recorder "everything that came to their minds" for two consecutive five minutes periods. Half of the subjects were solicited to try not to think of a white bear ("suppression group"), whereas, the other half, were asked to try to think of a white bear ("expression group") as they spoke aloud. The instruction was reversed for the two groups in the second period. In addition, for all groups, in both periods, the participants were asked to ring a bell any time they said "white bear" or "white bear" came to their mind. The results showed that participants were not completely successful in suppressing "white bear". Moreover, there was a "rebound effect" with regard to suppression, an increase of the frequency of thoughts about the white bear in the second period for the initial suppression group. In trying to stop thinking about this, people reported consciously trying to think of something else, and they even succeeded sometimes. Complete success was rare, because "the white bear" returned again and again. Each time it returned, people tried anew to distract themselves, in a repeated cycle. Subjects reported they felt unusually sensitive to the unwanted thought, throughout the period of suppression.

Hindsight bias. If something happens to us (e.g. we are subjects of a robbery, we failed an exam, etc.) and then, post factum, we are demanded to evaluate the probability of that event to happen, we will consider it as more likely than before it had happened. In general, we have an unconscious bias to consider an event or an outcome of a series of events as more probable after its occurrence, when we have outcome knowledge, than the probability we ascribe before its instantiation. History textbooks are full of this type of biases; quite always a historical event is considered a "necessary development" to a series of otherwise contingent character. What has happened is considered more likely after its instantiation than before it. This unconscious tendency of the individuals which possess outcome knowledge (hindsight) to claim that they would have estimated a probability of occurrence for the reported outcome that is than they would have estimated in foresight is called hindsight bias. A large amount of studies testify that subjects' intention to control this bias is unsuccessful. People who receive knowledge about the outcome of an event exhibit a change in their perception about the likelihood of that outcome, even when they want to disregard that knowledge. The logic of these studies

consist in reporting the outcome of an event to one group of subjects (hindsight participants) and comparing their likelihood of its occurrence to a group of participants who receive no outcome knowledge (foresight participants). For example, Fischhoff (1975) demanded the participants of an experiment to read descriptions of various historical events. Each event was associated with four possible evolutions or outcomes. Hindsight participants received the information that one of these outcomes has already happened, whereas foresight participants did not receive any information of this sort. All participants were asked to predict the probability to occur for each of the four outcomes. Fischhoff found that hindsight participants assigned higher probabilities to the outcome that they were told had actually occurred than did foresight participants. Moreover, even when hindsight participants were asked to disregard their outcome knowledge (i.e. to respond as they didn't know what happened), they continued to exhibit a hindsight bias.

To resume, the above-presented experimental findings highlight that intention to control mental contents (be they inadmissible testimony, prejudice, mood, biases or anything else, like a "white bear") is not always successful. This is not due to our inherent limitations but to some conditions (stress, time pressure, and additional mental load) and the nature of underlying mechanisms of intentional mental control. Theories presented below will try to identify and explain these mechanisms.

1.4. Wegner's Theory of Ironic Mental Control

To account for empirical findings concerning counterintentional effects (Wegner, 1984; Wegner and Pennerbaken, 1983; Wegner and Sneider, 1989), D. Wegner elaborated a two-factor explanatory model called "ironic mental control". He claims that processes undermining the intentional control of mental states are deeply intricate in the exercise of such control. Any attempt or intention to control our mental life initiates two processes that work together to promote desired mental state, an operating and a monitoring process.

The operating process endeavors to generate the desired state of mind. This is done by searching consciously for those mental contents and mechanisms, which are congruent with the targeted state. When we try to produce a new desirable mental state (e.g. to be relaxed, to be concentrated, to be self-controlled, to be happy, etc.), the operating process seeks for items congruent with the desired state (positive memories,

perceptual indicators of focussing attention, like scotomisation of distracting stimuli, muscular tension, increased performance in understanding, etc.). When we intend to suppress or avoid a state, the operating process searches for items which are not in the suppressed content. The search turns to distracters in the attempt to provide mental control. In this case, the range of search is much larger and, therefore, probability of a counterintentional effect, increased. Any time when the operating process identifies an adequate item, this is brought into consciousness. Some mental states are easier to achieve, by mere orientation of attention (e.g. concentration, suppression), whereas more complex mental states (e.g. relaxation, joy, sleep, etc.) are more difficult to reach. The operating process is effortful, resource-dependent and, therefore, it is subject to interference from other attention demands as, for example, additional mental load.

The monitoring process searches for indications of the failure of operating process. It searches continuously for sensations and thoughts that are inconsistent with the achievement of successful mental control. The monitoring process is unconscious, less resource-dependent and effortful than the operating process and, therefore, less prone to interference. Briefly speaking, the monitoring process is more robust than the operating process. Both processes underlying mental control are initiated by the initial intention to engage in controlling mental state, but later on, the monitoring process is initiated by any failure of the operating process, and the latter, any time when a failure is brought into the stream of consciousness by the monitoring process. To resume, monitoring merely review potentially conscious material, noting those items that indicate failure of control and thrusting them into consciousness so that the operating process can renew its work. Suppose a person is intending to relax. His/her intention initiates simultaneously both operating and monitoring processes. The first is searching for mental contents (e.g. memories, sensations, postures, patterns of arousal) able to induce relaxation. Whereas, the monitoring system searches for distracters and indices inconsistent with the proposed change, indicating failure of control. When detected, they are brought into the light of consciousness and become the target of the operating process. Each process is resource-dependent, but a complementary mental load much easier affects the operating process than the monitoring process. The operating process can be targeted either for the creation of a state of mind (e.g. relaxation, joy, sleep, etc.), or for the suppression of a state (e.g. suppression of worries, compulsive ruminations, etc.).

The occurrence of counterintentional effects is a direct consequence of the characteristics of operating and monitoring processes, deeply intricate in mental control. They are more likely to arise:

- (1) When mental control attempts are aiming rather to suppress than to create a state of mind because the range of searches for the operating process is much larger and resource consuming;
- (2) When one is under the adverse conditions of stress, mental load, time urgency, i.e. resource-consuming requirements that reduce the effectiveness of the operating process. At the same time, the monitoring process is more robust, less influenced by scarce resources and, therefore, it will flood our consciousness with contents indicating failed control, i.e. counterintentional states.

The range of data presented in the previous section can be satisfactorily explained by Wegner's theory. However, many researchers noticed that hypothetical constructs such as "operating process" and "monitoring process" do not yield easily to external observation and the theory is difficult to refute (Shoham and Rorhbaugh, 1997). In fact, the characteristics of these processes appear to be rather postulated by Wegner in order to explain the existent data than supported by experimental evidence. The monitoring process can be itself conscious and effortful in a similar way like the operating process. On the other hand, Wegner offers only allusive evidence for the resource-dependent character of the operating process and it is not at all clear why the monitoring process is less dependent on resource requirements than the operating one. Two other main objections can be raised against the theory of ironic mental control.

First, there is no place, in this theory, for the metacognitive activity of the subject. Mental control appears to be a one level matter, the targets of both mechanisms being situated at the same level of cognitive functioning; both are targeting mental contents about the state of the subject and its interaction with the environment. However, one of the most prominent features of human cognitive system is metacognition, a cognitive representation about the functioning of basic cognitive processes, a set of beliefs about their characteristics and functioning. One of the most important metacognitive cognition is self-efficacy, i.e. the perceived effectiveness one builds up about himself. Note that we can have adequate or inadequate perceptions about our own efficiency, but these perceptions have a substantial impact upon our actual efficacy. In a series of investigations, A. Bandura demonstrates that self-efficacy influences the

level of physical and cognitive performances, and even the functioning of immune system. People with high self-efficacy have higher physical performances (e.g. they can perform an increased number of exercises in a unit of time), better cognitive performance (e.g. they solve mathematical problems faster than those having a low level of self-efficacy) and, moreover, the production of natural killers cells (a body which increases our resistance to viruses and is a basic component of our immune system) is significantly improved. Considering these findings it appears natural to postulate metacognition and self-efficacy an essential factor in the achievement of intentional mental control. For instance, when we try to concentrate, we reactivate our knowledge about how successful we were in the past doing the same thing, how successful we are in general when we intend to achieve something, what kind of resources we have available, etc. If we remember that we tried beforehand several times unsuccessfully, that in general we couldn't reach our purposes and our resources are limited, we have all the chances to fail and/or to generate counterintentional effects. In short, self-efficacy is a neglected, metacognitive dimension of Wegner's model on mental control.

Secondly, and more important, the model ignores the importance of inhibition in mental activity and mental control. Given the legitimate resurrection of the interest for inhibitory mechanisms in recent psychological approaches, we shall consider more extensively this topic.

Inhibition is a general label for a family of mechanisms whose purpose is to deactivate a prepotent response or mental content. It is considered that there are two types of inhibition: behavioral and cognitive. Behavioral inhibition refers to the ability to resist temptations, to delay gratification or to control ones impulsivity. Cognitive inhibition refers to the ability to suppress previously activated cognitive contents and processes, the clearing of irrelevant actions or intentions from consciousness, and resistance to interference from potentially attention-capturing process or contents. These two types of inhibition appear to be independent one from another. Most studies found fairly low cross-correlation between behavioral and cognitive forms of inhibition. Reviewing the relevant literature, Bjorklund and Kipp (1996) found a median cross-correlation ranging from .01 to .23 with an average correlation of .17. Stronger correlation has typically been found when measures were taken between tasks within either the realm of behavioral or cognitive inhibition. For example, the median cross-task correlation in six studies assessing behavioral inhibition has an average of .31, whereas the median cross-

task correlation in the studies assessing cognitive inhibition has the value of .43. This means that various aspects of inhibition correlate much more inside those two categories of behavioral and cognitive inhibition than between them, therefore, we have sufficient reasons to consider that they are independent. Cognitive inhibition, the most relevant for our purpose, controls the content of consciousness as well as the operation of processing activities, by restricting attention and limiting processing to what is relevant for the ongoing task.

Now, and this is an important tenet of our approach to counterintentional effect, I claim that any intentional implementation initiate, at the same time, a cognitive inhibition process. More precisely, any intentional mental control is inherently associated with a process of restricting attention and thrusting out of consciousness any complementary information flow that could interfere with and jeopardize the implementation of our intention. The initial intention to engage in mental control is the starting point for two complementary processes: one aiming to implement that intention, another to inhibit any collateral information flow from challenging external stimuli to intrusive thoughts. The stronger our ability to exclude from the stream of consciousness irrelevant information relative to our intention, the higher the probability to succeed. On the contrary, a debilitated cognitive inhibition significantly increases the occurrence of counterintentional errors. Huge quantities of experimental data support the crucial role of inhibition for the functioning of the cognitive system. It would be fastidious to present them here, therefore we choose only to quote a symptomatic attitude in last years cognitive psychology, (Diamond, 1991): "Cognitive development can be conceived of, not only as the progressive acquisition of knowledge, but also of the enhanced inhibition of reactions that get in the way of demonstrating knowledge that is already present." (p. 67). There are enough reasons for now to consider cognitive inhibition as the big absent of a theory of counterintentional effects.

To conclude, although Wegner's theory, can explain a large range of experimental data, it is ignoring the impact of self-efficacy, and the existence of inhibitory mechanisms. These remarks can be considered as prolegomena for a new theory of counterintentional effects, which will be outlined bellow.

1.5. Toward a New Theory of Counterintentional Errors

A candidate theory must account for all the data which are explained by the old theory, must generate new predictions and explanations which are not available beforehand, must be easier to refute and consistent with other fundamental findings in a scientific area. Having all these constraints in mind, we propose an alternative theory for counterintentional effects. It is relying on the assumptions discussed above, that self-efficacy and cognitive inhibition play a leading role in pursuing one's intentions and in generating counterintentional effects. I claim that the occurrence of counterintentional error is determined by the involvement of three categories of processes:

- (a) An activating process, tuned to activate (or reactivate) mental content congruent to desired or intended mental state;
- (b) An inhibitory process, aiming to inhibit irrelevant stimuli and additional flows of processing;
- (c) A metacognitive process, involved in grasping information about the activating process and the evaluation of the subject's capacity to pursue, to implement his/her intentions.

The activating process is similar to Wegner's operating process. It is initiated by the intention to reach a certain state and achieve its purpose (the implementation of intended state) by (re)activating contents of memory and sensations consonant to its aim. If we want to relax, for example, we reactivate from memory images of previous relaxing circumstances, posture, rate of respiration, etc. If we want to forget something, we initiate a process of active suppression, repeating the idea of deleting the information from memory, we start an effortful processing of distracters, in order to reduce the availability of suppressed contents, etc. In a similar way to the functioning of the neural network, the higher the rest of activation of targeted units, the more likely to obtain an activation level required by the successful implementation of our intention. For instance, if we have practiced relaxation some time ago, it will be easier to reach it again, because the contents and mechanisms involved are still activated in our memory. If we stay in a favorable environment, having available stimuli consonants with the purpose of our intentions it will be easier to succeed than if we are in an aversive context. The performances of the activating process can be improved through learning and practice. If we learn appropriate techniques of relaxation, of concentration, of pursuing other types of intentions and if we practice these techniques, the occurrence

of counterintentional will be substantially reduced. Another theoretical advantage of postulating an activating process upon Wegner's operating process is that it is easier to refute and is compatible with the neural network modeling of human mind.

The inhibitory process involved in implementation of intentional states is initiated either by the intention to control or by the occurrence of stimuli, which could interfere with the ongoing process. Inhibitory mechanisms are aiming to reduce interference, to stop the allocation of resources for irrelevant or no longer relevant flows of information. A deficit of this class of processes accounts for deficit of concentration and ADHD-disorders (Barkley, 1997), intrusive thoughts in obsessive-compulsive disorders (Feraro et al. 1995), schizophrenia (Frith, 1979), etc. When we try to pursue our intention to create a new, desirable, mental state, inhibitory mechanisms are tuned to stop processing of irrelevant information from other competing sources. If we try to concentrate our attention to this text, for example, inhibitory process will work to stop processing of stimuli from our external environment (e.g. noises, surrounding conversations, the smell of a cup of coffee, etc) or from our internal medium (e.g. cenestopathic sensations). The degree of success is related not only to our activating mechanisms but to the efficiency of cognitive inhibition also.

On the other hand, when we intend to suppress a mental content, an activating process is directed toward active findings of distracters on which to be focused, whereas inhibitory process is involved in thrusting out of consciousness the intruding content to be suppressed. If one wants to forget a negative experience, the activating mechanism tries to focus on other items (daily routines, excessive workload, new persons), while inhibitory mechanisms avoid elaborated processing of trauma (e.g. we refuse to consider all negative consequences of a broken love or we postpone their analysis) and to thrust out of the stream of consciousness the intruding memory of that event (e.g. by autosuggestion, self-persuasion, etc). Suppressing a mental state is more difficult than creating a new one because the to-be-suppressed state already has a level of activation, which makes the task of inhibitory mechanisms much more difficult. Note that activating and inhibitory mechanisms compete for the same pool of neurocognitive resources, which mean that if one consumes too much of them, the other has less resources and will become more fallible. For example, if we are excessively motivated, we use too many resources for activation, which makes cognitive inhibition less effective, we become more easily distracted and our performance decreases. A good balance of

activation and inhibition appears to be a key factor in successful intentional mental control. Cognitive inhibition, like activation process, can be, in some measure, improved by learning and exercising (e.g. elaborated autosuggestion techniques, deidentification procedures, etc.) as well as by a careful management of the environment (trying to avoid those contexts which will reactivate the to-be-suppressed state and, therefore, make the task of inhibition more difficult).

The metacognitive process refers to the cognitive representations and propositional attitudes people have about their ability to implement their intention to control, as well as the efficiency of this control itself. Metacognition in this case includes also all conscious or unconscious feedbacks people receive during and after the implementation of intentional mental control. Any information received at this time is embedded in a general scheme one has about his/her ability to succeed in general and in that type of situation also. We are not innocent when we start to create or to suppress a mental state; we keep the memory of our former attempts to pursue our intentions, we can even have a comprehensive theory about what we can and what we cannot do or, at least we have general expectations, relying on similar situations and beliefs in our own resources. As we underlined above, our level of performance in mental control is influenced by our metacognition, corresponding to unfolded control, to our self-efficacy scheme in particular. A positive metacognition increases the probability of success and reduces the occurrence of counterintentional effects. Argumentative discussions, collaborative empiricism or behavior experiment and graded task assignment can modify inadequate metacognition. A presentation of these techniques is beyond the aim of this paper.

One last point to mention. The three types of processes mentioned above interact continuously; therefore, the success or failure of intentional control is always the outcome of these interactions. An effective inhibitory process can be seriously undermined by an inadequate metacognition, a low level of self-efficacy, whereas, a debilitated activating mechanism may induce negative biases in metacognition, and so on. Note also that, for the sake of simplicity, we used generic terms like "activating or inhibitory process", but, in fact, we refer to families of mechanisms undertaking these functions not to a single mechanism.

Consider now our basic question: Why intentional mental control produces counterintentional effects? Relying on the theory outlined above

we hope to offer a comprehensive answer. Counterintentional effects occur because:

1. The state we want to create or suppress is, in fact, uncontrollable;
2. Debilitated functioning of the activating process due to: (a) limited neurocognitive resources; (b) inadequate timing (starting mental control when one is under stress, time-pressure or additional mental load, which are resource-consuming processes); (c) unbalance between activating and inhibitory processes (e.g. excessive resource allocation for activation when overmotivated); (d) inadequate activating strategies (e.g. use of inefficient relaxation strategies); (e) not enough practice (e.g. lack of concentration exercises);
3. Deficiencies of inhibitory mechanisms, due to (a) prior overactivation of to-be-suppressed mental state (e.g. excessive ruminations about a topic which we later on decide to repress); (b) inadequate circumstances (e.g. exercising inhibition in the same contexts which were formerly associated with the target of inhibition and which, therefore, can neutralize inhibitory efforts); (c) inadequate inhibitory strategies;
4. Inadequate metacognition; (a) nonrealistic expectations; (b) low self-efficacy;
5. Dysfunctional interactions between these factors.

The theory outlined above has several epistemological advantages compared to Wegner's theory. First, it accounts for all range of data obtained by Wegner et al. (Wegner, 1994, 1997). The increased incidence of counterintentional errors when under stress or overwhelmed by a competing alternative task can be explained by the deficiencies or failures of activating and inhibitory mechanisms. Counterintentional effects occur more frequently when suppressing mental state because subjects must inhibit a previously activated item and moreover, the activating mechanism must activate a larger range of stimuli (i.e. distracters) than in the case of creating a state.

Second, the proposed theory is able to explain data that cannot be accounted by Wegner's "ironic mental theory". For example, Wegner's model cannot account for increased incidence of counterintentional effects when we try to suppress emotional-laden contents (e.g. memory of a trauma) than neutral content (e.g. false information). There are several other data which can be explained by our theory but not by Wegner's. These will constitute the subject of our case study on repression and intentional forgetting, presented in the next section.

Third, our theory is easier to refute. It generates different predictions than Wegner's theory. Consider two of them, which will be tested in a series of experiments, presented bellow. Relying on the basic assumptions of our model, we predict that counterintentional errors will occur more frequently with people whose inhibitory mechanisms are deficient. Recent work strongly suggests that inhibition is less efficient for depressed and stressed young adults relative to age-mate control, for younger children relative to older children (Dempster, 1992), for people with schizophrenia (Hasher et al., 1997), with frontal-lobe damage (Shimamura, 1995), with attention-deficit disorders (Penigton et al., 1993), with obsessive-compulsive disorders, for older adults than for younger adults (Zacks, Radvansky and Hasher, 1996). Wegner's model does not predict any increased incidence of counterintentional errors for all these groups. Monitoring process being unconscious, less effortful, and more reliable, it cannot be disturbed by age or emotional disorders. Briefly speaking, if we find an increased incidence of counterintentional effects with children and older rather than young adult groups we shall consider these findings as an empirical evidence for the involvement of cognitive inhibition, i.e. for the validity of our model.

A second prediction refers to the contribution of metacognitive components in the production of the counterintentional effect, a factor finding no place in the theory of ironic mental control. More precisely, the manipulation of self-efficacy will have a considerable impact upon the successful implementation of an intention. We expect that subjects with a high-level of self-efficacy will perform better at an intentional-forgetting task (under mental load conditions or in normal circumstances) than subjects with a low level of self-efficacy. The frequency of counterintentional effects will be a function of differential levels of perceived self-efficacy. A higher level of self-efficacy will correlate with a reduced number of counterintentional errors. These two predictions will become the object of our case study.

2. Repression and Intentional Forgetting. A Case Study

The variety of situations where we can encounter counterintentional effects is disarming; therefore we chose to test our theory only on a single case, that of intentional forgetting of affective laden stimuli or repression. In the first part of this section we shall present the results of our experimental

investigations on repression, trying to measure its impact upon explicit and implicit memory. In the second section, we shall test our predictions about the impact of inhibition and self-efficacy upon occurrence of counterintentional effects.

2.1 Repression as Successful Intentional Forgetting

Called by S. Freud "the cornerstone on which the whole structure of psychoanalysis rests" (1915, p. 16), repression—the exclusion of negative information from the stream of consciousness—has been something of a puzzle for psychology. Although the founder of psychoanalysis makes use for the first time of the term "repression" in his *Preliminary communications*, more than 100 years ago (Breuer and Freud, 1893, 1955), its scientific status is still uncertain despite the large amount of research conducted on the topic. To illustrate, we shall shortly consider only two extreme positions. At one extremity, relying on successive reviewers D. Holmes (1974, 1982, 1990; Holmes and McCaul, 1989) has warned that the use of the term "repression" in both clinical practice and children abuse prosecutions is meaningless or hazardous. He emphasizes that given the amount of laboratory investigations it is surprising why some experimental evidence was not found simply by chance.

At the other end of the continuum, we find M. Erdely's utterance that

conscious defensive repression is an ubiquitous phenomenon and, accordingly, ubiquitously accepted. (1993, p. 144)

Between these two extremities there is an entire spectrum of more or less conclusive approaches (e.g. Anderson and Bolton, 1925; Zeller, 1950; Loftus and Ketcham, 1994; Wegner and Zanakos, 1994).

Although through a series of examples Freud illustrated the unconscious nature of repression, in his comments on the case Lucy R. he mentioned that

a historical subject seeks intentionally to forget an experience or forcibly repudiates, inhibits and suppresses an intention or idea. (Freud, 1892/1940, p. 153)

An authoritative exegesis undertaken by M. Erdely (1993) concluded that Freud used the term "repression" differently at different times, using an interchangeable and vast terminological sprawl: "repression", "conscious rejection", "suppression", "inhibition of thought", "resistance". These are no explicit theoretical claims that this mechanism is unconscious. The unconscious character of repression is Ana Freud's legacy, who advocated a sharp distinction between repression—as an unconscious mechanism and suppression—as a conscious one (Freud, 1936). She initiated an interpretation of her father's theory according to her own and, since then, the dichotomy repression became a popular topic in any introductory text, books in psychology and dictionaries (Erdely, 1990, 1994). The failure to find the laboratory evidence for repression could be, among others, a consequence of its interpretation as an unconscious mechanism.

In our opinion it seems more productive to investigate primarily conscious, intentional aspects of repression at least for three reasons. First, because it is difficult to establish experimentally the unconscious status of some mental process (Holander, 1986). Second, because this approach could be integrated into a broader and experimentally more respectable tradition which use terms like "cognitive avoidance" (Miscel, 1986), "thought stopping" (Wolpe and Lazarus, 1966), "selective inattention" (Kohnemann, 1973) or "intentional forgetting" (Bjork, 1970; Basden et al., 1993; Johnson, 1994). Third, because it is, at least partially, allowed by S. Freud's original conception. Therefore, we have sufficient reasons to approach repression as a conscious mechanism aiming intentionally to turn something away and keep it at distance from consciousness. A subsequent problem to solve is whether repression is a memory-related or a decision-making phenomenon. In our view both alternatives—in fact complementary—are true. We can "repress" harmful information either by inhibiting its retrieval or by deciding to avoid thinking or talking about it. Although many people are remembering an unpleasant event from their own past, they avoid to ruminate or to talk about it with their peers. Others prefer to suppress directly a harmful memory. In other words, we can limit the future expression of a traumatic event either by blocking its retrieval or by deciding to disconsider it if remembered. However interesting could be the decision to scotomize a painful event, the focus of our present research concerns memory process.

Our basic assumption is that repression—as a memory-related phenomenon—could be approached as motivated (directed or intentional)

forgetting and, consequently, the method used to study intentional forgetting becomes relevant for it.

These last years testify for a resurrection of the interest for intentional or directed forgetting (see Johnson, 1994 for review; Bjork, 1989; Anderson and Bjork, 1994; Zacks and Hasher, 1994; Anderson and Spellman, 1995; Zacks, Hasher and Radvansky, 1996). Considered as a special case of cognitive inhibition, intentional forgetting is a deliberated attempt to limit the future expression of memory content. The general paradigm to study it in laboratory is by cueing some items for remembering (TBR items) and other for forgetting (TBF items) after the items have been presented for study. Thus, the intentional forgetting paradigm analyses the ability to forget F-cued items that one has recently attended to while remembering R-cued items presented in the same content and near the same time. Remember-forget cueing can be done on an item-by-item (specific method) or list basis (global method). With the specific method each item is followed by a randomly determined R or F-cue. With the global method the subject is asked to learn an initial list of words and is then told to forget the list and try his/her best in remembering the second list. After the learning phase a memory test is administrated. The subject proves a successful intentional forgetting when a poorer retrieval of TBF items than TBR items is documented. Much of the work done used only explicit tests (e.g. Davis and Okada, 1971; McLeod, 1975; Horton and Petruk, 1980) although some recent researches used also implicit memory tests (McLeod, 1989; Paller, 1990; Basden, Basden and Gargano, 1993). Basic findings, relevant for our investigation, are summarized bellow.

MacLeod (1989) assumed that whereas encoding manipulation influences performance in explicit memory tests but not in implicit memory tests, retrieval manipulation might affect the tow classes of memory tests similarly. Supporting evidences were obtained by comparing direct-forgetting effects in two explicit memory tests (recall and recognition) and two implicit memory tests (fragment completion and lexical decision priming). He presented a set of words, each word being associated with either an instruction to remember (R-cued) or an instruction to forget (F-cued). In all four tests better memory scores are found for R-cued than for F-cued items. He concluded that directed forgetting affects both direct and indirect tests of memory because the F-cued items are inhibited at the time of retrieval.

Paller's (1990) findings contradict these conclusions. In a study-test procedure 24 subjects are instructed to forget some words and to remember

others. Free-recall and cued-recall are better for R-cued items, whereas directed forgetting has no influence on stem-completion (an implicit memory test). He found also that free recall and stem-completion have different electrophysiological correlates. Moreover, he emphasized that the differential impact of directed forgetting on explicit and implicit memory tests is initiated at the time of encoding. Basden, Basden and Gargano (1993) undertake a comparison of two laboratory methods of directed forgetting: word method (i.e. each item is followed by a randomly determined R or F cue) and list method (i.e. the subject is asked to learn an initial list of words and then told to forget the list and to concentrate on learning a second list). They detected an influence of directed forgetting for explicit memory tests but not for implicit memory tests performances. The mechanisms accounting this phenomenon are different. Successful intentional forgetting for word method is caused by encoding conditions (i.e. differential rehearsal), whereas retrieval inhibition is responsible for directed forgetting detected by list method. Finally, Johnson (1994), reviewing laboratory and social judgment research, concluded that there are few evidences of successful intentional forgetting for implicit memory tests (but see Anderson, 1982, 1983; MacLeod, 1989) and that the mechanisms responsible for lower remembrance of F-cued items are either differential encoding (revealed by specific methods), retrieval inhibition (elicited by global methods) or post retrieval decision process (identified by social judgment procedures).

A major limitation of all these studies concerns the characteristics of the stimuli used, particularly their affective valence. Always the cued items are neutral or, for the purpose of our study, stimulus valence becomes an important variable. Repression is a mechanism known to thrust-out of consciousness negative information. Therefore, unlike the investigations mentioned above, we shall use emotionally laden stimuli: positive, negative and neutral. We shall contrast the effect of intentional-forgetting for negative information with those for positive and/or neutral items.

In sum, relying on the assumption that repression may be operationalized as successful intentional forgetting of negative items, we shall proceed to the following investigations. First, we shall prove the efficacy of intentional forgetting for emotional-laden as well as neutral information. Second, we want to circumscribe the modulator effect of stimulus valence upon the impact of intentional forgetting. Third, in order to see the magnitude of directed forgetting effect, we will contrast

performances at implicit memory-tests. Fourth, we will compare the results obtained by specific method with those obtained by global method.

Accordingly, our investigation is aiming to prove four hypotheses: (1) a successful intentional forgetting can be documented for emotional as well for neutral information; (2) emotional valence modulates the effectiveness of instruction to forget; (3) intentional forgetting has a larger impact for explicit than for implicit memory; (4) its involvement during encoding or retrieval produces similar effects.

Experiment 1

Subjects are asked first to select from the Adjective Checking-List—a test containing 300 adjectives relevant for personality description (Gough, 1985; Heilbrun, 1982) – 30 psychological descriptors: 10 associated with a positive valence, 10—negative and 10—neutral. These adjectives were randomly paired with common (neutral) nouns. During the learning phase each pair was presented on a display for 10 seconds, followed after 2 seconds by a capital letter R (“remember”) or F (“forget”). At the test phase, the first group of subjects was required to recall as many adjectives as possible, disregarding associated instructions (explicit test) and the second group to perform a word association-test (i.e. to associate words to the stimulus terms of a pain).

Method

Subjects. A total of sixty subjects enrolled at Babeş-Bolyai University—divided into two equal groups—participated voluntarily. The subjects were tested individually. Their average age was 22 years.

Material and apparatus. From the Adjective Checking-List, a test elaborated by Gough (1980) and periodically revised by Heilbrun (1978, 1984), each subject selected the most emotionally laden items for him/herself—10 positive, 10 negative and 10 neutral. We elaborated a list of 45 common nouns, emotionally neutral, designating usual objects (e.g. car, book, door, etc.) or natural phenomena (e.g. sun, rain) of moderate frequency of occurrence in Romanian language. Thirty of these stimuli are randomly associated with the adjective selected by the subject and the last fifteen are used during testing-phase as distracters. All instructions and paired items were presented via an IBM computer.

Design. There are two parallel 2 (type of instruction) x 2 (type of memory test) x 3 (valence) factorial design, one for each method—specific or global. The first group was in specific method condition, while the other one in global method condition. The intergroup comparison serves the purpose to evaluate the impact of directed forgetting on encoding and retrieval inhibition, respectively.

Procedure. At the beginning of the experiment all subjects were informed that their ability to remember would be tested. Special software randomly segregated the 30 adjectives and associated nouns of the study-list into R and F subsets. Individual random presentation was generated as well. Subjects were informed that the instruction to forget or to remember refers only to the adjective of the pair. Therefore, each subject studied 30 pairs, 15 F-cued and 15 R-cued. Among F-cued adjectives 5 were emotionally positive, 5—negative and 5—neutral; a similar partition was established for R-cued items.

Subjects in the specific condition received the following instruction: "Each pair exposed on the screen will be followed by a capital letter aiming to inform you whether to remember (R) or to forget (F) the adjective of the pair. If the letter is R you are solicited to recall the adjective, but if the letter is F you have to forget the item."

After reading these initial instructions on computer screen, each pair was presented individually (the noun in the lowercase letters and the adjectives in uppercase) at the rate of 10 seconds per pair. In the last 2 seconds of this experiment, a capital letter R or F appeared on the display, asking subject to remember or to forget the item. Then another pair was presented.

Subjects in global condition received 15 pairs with a rate of 10 seconds per pair. At the end of this series, they received the following message: "The list you have just studied was only for practice. Forget it now. The series you will see next is that I want you to remember. Therefore, forget the initial series and focus your attention only on the new one." The last fifteen pairs are presented in the same condition.

During the test phase, in order to evaluate their explicit memory, subjects were urged to recall as many adjectives as possible from the

study list, disregarding associated instructions. An implicit word association test is also used. Subjects received the initial 30 nouns randomly combined with 15 distracters and were told that they have to perform a task of verbal fluidity, therefore to provide an associate for each stimulus word, as quickly as possible. For a counterbalancing of the results between each group, half of the subjects started with the explicit memory test and continued with the implicit one, whereas the other half—vice versa. The test-phase was time-unlimited and begun after the learning phase with a break of 2 minutes. During the break subjects were asked to perform easy arithmetical exercises.

Results

Intentional forgetting. We began our analysis by contrasting the performances for TBF-item. Then we evaluated the magnitude of intentional forgetting for explicit and implicit memories and the presumed mediating role of stimulus valence.

We performed first a 2 (type of instruction) x 3 (valence) two-factors analysis of variance for explicit memory, subject in specific condition. We found that F-cued items are poorer remembered than R-cued items, $F(1,28) = 30.99$, $p < .001$, proving a successful intentional forgetting phenomenon; we found a small moderator effect of the valence of stimuli, $F(2, 27) = 3.00$, $p = .05$ but no interaction instruction x valence. We compared the retrieval performances between F-cued and R-cued adjectives for each type of valence and we found significant differences: $t(+)= 3.38$, $p < .002$; $t(-) = 4.40$, $p < .001$ and $t(0) = 2.65$, $p < .01$, confirming the effectiveness of intentional forgetting for emotionally laden information.

We obtained quite similar results for subjects in global condition. A two-factorial ANOVA instruction x valence revealed that R-cued information is better remembered than F-cued items, $F(1, 28) = 39.55$, $p < .001$, a post-hoc Scheffé test showing a mean difference of 1.067 at $p < .0001$. The instruction to forget produces a decrease of recalling F-cued items, but their valence and interaction instruction x valence have no modulating effect.

Discussions

Trying to summarize the basic results before starting the discussions, our experiment provided evidences that (a) we can successfully forget not only neutral but also emotionally laden information; (b) the magnitude of forgetting is larger for explicit than for implicit memory; (c) intention to forget has similar results despite its influence on encoding or retrieval.

These experimental findings become relevant for our basic assumption that repression is a successful intentional forgetting of negative, harmful information. We didn't find that negative F-cued items are more affected by intention to forget than other items. On the contrary, neutral items seem much easier to ignore than those effectively laden, which means that if one wants to forget an unpleasant information it is highly recommended to neutralize it first before making it a target for directed forgetting.

The fact that negative information is not differentially repressed leads to another conclusion, that repression is not a specific mechanism concerned with the thrusting-out from consciousness of a harmful information. On the contrary, it appears to be a general mechanism, aiming to intentionally forget memory contents, respective to their affective value. However, it may have a defensive function if it is oriented toward threatening information, improving subject's ability to cope with it. The defensive function of intentional forgetting is not entirely connected with negative information. When we are in a depressive mood, the remembering of old good days deepens on our depression. Therefore, to defend yourself, you need to keep out of working memory not only negative but also positive (or, at least, initially positive) information; both could be threatening, depending on the actual mood. If this is true for intentional forgetting, by consequence, is true for repression. Thus, approaching repression as intentional forgetting leads us to the conclusion that behind Freudian intuitions we actually have a more general mechanism, concerned not only with unpleasant information but with any harmful or neutral memory content. Defense is a contingent function of this general mechanism.

Strangely enough, our conclusion fits with some recent trends in psychoanalytic paradigm. In a bitter critic of Freudian conception on defense mechanism, C. Brenner (1981, but see Wallerstein, 1983 and Horowitz, 1990 for similar ideas) underlined that there are no special ego functions used for defense exclusively. Put in his own words,

To discuss defense in terms of defense mechanisms as Freud and any analyst since has done, included myself, is wrong. To do so implies that these are special ego mechanisms of defense, used for defense and nothing else. This is not the case. The ego can use for defense anything that comes under the heading of normal ego functioning or development.

It appears now meaningless to seek-for experimental evidences for a particular mechanism called repression when even psychoanalysts proceed to a radical revision of it. Rather, we shall talk about defensive or repressive function of intentional forgetting. Of course, it has many other functions, for example to hinder from working memory no larger relevant information (Zack and Hasher, 1994).

A second problem concerns the impact of intentional forgetting upon implicit memory. Our findings provide evidences that not only explicit but also implicit memory is affected by the instruction to forget. These are few works contrasting the effect of directed forgetting for explicit and implicit memory tests. The results are mixed; MacLeod (1989), using a specific method for cueing and fragment completion tests, found a significant difference between TBF and TBR items. However, his results are contradicted by those of Paller (1993) who found different FRPs for F-cued versus R-cued items, supporting the idea that instruction to forget leads to superior encoding for R-words. This different processing influences only recall not stem completion. In a similar way, the results of Basden, Basden and Gargano (1993) are conflicting with those reported by MacLeod (1989). They attribute this inconsistency to procedures used by MacLeod that would have permitted a contamination of implicit test with implicit retrieval. Finally, Johnson (1994), reviewing the literature, concluded that in undirected retrieval tasks little intentional forgetting occurs.

Our own results are congruent with MacLeod's findings certifying the impact of intentional forgetting upon implicit memory, although its magnitude is smaller than for explicit memory test. We ascribe these results to the characteristics of word-association we used. As we mentioned above, the target of intentional forgetting was only the second member of a pair—the adjective—whereas the nouns played the role of the context. The instruction to forget primarily affected the target and in a much smaller measure the context, which keeps quite unaffected its capacity to prime the target. According to encoding-specificity theory (Tulving and Thompson, 1973) we memorize not only particular information or event

but also, more or less explicitly, its associated context. The mere presence of a similar or identical context primes the "case information", improving retrieval. Following the same logical chain, our intention to forget can be focused only on essential (targeted) information, neglecting its context of occurrence. An event/information successfully inhibited by an instruction to forget becomes quickly reactivated when an appropriate context is provided. In sum, the impact of intentional forgetting upon implicit memory is due to its focus on target information, while ignoring the associated context. Note that we obtain similar results for each method of cueing. However, we do not deny the possibility to obtain a better estimation of instruction to forget upon unconscious or implicit memory appealing to Jacoby's process dissociation procedure (Jacoby) or to a more general class of models recently proposed by Cowan and Stadler (1996) which encompasses that of Jacoby.

Third, of a particular importance are our findings concerning the motivated forgetting of affective information. All the more so, as researchers of intentional forgetting have used in their study only neutral stimuli, neglecting affective information. According to the Freudian repression hypothesis, unpleasant emotional or traumatic events are repressed from the conscious state by the person to avoid and to cope with an overwhelming psychological pain. A number of attempts aiming to experimentally induce so-called repressive processes in laboratory settings (Erdely, 1970; Flavell, 1955), reviewed by Holmes (1974, 1990) failed to produce uncontroversial results. All of them were relying on the assumption of unconscious nature of repression. Following Weinberger et al. (1979), a series of researchers claim that repression is not a general ability, but rather a specific coping-style of personality-type called repression. Repressors are defined as lowly anxious and highly defensive; they report a lower level of subjective distress although, at the same time, psychological measures revealed a higher level of arousal than for a control group (Gudjonsson, 1981; Davis and Schwartz, 1985; Weinberger, 1990). By using the Weinberger et al. (1979) measure of repression, Davis and Schwartz (1987), Davis (1987, 1990) found that the fewer affective experiences reported by repressors reflect an inhibition of retrieval rather than a limited availability of affective information. The effects of repression, emphasized by experimental data, seem more pronounced for negative information. However, repression also appears to be associated with experiences involving a wide range of affects, including positive ones. Davis (1987, 1990) concluded that repression is a defensive mechanism

used by individuals who have a propensity to think about their emotional experiences to a lesser extent than the average people.

On the other hand, in a provocative series of studies concerning suppression, invoked above, D. Wegner and his colleagues (Wegner et al., 1987, Wegner and Zanakos, 1994) provided experimental evidences that an initial attempt to suppress (i.e. avoid consciously a stressful thought) may be followed by an unusual preoccupation with the suppressed thought domain. Moreover, reviewing the literature Wegner (1994) has developed the theory of ironic processes of mental control to account for the intentional and counterintentional effects that result from efforts to control mental contents, repression included. According to this theory a person who is first most successful in carrying out the suppression may eventually be most susceptible for the resulting obsession. Even when thoughts can be suppressed, they may return to consciousness with minimal prompting, perhaps to become obsessive preoccupation. Summing up, the three research traditions reviewed above concluded that: (a) repression as an unconscious mechanism lack any laboratory evidences and therefore is meaningless; (b) repression is a peculiar mechanism used only by lowly anxious, highly defensive persons, i.e. repressors; (c) suppression (the conscious counterpart of repression) has a paradoxical or ironic effect of reactivating the unwelcome, suppressed memory content.

Our results show that, at least for a short period of time, intentional forgetting of affective information (positive or negative) is successful. It is more efficient for neutral information but in any case it can be disrupted by the associated context, which can prime an initially repressed content. Further investigations are required to plot the evolution over time of directed ignored memory contents.

Finally, we obtained the same results by using a specific method and a global method of cueing. Previous investigation supported the idea that the first method account for the impact of instruction to forget at encoding whereas the global method reveals its impact upon retrieval (Basden, Basden and Gargano, 1993, Holyn, 1994). The similarity of the reported results allows the conclusion that intentional forgetting may operate complementary, either at encoding (producing a differential encoding of TBR and TBF items) or at retrieval reducing the availability of F-cued items. Consequently, its defensive function is perceptible as disrupted encoding or inhibited access to the F-cued information.

2.2 Intentional Forgetting and Counterintentional Effects

This section is dedicated to testing two major predictions that can be drawn out of our theory about the occurrence of counterintentional effects. Remember that for the case of intentional forgetting, counterintentional effects occur when subjects recall more F-cued than R-cued items. Therefore, we claim that:

- (1) Counterintentional effects are more robust when inhibitory mechanisms are debilitated.
- (2) A low-level of self-efficacy influences the occurrence of counterintentional effects.

Debilitated inhibitory mechanisms produce counterintentional effects.

To test our first hypothesis we used a lot of 104 subjects, belonging to three age-groups: a) children (N=42) of an average age of 8,6 years, from elementary schools; b) young adults (N=42), of an average age of 17,19 years from a college; c) old adults (N=20), with an average age of 62 years, living in a social home for elderly people in Cluj Napoca. The reason for which we chose these three groups of participants was that a large number of studies demonstrated significant deficiencies of inhibitory mechanisms for children and older adults, compared to younger adults. (Dempster, 1991, Arbuthnott, 1995). So, the idea was that if we find an increased number of counterintentional errors for children and older adults than for young adults, we can prove the involvement of inhibitory mechanisms in occurrence of counterintentional effects, offering a solid experimental support for our theory. It is relevant, for this theory-race, to remember that Wegner's theory allows a different prediction, i.e. intensity of counterintentional effect will not be differentiated for age groups.

We used the intentional forgetting paradigm, item method, already described in section 2.1. There was only one additional manipulation: half of the subjects received an intentional forgetting task with an additional mental load (they were asked to remember a 7-digits number at the end of the test), whereas, the other half, performed intentional forgetting without mental load. We avoid here a fastidious description of procedure, which, in fact, is very similar to what we exposed in a prior section and present our results straightforward.

We found that memory performance is higher for young adults than for children and elderly people ($F= 6.32, p< .001$). They recalled 56.66% of TBR items, compared to 32.41% for children and 20.66% for old adults.

But what is more relevant for our research is that children and elderly people recalled more TBF-items than TBR-items. Children remembered 33.63% F-cued items and 32.41% R-cued items and old adults 21.90% F-cued items relative to 20.66% R-cued items. Young adults exhibit a different pattern of performances: they retrieved 65.90% R-cued and only 56.66% F-cued items. Although the differences are small, we have empirical support to prove that those participants with deficient inhibitory mechanisms emphasize an increased rate of counterintentional errors. Therefore, cognitive inhibition is a basic mechanism involved in the occurrence of counterintentional effects.

Low level of self-efficacy induces counterintentional effects. In order to test our second hypothesis we administered a self-efficacy scale, elaborated by Schwarzer and Jerusalem (1993). We selected then 38 subjects, half of them with a very low and half of them with a very high level of self-efficacy and we asked them to perform an intentional forgetting task, with or without additional mental load. Confirming our hypothesis, participants with low self-efficacy exhibited more counterintentional errors than those high in self-efficacy. In fact, quite surprisingly but according to our hypothesis, subjects low in self-efficacy recalled more F-cued than R-cued items (57.03% versus 52.10%), whereas subjects with a high level of self-efficacy exhibited an opposite pattern, remembering more R-cued than F-cued words (55.99% versus 49.99%). We can conclude, relying on this data, that self-efficacy, a basic ingredient of metacognition, has a significant contribution to the occurrence of counterintentional effects.

To conclude, taking together, all experimental findings presented in this section constitute a substantive experimental support for our theory. As we claimed before, it is more powerful than Wegner's theory, because it explains all the data which were invoked by Wegner but, additionally, it explains new findings as those presented above. We are very aware that the process of theory testing takes long time and is continuous, but we have substantial reasons to be optimistic.

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