

- Stukat, K.G. (1958). *Suggestibility: A factorial and experimental analysis*. Stockholm: Almqvist & Wiksell.
- Sully, J. (1881/1982). *Illusions. A psychological study*. New York: Da Capo Press.
- Titchner, E.B. (1916). *A textbook of psychology*. New York: MacMillan.
- Tönnis, S., Böttcher, S. & Schildt, A.: (1999, in Vorbereitung). Autosuggestion und kognitives Training bei psychischen Störungen. *Experimentelle und klinische Hypnose. Zeitschrift der Deutschen Gesellschaft für Hypnose*, XVI, 2.
- Toland, K., Hoffman, H. & Loftus, E. (1991). How suggestion plays tricks with memory. In: J. Schumaker (ed.) *Human Suggestibility*. New York: Routledge
- Vaitl, D. & Petermann, F. (Hrsg.) (1993). *Handbuch der Entspannungsverfahren Bd.1: Grundlagen und Methoden*. Weinheim: Psychologie-Verlags-Union.
- Volbert, R. (1999). Determinanten der Aussagesuggestibilität bei Kindern. *Experimentelle und klinische Hypnose. Zeitschrift der Deutschen Gesellschaft für Hypnose*, XV, 1, 55-78.
- Wallbott, H. G. (1992). Nonverbal Behavior and Suggestion. In: Bongartz, W., Gheorghiu, V. A., Bongartz, B. (ed.). *Hypnosis: 175 Years after Mesmer*. Konstanz: Universitätsverlag.
- Watzlawick, P. (1981). Selbsterfüllende Prophezeiungen. In: P. Watzlawick (ed.). *Die erfundene Wirklichkeit*. München: Piper.
- Wegner, D.M. (1989). *Die Spirale im Kopf. Von der Hartnäckigkeit unerwünschter Gedanken - Die Psychologie der mentalen Kontrolle*. New York: Routledge.
- Weitzenhoffer, A.M. (1953). *Hypnotism. An objective study in suggestibility*. New York: Wiley.
- Weitzenhoffer, A.M. (1989). *The practice of hypnotism*. New York: John Wiley & Sons.
- Yapko, M. D. (1994). *Suggestions of abuse*. New York: Simon & Shuster.
- Zaragoza, M.S. & Mitchell, K.J. (1996). Repeated exposure to suggestion and the creation of false memories. *Psychological Science*, 7, 294-300.
- Zwingmann, Ch. (1978). Zur Wirkung suggestiver Einflüsse im Alltagsleben am Beispiel des nostalgischen Phänomens. In: Katzenstein, A. (Hrsg.) (1978). *Suggestion und Hypnose in der psychotherapeutischen Praxis*. Jena: VEB Gustav Fischer.

Theoretical and Psychophysiological Aspects of Suggestibility

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■ In the first part of the present chapter a short review of theoretical approaches is provided which is important for the development of a psychophysiology of individual differences in suggestion and suggestibility. In the second part of the chapter findings are described which are derived from a number of correlational analyses on suggestibility and other personality dimension; they evidence the multicomponential dimensionality of suggestibility and the difficulty to define this dimension in terms of other related personality variables. Correlational analyses have provided experimental evidence indicating that hypnotic suggestibility is a mediocre predictor of perceptual suggestibility and imaginative suggestibility by accounting for a modest portion of total variance. Finally, in the third part of this chapter, results from three psychophysiological studies on suggestibility, carried out in our laboratory, are reviewed and discussed in terms of physiological processes that may account for individual differences in suggestibility.

In the work of the Nancy School (Bernheim, 1888), suggestive phenomena were considered as the basis for the explanation of hypnosis; and the distinctive characteristic of hypnosis was the increase in suggestibility. If on one hand Bernheim's theory on suggestion produced a new perspective for the explanation of hypnosis, on the other hand the view of suggestibility as a medium for the induction of hypnosis has interfered with the growth of a psychology of suggestion.

In the beginnings of psychology as a science, suggestion phenomena were considered as important elements of psychology. Binet (1900) began the introduction of his book "La suggestibilité" by considering the individual suggestibility as independent from hypnosis. In contemporary general psychology, in contrast, the suggestion phenomena outside of hypnosis appear to be in large part neglected. Gheorghiu (1989a), in his critical considerations of suggestibility research, pointed out that suggestibility is the stepchild of psychological research. Current work in this area has confined sug-

gestibility to hypnosis research and this permanent overlap has produced misleading ideas about the link between them.

In the field of research on suggestion the definition of suggestion has produced a number of serious attempts which did not come to a conclusion. This may have happened because suggestion is a multifaceted phenomenon. Anyway, in the dawning experimental research, the concept of suggestion played an important explicative role in early psychological theories (for a review, see Chertok, 1984; Allport, 1985; Gheorghiu, 1989a, b). This concept has been used to explain placebo response (Trouton, 1957). Eysenck (1947), Eysenck and Furneaux (1945), and Stukat (1958) have provided experimental evidence in favor of multicomponents of suggestibility. They indicated two main subdimensions that were named 'primary suggestibility' and 'secondary suggestibility'. Suggestive influences were also introduced in cognitive models by Sherif (1935) and Asch (1956).

During the second half of the outgoing 20th century, the concept of suggestion/suggestibility was abandoned as an explicative tool. The concept of suggestion surfaced strongly in the research field of forensic psychology (Gudjonsson, 1989) and it was the subject of the First Symposium on Suggestion and Suggestibility' held at University of Giessen in the 1987 (Gheorghiu et al., 1989). This symposium summarized historical, theoretical and experimental aspects of research on suggestion and suggestibility. Today suggestion is generally defined as a form of communication (see Gheorghiu, 1989a; Lundh, 1998) whereby one person (the suggestor) intentionally or unintentionally (using verbal and/or nonverbal messages and other contextual factors) indicated to another person (the suggestant) that he/she will experience a particular response. If the suggestion prevails, the suggestant does not realize while responding that other possible behavior are excluded and he/she takes over from the suggestor intentions, desires, feelings, and beliefs. A peculiar characteristic of a suggestion response is that it is the product of an autonomic process that the suggestant perceives as non-volitional (Bowers, 1994; Gheorghiu, 1989a, b; Lundh, 1998). Ernest Hilgard (1991, p.38) has characterized the suggestion in the following way:

"Suggestion is a form of communication that produces a compliant response that differs in its subjective aspects from a deliberate response to a request."

Furthermore, E.R. Hilgard differentiates suggestibility from suggestion. Suggestibility refers to individual differences among persons who receive suggestions under carefully stated conditions. Suggestion may affect the general psychological and physiological functioning at various levels. For example, suggestion may affect behavior at various levels such as perception, emotion-motivation and cognition. Furthermore, if we assume that every mental process (like suggestion phenomenon) is the product of a brain process (Mountcastle, 1995), then we have to maintain that physiological brain functioning has a central role in determining this phenomenon.

A number of researchers (e.g., Barber, 1969; Weitzenhoffer, 1963, 1980) argue that suggestion, rather than hypnosis, is the basic phenomenon that may explain hypnotic

behavior. In the First Symposium on Suggestion and Suggestibility, the independence of hypnotic events from suggestion phenomena was pointed out. In particular, Evans (1989), after an historical and empirical review, concluded that suggestion/suggestibility and hypnosis can be considered in part as different processes. Edmonston (1989) concluded more drastically that hypnosis is not suggestion and suggestion is not hypnosis. Later, Hilgard (1991) provided evidence that hypnotic behavior cannot be defined simply as responses to suggestions: although hypnotic behavior consists of responses to suggestion there are responses to suggestion that do not belong to the hypnosis condition; and, viceversa, hypnotic phenomena cover more than specific response to suggestion.

Research on hypnosis has produced a number of social-psychological oriented theories in which the utility of terms such as "waking" or "hypnotic state", "trance" or "altered state of consciousness" is rejected (see Kirsch, 1985; Kirsch, Mobayed, Council & Kenny, 1992; Sarbin & Coe, 1972; Spanos, 1982, 1986; Wagstaff, 1981). In contrast, the terms used in these theories are relaxation, attitude, belief, compliance, expectation, and conformity. These theories view hypnosis as a social situation in which subject and hypnotist play two different roles. The role of subjects is to behave as if they are in "hypnosis" in order to comply with instructions, expectations, and cues previously given indirectly or directly by the hypnotist. The subject may try to use imaginative or other specific activities devoted to produce the suggested responses.

The contribution of social-psychological theorists to the development of experimental paradigms so as to study multidimensional aspects of suggestion cannot be contested. In hypnosis research, Martin Orne (1970) suggested the importance of controlling for the effects of conformity to demand characteristics ("compliance" with instructions, i.e., the phenomenon of responding in a way that is contrary to one's own beliefs, in order to behave in agreement with the expectations or wishes of others). According to Wagstaff (1991), with the adoption of the social psychological perspective, the distinction between waking and hypnotic suggestibility becomes simply a nominal issue. In the cases in which there are differences between waking and hypnotic suggestibility, it is because the hypnotic ritual generates further contextual demands and expectations. One of the peculiar phenomena of hypnosis is the subjective perception that a suggested movement is occurring without volitional effort (ideomotor response). According to Kirsch (1990), the role of response expectancies in generating non-volitional responses is similar to the role of intentions in generating voluntary actions. According to this author, response expectancies affect subjective experiences and their physiological concomitants. The self-confirming effects of response expectancies on physiological activity do not appear to be limited to the level of subjective experience, but they can cure contact dermatitis or affect the immune system. According to Kirsch and Lynn (1997), suggested non-volitional behaviors are intentional acts that are triggered automatically by suggestion and suggestion-related sensations. The generalization of response expectancy is a cognitive set which enables the triggering of both behav-

viator and sensations. The subjective classification of a response as volitional or non-volitional depends on prior beliefs and on interpretation of instructional cues.

Looking for a psychophysiological approach to suggestive processes, the variety and multidimensionality of suggestion and suggestibility phenomena makes this approach very difficult to pursue. The psychophysiological perspective of suggestive processes needs clear and specific theories of suggestive phenomena that allow us to make hypotheses about the classes of physiological phenomena that may be involved in response to specific suggestions. One obvious assumption is that brain response to suggested response is nothing more than the physiological expression of the same psychological phenomenon; and, therefore, it cannot be explicative of the generation of suggestive phenomena *per se*. In the case in which a brain response is detected, the problem could be in the understanding how suggested stimuli produce the observed physiological changes, and to what extent these changes differ from those observed in a non-suggestive context.

Another important question concerning suggestive brain processes is to understand how different suggested mental strategies are significantly effective in evoking the same response. For example, it is known that different analgesia suggestions are effective in reducing pain perception (see De Pascalis et al., 1998; Zachariae & Bjerring, 1994), but it still remains unclear as to whether or not hypnotic analgesia is the product of a single inhibitory phenomenon in the brain or a given hypnotic suggestion is one of the possible keys to have access to it. More complex still is the physiological approach devoted to find the neurophysiological determinants of suggested response to a given stimulus. This approach could consider the physiological activity as an independent variable that determines the ongoing suggested behavioral response, i.e., the configuration of neural preparatory activities that significantly increase the probability of the emission of a suggested response. Looking for the psychophysiological contributions in the field of suggestion/suggestibility phenomena (apart from the area of hypnosis), research into suggestion is clearly lacking. It is far from being able to organize itself as a new branch of psychophysiology among the variety of research areas existing today.

There are a number of interrelated reasons for the lack of psychophysiological studies concerning suggestion or suggestibility phenomena. The first reason lies in the complexity and difficulty of the topic itself. The second lies in the underevaluation of the importance of the topic. The third reason lies in the insufficient analysis of the variety of psychological processes responsible for the multiplicity of suggestive phenomena. On the other hand, as Gheorghiu (1989a) has so aptly summarized, the difficulties in developing theories of suggestion cannot only be attributed to shortcomings in suggestion research. They mainly depend on the lack of integrative approaches into psychological research.

Suggestibility and Neodissociation

Neodissociation theory is mainly concerned with the phenomenon of hypnosis, and views the influence of hypnotic suggestion as dissociated from conscious intentions and purposes. The theory, which dates back to the end of nineteenth century, has been recently modified by E.R. Hilgard (1977, 1986) in his neodissociation model of hypnosis. Hilgard assumes that at any one time the behavior of a given individual is the product of the activity of subordinate cognitive control systems operating in a hierarchical order. At the top of a control hierarchy is the executive control of thought and behavior, with the other subsystems being subject to executive control and monitoring. When the action is experienced as conscious, the operation of these systems is carried out in an integrated way according to their hierarchical arrangements (with the most automatized system being at the lowest level of the hierarchy). However, under particular circumstances, as in the cases in which waking or hypnotic suggestions are administered, the activity of subordinate control systems can be dissociated from that of executive and/or monitoring systems. According to Hilgard's neodissociation theory, the suggestive behavior is characterized by a reduced influence of executive control and volition and by an increased activation of subordinate systems of control whose automatic activity produces the suggested response. The suggested action is experienced as non-volitional because the activity of the superordinate conscious system is bypassed (Bowers, 1984; Kihlstrom, 1984). This does not mean that in this condition the person does not exercise control over his or her behavior and thought, but simply that the ongoing control can be dissociated from conscious intentions and goals. According to Gheorghiu (1989a p.42) "the influence of suggestion operates on the basis of a substitution process in which the conscious monitoring is bypassed". Persons who perform the suggested behavior, experiences it as if they have no alternative solution at their disposal. Neodissociation theory began to be used in explaining the phenomenon of hypnotic analgesia. Afterward, it has been evoked in order to explain multiple personality disorders (Brassfield, 1983), as a method of coping with trauma (Spiegel, Hunt & Dondershine, 1988), and various experiences as divided attention, and recall from unavailable memories, etc. More recently, neodissociation theory has been suggested, independently of a hypnotic context, as a tool to explain preparatory mechanisms necessary for making suggestible responding possible. In particular, John F. Schumaker (1991) discussed, in an excellent paper, the role of dissociation as an inhibition of our analytical and critical thought processes:

"More specifically, I feel that it is our ability to dissociate that makes suggestive responding possible. Dissociation must precede, and pave the way for, suggestibility. Consequently, if the conditions are not right for dissociation, they are not right for suggestive responding. Suggestions, properly defined, involve conclusions about or interpretations of reality which would not be made if a person was enjoying (or suffering from!) the workings of his/her critical and analytical mental faculties. If not initially dissociated, a chair could not be "suggested" into a horse. A person would not respond

to the suggestion that he/she would feel no pain while undergoing major surgery. Likewise, there would be no angels, devils, or holy ghosts" (p. 113).

Schumaker, starting from a functionalistic point of view, pointed out also the adaptive value of suggestion. Because suggestive responses are necessarily produced under a certain level of dissociation, both components are also involved in a process that allows us to escape from situational conflicts or perceptual incongruences that could be rendered as suitable for living our everyday life. According to this model, dissociated consciousness is a preparatory mechanism producing a condition like a "vacuous state" that is rendered meaningful through the process of suggestion. Schumaker, starting from Ludwig's (1983) views of psychobiological functions of dissociation, has pointed out that one of the adaptive features of the dissociation/suggestion phenomena is the "economy of effort". The dissociation from sources which overload our nervous system can preserve ourselves from neurologic disturbance and can serve as a "cognitive filter" that selects relevant stimuli and related mental functions and behaviors in order to enhance productivity and improve efficiency with minimum expenditure of energy. One important component involved in obtaining dissociation is the focusing and narrowing of attention.

It is generally accepted that one purpose of the hypnotic induction procedure is to allow the subject to eliminate irrelevant stimulation and to focus attentional resources on the most relevant source of information. Tellegen and Atkinson (1974) defined the construct of absorption as an individual disposition allowing one to "totally" attend to a certain type of event which becomes particularly relevant. These authors developed an absorption scale that has shown moderate, but consistent, positive correlations with hypnotizability. Even if the moderate correlation suggests that the trait absorption did not fully explain hypnotizability, absorption ability appears to be an element facilitating the experience of dissociation. Cardena and Spiegel (1991) highlighted a model that seeks to integrate the concepts of absorption, suggestibility and dissociation. A complex issue concerns the increase in suggestibility as a consequence of hypnotic induction. According to such a model, in the ordinary modality of experiencing, a suggestion might be one among numerous (engaging) resources available to the person and would be competitive with other sources of stimulation. In contrast, in hypnosis, a suggestion would have greater relevance because of the increased level of dissociation; there would be diminished competition with other sources of stimulation, accentuated by the person's absorption in continuous experience. The general disposition to become absorbed, and the focussing of attention that commonly is required in the hypnotic induction, both enhance responsiveness to suggestion.

Suggestibility and Dissociated Control

Bowers (Bowers, 1983, 1992, 1994; Woody & Bowers, 1994), starting from Hilgard's neodissociation theory, formulated a revision of neodissociation theory that refers to 'dissociated control'. Starting from the subjective experience of involuntariness in res-

ponse to suggested movements in hypnosis, Bowers relocated the influence of suggestion with respect to E.R. Hilgard's model (1986).

According to E.R. Hilgard's model, hypnotic suggestions are hypothesized to act upon the central control structure, or executive ego, causing it to create a communication barrier that separates a small part of itself from conscious awareness. Bowers hypothesized that hypnotic suggestions act directly on subordinate systems of control (i.e., movement control system in the case of a suggestion of movement). This may happen because hypnotic induction reduces the executive control over the subordinate subsystems.

The main difference between E.R. Hilgard's and Bowers' models lies in the fact that, for the first model, the hypnotic response is an intentional act that is experienced by the participant as involuntary. In contrast, Bowers' model considers that suggested response is truly involuntary and cognitive activities are concomitant rather than mediators of suggested responses. According to the latter model, hypnosis is a state which is directly activated by the hypnotist's suggestion since the executive control over subsystems is weakened, suggestion acting directly on subordinate systems. According to Woody and Bowers (1994), the effects of suggestions are enhanced in hypnosis since hypnotized subjects are behaving in a similar way to patients with frontal lobe disorders. Recently, Woody and Farrowden (1998) reported preliminary results from a number of studies in which performances of people with high and low hypnotic suggestibility were compared both in and out of the context of hypnosis on a variety of memory tasks known to be sensitive to frontal lobe functioning. It was predicted that, in the absence of any specific suggestions for amnesia, highly hypnotizable people, in hypnosis, would demonstrate impaired performance on frontal memory tasks, as compared to highs outside the context of hypnosis and to lows in either context. Preliminary results showed that high hypnotizables, both in waking and in hypnosis, performed poorly on most of the memory tasks. Since the high hypnotizables behaved according to the dissociated control model also outside of hypnosis, the authors concluded that their observations were inconsistent with this model and indicated that hypnotic susceptibility differences outside the context of hypnosis are more important than hypnotic context per se (i.e., without specific suggestions to produce a given effect).

Suggestibility and Socio-Cognitive Theory

Social-cognitive (or social-psychological) theories of hypnosis (Barber, 1969; Coe & Sarbin, 1977; Lynn et al., 1990; Sarbin & Coe, 1972; Spanos, 1986; Spanos & Chaves, 1989; Wagstaff, 1981, 1986) argue that hypnosis is not an altered state of consciousness. Rather it involves normal behavioral and mental processes that derive from the special social-contextual situation. According to such a theory, subjects, in a hypnosis situation, enter into a special social role and play that role by using goal-directed cognitive and behavioral strategies devoted to convince the hypnotist and themselves that they are good hypnotic subjects. In particular, representative scientists of the social-

cognitive theory of hypnosis (Sarbin, 1989; Spanos, 1986) see hypnotic responses as intentional acts rather than involuntary responses. Highly hypnotizable participants deceive themselves into believing that their intentional acts are happening involuntarily.

With respect to the problem of 'non-volitional' responding, both neodissociation and social-cognitive theories have maintained that highly hypnotizable persons intentionally initiate a suggested behavior (e.g., to begin or inhibit a movement), but somehow manage to retain their intentional acts out of awareness. In contrast, dissociated control theory (Bowers, 1992) maintains that hypnosis weakens executive control structure over the subordinate cognitive and motor subsystems by allowing the subsystems to be invoked directly by suggestions.

Social-cognitive scientists think that hypnosis is not a special condition in which the laws of behavior are different from normal. In particular, according to Kirsch (1997a), it seems more reasonable to assume that all of the behaviors and experiences occurring in hypnosis can be evoked by suggestions delivered without the prior induction of hypnosis. Furthermore, given that in hypnosis, responses to suggestions are facilitated, it is also reasonable to assume that the induction of hypnosis is a procedure that typically aims to produce an enhancement of individual disposition to suggestive responding. Intensive research has been conducted to suggest that the best predictors of hypnotic susceptibility are waking suggestibility and response expectancy, with expectancy being a significant predictor of hypnotic response (see, e.g., Kirsch, 1997a; Kirsch & Lynn, 1999; Gearan & Kirsch, 1993; Lynn et al., 1984; Vickery & Kirsch, 1991).

The singling out of mental processes which account for the phenomena of suggestion on responding seem to represent an important challenge for psychophysiological research. A general theory of suggestion/suggestibility phenomena, should lay the foundations for a scientific approach to the central problem of what are the psychological and physiological determinants of suggestive responding. How can different suggested cognitive strategies produce a similar final response to a given suggestion? How is this expressed into neurophysiological language? An answer to such questions may help in the understanding of how suggested responses, which are experienced as automatic and involuntary, become operative in the brain.

Suggestibility, Conditioning and Satiation

Pavlov (1927) considered suggestibility as the most elementary manifestation of a conditioned reflex, dependent on the interaction between cortical excitation and inhibition. The studies viewing suggestibility as a satiation phenomenon are linked to those that viewed suggestibility as conditioning. According to Gheorghiu (1989b), however, the formation of a conditioned reaction is not definable as suggestion since it leaves no alternative possibilities of response. This does not mean, however, that suggestion effects may not occur on the basis of learning processes or conditioned responses. Pavlov (1927), with respect to the phenomenon of hypnotic suggestion, speculated about the fact that a word may be "conditioned", and like the classical conditioned

reflex, the process may evoke a conditional response. The word is connected with other internal and external stimuli in the cortex which assume the function of an integrating system. According to Pavlov, the word is a comprehensive stimulus ("the signal of the signal") that can replace any type of conditioned stimulus and, therefore, can induce any reaction conditioned by a given stimulus.

Afterwards, the Pavlovian point of view was rejected because it was considered to involve physiological reductionism. In an attempt to evaluate the relationship between conditioning and suggestion, Stukat (1958) found a significant association between "primary" suggestibility measured by the Body Sway test, and conditioned motoric withdrawal to a red light signalling the delivery of an electric shock. Galvanic skin response (GSR) to the conditioned stimulus was not found to be significantly related to suggestibility. The author concluded that a conditioning mechanism is involved in primary suggestibility, but he also observed that a conditioned response model can only partially explain suggestion.

Other experiments have shown that it is possible to produce hallucinations with suggestions by using a learning-conditioning procedure (Davies, 1987; Warburton, Wesnes, Edwards, & Larrad, 1985:). Lohr and Souheaver (1981), in order to investigate the nature of suggestibility, used a procedure for language conditioning of evaluative word meaning. They hypothesized, for highly suggestible subjects, a greater capacity for conditioning compared to low suggestible subjects; their results, however, did not provide evidence for their hypothesis. Das (1966) found that semantic satiation, i.e., the lapse of meaning after word repetition, was negatively related to suggestibility. This result was explained by appealing to a state of selective cortical inhibition assumed to be implicated by the phenomenon of suggestibility, with highly suggestible people being characterized by a slow satiation effect following word repetition and vice versa. According to Gheorghiu (1989a), the general relevance of Pavlov's point of view is in the idea of substitution by verbal suggestion; it is layed "in the 'as if' condition of the suggestion itself" (p. 35).

Wickramasekera (1980) presented a model of placebo response as a conditioned response wherein, by means of association with unconditioned stimuli, neutral places, persons, things and procedures can acquire the ability to reduce pain, and a variety of anxiety responses. The author divided the formation of placebo response into two stages, the 'acquisition' and 'consolidation' phases. The first involves mainly the activity of the left hemisphere, the second the activity of the right. According to Wickramasekera, in the second conditioning stage of placebo responding, the same variables that can influence hypnotic susceptibility can also influence placebo responding. This assumption was derived from observations supporting that, for right-handed people, hypnotizability and suggestibility appeared to be predominantly the product of a right-hemisphere function (mainly engaged in holistic and imaginative activities; see, for example, Bakan, 1969; Graham & Pernicano, 1976; Gur & Gur, 1974:) and from the fact that the reduction in awareness is common to placebo effect and suggestibility-

Even if the literature does not evidence a strong relationship between suggestion/suggestibility and conditioning phenomena, results from a range of studies indicate that psychophysiological investigations aiming to evaluate the influence of suggestibility/suggestion on conditioning provide important results in this field.

More recently, Wickramasekera (1994, 1996) assumes that: (a) hypnotic susceptibility is dependent on a mode of information processing in which the sequential-analytical mentation can be cognitively attenuated; (b) hypnotic susceptibility is a stable ability (Piccione, Hilgard & Zimbardo, 1989); (c) in highly hypnotizable persons, during threat perception, changes in perception, memory and mood appear to occur 'automatically' or 'involuntarily' both inside and outside of hypnosis (see e.g., Bowers, 1982; Sheehan, Donovan & MacLeod, 1988; Wickramasekera, 1979). Starting from these assumptions, Wickramasekera has provided a number of experimental findings which indicate that highly hypnotizable people are at risk of stress or threat-related psychological and somatic symptoms because of their hypersensitivity to the perception of threat (Wickramasekera, 1988, 1993, 1995, 1996). Considering that people high on the neuroticism dimension are highly sensitive to negative emotions or threat in information processing (e.g. Mathews & MacLeod, 1986; Mathews, May, Mogg & Eysenck, 1990), this author constructed a model wherein the coincidence of high hypnotic susceptibility and neuroticism amplified chronic threat mainly in the cases of those who lacked social support and high coping skills (e.g., Wickramasekera, 1988, 1993, 1994). There is experimental evidence suggesting that people with high levels in these two variables may learn inadvertently to amplify pain perception by increasing chronic sympathetic activation that can drive psychopathology via neuroendocrine and immune mechanisms (Wickramasekera, 1996; Herbert & Cohen, 1993).

Self-Organization Theory and Suggestibility

The increasing interest in the field of non-linear effects in complex systems (or chaotic processes as they are commonly called) and their application in many areas of science including psychology and physiology (see Elbert, Ray, Kowalik, Skinner, Graf, & Birbaumer, 1993) is producing consistent changes in the manner in which psychological processes are analyzed. The classic method of investigation tries to explain behavior in terms of the dynamics of linear systems. The output of the system (i.e., the response) is a function of the input (characteristics of the environmental stimuli and of the cognitive activity). In contrast, non-linear methods of investigation enable focus on sustained oscillations and on sudden changes of state. In contrast, with the classic method, the role of initial conditions (i.e., the history) becomes the determinant that defines the behavior.

Kruse (1989) has proposed the self-organization theory of cognitive functioning in order to explain hypnosis and suggestion/suggestibility phenomena. According to the self-organization theory (Maturana, 1970, 1982; Maturana & Varela, 1980; Von

Poerster, 1981), cognition is nothing but a process of relating inner-organismic events devoted to the maintenance of the biological structure. According to Maturana (1970), the structure of a biological organism is the product of a non-linear self-organization process that presents an "autopoietic" function, i.e., the only purpose of living organism is to maintain this structure. In Maturana's conception the brain is part of an autopoietic system that can be viewed as: 1) an "open" system because of its continuous exchange of energy and substance with its medium and because of its fluctuation by external events; and 2) a "closed" system because of its autonomous capacity to create meaning. Cognitive processes, in contrast with information processing theories, are the products of active construction. From an informational point of view, the cognitive system is a closed system. Like the gestalt principles in perception, the process of formation of an object is the product of a self-organization activity of order formation. This approach steers us to an epistemological position termed "radical constructivism".

Kruse and Gheorghiu (1992) argued that the induction of positive and negative hallucination via suggestions is one of the most indicative responses demonstrating the self-organization character of the cognitive system. This phenomenon can be explained assuming that many situations in our everyday life are ambiguous, but we do not experience any individual instability since cognitive strategies operate to achieve disambiguation. Kruse (1989) suggested that rational mechanisms, which are considered to be the most developed form of disambiguation, are too slow to cope with all situations of everyday life and, therefore, "suggestive mechanisms" are activated as a more adequate strategy to face the new unstable situation. Suggestive mechanisms are characterized by a high degree of cognitive flexibility without conscious representation of the underlying instability. The effectiveness of suggestive cues is a consequence of the ambiguity of experienced situation. Suggestion is a normal cognitive function necessary to overcome the resulting individual instability.

In order to verify the existence of a hypothesized relationship between inner-systemic instability and suggestibility, Kruse and Gheorghiu (1992) presented a study in which the Sensory Suggestibility Test (SST; Gheorghiu & Reyher, 1982) was administered to 85 subjects. The rate of apparent change between different alternatives of multistable patterns (i.e., Necker cube, binocular rivalry) and the tendency to persist to a stable state (hysteresis) were obtained (as a measure of the level of instability). As expected, the authors found a significant positive correlation between rate of apparent change and suggestibility and a significant negative correlation with hysteresis. In another study carried out in our laboratory (De Pascalis, 1992), it was observed, for highly suggestible subjects compared to lows (as resulted at SST), greater instability of the EEG alpha amplitude. The lower stability of alpha rhythm was hypothesized as one of the possible determinants of the perceptual and cognitive behavior of high suggestible subjects.

The concept of instability is in line with a non-linear dynamic or chaotic approach; it appears to be a new method for extracting information from the underlying process-

ses of the brain. According to Elbert et al. (1993), this approach has drastically modified the manner in which physiological processes are viewed and described. The term chaos, itself, does not indicate randomness, but the idea that the activity of a complex system may be governed by relatively simple mathematical formulations. Dimensionality, that is a calculation of the minimum number of variables in the phase space necessary to describe the system dynamics, has been usually used as a quantitative measure of a complex dynamic system. The greater the complexity of the dynamic system, the greater will be its dimensionality. Ray, Wells, Elbert, Lutzenberger and Birbaumer (1991) reported two studies on EEG and chaos. The first study evaluated the EEG system dimensionality during a variety of sensory and imagination tasks. The EEG was recorded from frontal, central, temporal, parietal and occipital sites. The authors found that the highest dimensions in the phase space were obtained during the imagery tasks and the lowest dimension in the verbal tasks. In the second study, high and low hypnotizable subjects were tested during a series of cognitive tasks (mental math, spatial rotation, imagery, a series of Stroop color-word tasks). EEG measurements were made in waking as well as in hypnosis conditions. In terms of dimensionality measurements, the authors reported a tendency for high hypnotizable subjects to show a slightly higher relative dimensionality compared to low hypnotizable subjects. In contrast with the authors' expectations, no dimensional differences were observed between waking and hypnosis conditions. Results from these studies appear to be in agreement with predictions that can be derived from self-organization theory, i.e., higher alpha instability and higher dimensionality for highly suggestible subjects, compared to the lows; higher dimensionality for imagery tasks, compared to verbal task, etc.

A more direct application of this approach to the psychology of suggestion and suggestibility appears to promise fruitful, new findings. The approach may help us to answer new questions and re-frame old ones.

Suggestibility and Hypnotizability

Suggestibility was linked to hypnosis by the Nancy School, but the majority of suggestibility studies carried out from the beginning of this century did not report a very close relationship with hypnotic susceptibility. In their pioneering study, Eysenck and Furneaux (1945) evidenced two main types of suggestibility, "primary suggestibility" and "secondary suggestibility". The first is a reliable trait and involves the subject's execution of direct suggestions of motor movements without his/her conscious volitional participation. The second type involves subjects' experience of sensations or perceptions following indirect concealed suggestions. Primary suggestibility was found to be a predictor of hypnotic susceptibility; secondary suggestibility did not predict hypnotic susceptibility. Eysenck (1989, 1991) assumes that people have "aptitudes" to hypnosis and "attitudes" for such behavior. Individual aptitude, probably determined to some degree by genetic causes, concerns an ability for hypnotic behavior and can be regarded as a fundamental personality trait. Individual attitude concerns the context in

which certain behavior is suggested and is dependent on the cooperative mood of the subject towards the experiment. Many of the inconsistencies of hypnosis/suggestibility research can be explained taking into account the aptitude and attitude aspects of hypnotizability. The social-interactive point of view (e.g., Barber, 1969; Sarbin & Coe, 1972; Spanos & Chaves, 1970) has focused on the role of attitude to explain hypnotic performance, but the attitude does not rule out the question of individual differences in hypnotic behavior.

Indirect evidence that the assumption of primary and secondary suggestibility may account for hypnotizability can be derived from a study of Faith and Ray (1994). They attempted to answer the question of whether individuals who are hypnotically susceptible are also individuals who report experiences of dissociative events. Hypnotizability failed to correlate with dissociative experiences when difficult hypnotic tasks were considered. The authors attributed the lack of supportive results to the fact that hypnosis experiences are conscious and purposeful acts; in contrast, dissociative experiences are characterized by an involuntary 'out-of-awareness' quality. In a later study, Ray (1996) confirmed the validity of this hypothesis in favor by showing an independence of dissociation from hypnotic susceptibility.

It is known that hypnotizability is the product of at least two components: primary suggestibility that is a trait and predicts hypnotizability, and secondary suggestibility that is more dependent on context and the subject's cooperation. Starting from this assumption, the involuntary dissociative experience is mainly dependent on trait characteristics. Therefore, it would seem to be correlated with primary suggestibility and relatively independent from secondary suggestibility.

Hypnotic Susceptibility and Suggestibility

De Pascalis (1989) reported a correlation study in which the relationships among hypnotizability (SHSS:C, Weitzenhoffer & Hilgard, 1962), Eysenck's dimensions of personality (Eysenck, 1981), sensory suggestibility (SST, Gheorghiu & Reyher, 1982), and absorptive ability (TAS, Tellegen & Atkinson, 1974) were evaluated. One of the aims of this study was to evaluate the effectiveness of sensory suggestibility and imaginative involvement in the prediction of hypnotic susceptibility. Results from this study indicated that there was no reliable association between Eysenck's personality variables and hypnotic susceptibility. Multiple regression analysis evidenced a significant relationship between hypnotic susceptibility and TAS absorptive ability ($r=0.22$, $p<0.05$), while the relationship between sensory suggestibility and hypnotic susceptibility failed to reach significance ($r=0.15$ $p>0.05$) (De Pascalis et al., 1998). The absorptive ability accounted for 22% of total variance and, therefore, was retained as an essential component of hypnotic susceptibility. The weak relationship between sensory suggestibility and hypnotic susceptibility supported the hypothesis that sensory suggestibility and hypnotic susceptibility are in part manifestations of different processes.

Recently we collected three different personality data sets derived from a number of

psychophysiological studies wherein both, suggestibility and hypnotic susceptibility, were measured. The aim was to locate personality or ability correlates of suggestibility, including the relationship between suggestibility and hypnotizability.

First data set

Data scores from the following personality scales were pooled from 88 volunteers (29 men and 59 women): 1) Revised form of Eysenck Personality Questionnaire (EPQ-R, Eysenck, Eysenck & Barrett, 1985; Eysenck S.B.G., 1985; San Martini, Mazzotti & Setaro, 1996); 2) Sensation Seeking Scale, Form V (SSS-V, Zuckerman, 1979); 3) Tellegen Absorption Scale (TAS, Tellegen & Atkinson, 1974); 4) Harvard Group Scale of Hypnotic Susceptibility: Form A (HGSHS:A, Shor & Orne, 1962); 5) Sensory Suggestibility Test (SST, Gheorghiu & Reyher, 1982); 6) Stanford Hypnotic Susceptibility Scale: Form C (SHSS:C, Weitzenhoffer & Hilgard, 1962). All the subjects were right-handed students (age range 18-29 yrs). The correlation matrix from dimensional scales, obtained from the uppermentioned measurements, is reported in Table 1.

The correlations among SST, TAS, SHSS:C and HGSHS:A scores were all highly significant. However, in order to evaluate the contribution of each dimension in predicting hypnotic susceptibility as measured by SHSS:C, a stepwise multiple regression analysis was carried out. The first predictor of the SHSS:C was HGSHS:A which accounted for 68% of the total variance, while TAS and SST scores accounted only for 3.43% and 1.63% of the total variance, respectively (see Table 2).

A similar stepwise regression analysis, using SST as the dependent variable, displayed the SHSS:C as the main predictor of sensory suggestibility which accounted for 29.15% of the total variance. These results were interpreted as showing that among the classical measures of hypnotic susceptibility, SHSS:C is mainly related to sensory suggestibility (see Table 2). These results were seen as indicating that even if sensory suggestibility and hypnotizability share some common elements, these dimensions may be considered as expressions of somewhat different processes.

Second data set

In another attempt to evaluate personality correlates of imaginative suggestibility, the following tests were administered to a group of 60 women, psychology students (age range 19-26 yrs): 1) a group scale to measure sensory-imagination suggestibility (SSK-G scale, Gheorghiu, Koch & Hubner, 1993); 2) shortened form of Betts' questionnaire upon mental imagery (Sheehan, 1967); 3) Tellegen Absorption (TAS); 4) hypnotizability (SHSS:C); 5) Sensation Seeking Scale to evaluate the basic personality traits as experience seeking, disinhibition, boredom susceptibility, thrill and adventure seeking (SSS-V, Zuckerman, 1979); 6) revised form of Eysenck Personality Questionnaire (EPQ-R). The correlation matrix among these personality dimensions is reported in Table 3. The SHSS:C was the only variable significantly correlated with SSK-G. Similarly for the first data set, two stepwise regression analyses were performed. The

first used hypnotic susceptibility as a dependent variable and the second used sensory suggestibility as the dependent one. As can be seen in Tables 4, imaginative suggestibility, measured by SSK-G, was the best predictor of hypnotic susceptibility and accounted for 20% of total variance. When SSK-G was considered as a dependent variable, only SHSS:C was a predictor of sensory suggestibility by accounting for 20% of the total variance. No other personality variables appear to be predictors of imaginative susceptibility (see bottom of Table 4). Even if Betts' mental imagery scale was found to be significantly related to SHSS:C, Betts' mental imagery was not a good predictor of hypnotizability.

Third data set

The following tests were administered to a group of 45 women (age range 19-28 yrs): 1) imagination suggestibility (SSK-G); 2) hypnotizability (SHSS:C); 3) Tellegen Absorption (TAS); 4) Dissociative Experience Scale (DES, Bernstein & Putman, 1986) which, according to Ray and Faith (1995), yielded the measures of Absorption/Derealization (ABS/DER), Depersonalization (DEPERS), Segment Amnesia (SEGAMNE), In Situ Amnesia (SITUAMNE). The correlation matrix among subdimensions of these tests is reported in Table 5. A stepwise regression analysis, using SHSS:C as the dependent variable, showed that imagination suggestibility and segment amnesia (SEGAMNE, a subdimension of DES) were the best predictors of hypnotic susceptibility (see Table 6). The first accounted for 23.5% and the second for 9.6% of total variance. A similar stepwise regression analysis, using imagination suggestibility as the dependent variable, displayed hypnotizability and In Situ Amnesia as the best predictors of suggestibility. Hypnotizability accounted for 23.5% and In Situ Amnesia for 12.24% of total variance. Looking at Table 5, two significant correlations, one negative between Segment Amnesia and hypnotizability and the other positive between In Situ Amnesia and imagination suggestibility, were also evidenced. The significant negative correlation between segment amnesia and hypnotizability appears difficult to explain since we expected a close positive association between dissociative phenomena and hypnotic susceptibility. The positive correlation between In Situ Amnesia and suggestibility seems more in line with behavior induced by suggestion. Finally, these results appear to be in agreement with previous findings (Ray, 1996; Ray & Faith, 1995) wherein, using a more consistent number of subjects, there was evidence of a lack of relationship between total score of DES and hypnotizability.

Furthermore, these results support the assumption that there is some commonality between hypnotic susceptibility and sensory imagination suggestibility. This does not imply, however, that these dimensions are expressions of the same process. Hilgard (1991) has provided evidence that the domain of suggestion includes responses that do not belong within hypnosis and the phenomena of hypnosis. Hypnosis covers more than specific responses to suggestion.

Looking at our findings, how can we explain the weak relationship between SST and

Table 1: Pearson correlation matrix and levels of significance for Extraversion (E), Neuroticism (N), Psychoticism (P), Lie (L), Sensory Suggestibility Test(SST), Absorption (ABS), Stanford Hypnotic Susceptibility Scale, Form C(SHSS:C), Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A)

	E	N	P	L	SST	ABS	HGSHS:A	SHSS:C
E	1.00000	-0.20542	-0.05182	0.05852	0.06869	0.16991	0.07254	-0.00159
	0.0	0.0554	0.6316	0.5881	0.5248	0.1135	0.5018	0.9882
N		1.00000	0.06873	-0.29838	-0.04659	0.03366	-0.11613	-0.10787
		0.0	0.5246	0.0047	0.6664	0.7556	0.2813	0.3171
P			1.00000	-0.21281	-0.01231	0.20587	0.02970	0.00804
			0.0	0.0465	0.9094	0.0543	0.7835	0.9407
L				1.00000	0.17945	0.03220	0.12620	0.14536
				0.0	0.0943	0.7659	0.2413	0.1766
SST					1.00000	0.36340	0.52920	0.53990
					0.0	0.0005	0.0001	0.0001
ABS						1.00000	0.51696	0.56200
						0.0	0.0001	0.0001
HGSHS:A							1.00000	0.78034
							0.0	0.0001

Table 2: Stepwise regression procedure for dependent variable SHSS:C, as predicted by the variables reported in Table 1 *

Variable	Step	Entered	No Partial		Model	C(p)	F	Prob>F
			In	R ²				
HGSHS:A	1		1	0.6089	0.6089	12.6126	133.9131	0.0001
ABS	2		2	0.0343	0.6433	6.1318	8.1794	0.0053
SST	3		3	0.0163	0.6596	4.1046	4.0222	0.0481

Stepwise Procedure for Dependent Variable SST

Variable	Step	Entered	No Partial		Model	C(p)	F	Prob>F
			In	R ²				
SHSS:C	1		1	0.2915	0.2915	1.7039	35.3815	0.0001
HGSHS:A	2		2	0.0298	0.3213	0.1033	3.7276	0.0569

* All variables left in the model are significant at the 0.1500 level. No other variable met the 0.1500 significance level for entry into the model. C(p) is Mallows' Cp statistic (Mallows, 1973).

Table 3: Pearson correlation matrix and levels of significance (N=60) for Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C), Sensory-Imagination Suggestibility (SSK-G), Bett's Mental Imagery (BETTS'), Psychoticism (P), for Extraversion (E), Neuroticism (N), Lie (L), Sensation Seeking Scale: General (GEN), Thrill Adventure Seeking (TRIADV), Experience Seeking (EXPS), Disinhibition (DISIN), Boredom Susceptibility (BORED), Tellegen Absorption Scale (TAS)

	SHSS:C	SSK-G	BETTS	P	E	N	L	GEN	TRIADV	EXPS	DISIN	BORED	TAS
SHSS:C	1.00000	0.44774	-0.29418	-0.02314	0.22840	0.01034	0.15426	0.14021	0.15625	0.09625	-0.00424	-0.05610	0.27013
	0.0	0.0003	0.0225	0.8607	0.0792	0.9375	0.2393	0.2853	0.2332	0.4644	0.9743	0.6703	0.0369
SSK-G		1.00000	-0.23774	-0.06751	0.20806	0.12549	0.17356	0.18237	0.22010	0.13338	-0.07140	0.14335	0.02480
		0.0	0.0674	0.6083	0.1107	0.3394	0.1848	0.1631	0.0911	0.3096	0.5877	0.2745	0.8508
BETTS			1.00000	-0.04748	-0.24410	0.22144	-0.11121	-0.02854	-0.03300	-0.08756	0.12491	0.03704	-0.32323
			0.0	0.7187	0.0602	0.0891	0.3976	0.8286	0.8024	0.5059	0.3417	0.7787	0.0118
P				1.00000	0.13014	0.13775	-0.31791	0.26538	0.30248	0.44783	0.71383	0.10774	0.18509
				0.0	0.3216	0.2939	0.0133	0.0404	0.0188	0.0003	0.0001	0.4126	0.1568
E					1.00000	0.00461	0.1018	0.20945	0.22508	0.25917	0.09038	0.25495	0.09583
					0.0	0.9721	0.4386	0.1082	0.0838	0.0455	0.4923	0.0493	0.4664
N						1.00000	-0.19715	0.03962	0.21368	0.02109	0.20775	0.20123	0.11480
						0.0	0.1311	0.7638	0.1011	0.8729	0.1112	0.1231	0.3824
L							1.00000	-0.0313	-0.14414	-0.21161	-0.13019	0.04973	-0.39542
							0.0	0.8124	0.2719	0.1046	0.3215	0.7059	0.0018
GEN								1.00000	0.65097	0.76591	0.46567	0.53566	0.12926
								0.0	0.0001	0.0001	0.0002	0.0001	0.3250
TRIADV									1.00000	0.35435	0.26379	0.13814	0.29885
									0.0	0.0055	0.0417	0.2925	0.0204
EXPS										1.00000	0.54703	0.43724	0.14221
										0.0	0.0001	0.0005	0.2784
DISIN											1.00000	0.28780	0.10546
											0.0	0.0258	0.4226
BORED												1.00000	0.00996
												0.0	0.9398

SHSS:C scores and the consistent relationship between the SSK-G and SHSS:C measures? Our opinion is that these different relationships are dependent on the fact that SST is a measure of perceptual suggestibility while SSK-G is a measure of imaginative aspects of suggestibility. We exclude the influence of different situational factors like demand characteristics or expectation among our studies. In the first studies, the SST scale was administered in a separate session and before the SHSS:C; subjects were naive women invited to participate in an experiment aimed to measure "perceptual threshold" (in the first study) and "sensation threshold" (in the second one). A similar procedure was used in the study in which the SSK-G was administered. Excluding situational intervening factors, the present results indicate that suggestibility is not an unitary phenomenon.

Stepwise regression analysis, carried out on the third data set, evidenced that In Situ Amnesia is a predictor of imagination suggestibility, even if only to a small degree. In Situ Amnesia is defined as a component of DES which refers to individual experiences of amnesia (e.g., some people find themselves in places that they don't remember; or while listening to someone talk they suddenly realize that they did not hear part or all of what was just said).

Finally, the present findings can be seen as an attempt to show what role some variables (e.g., imagination, absorption, hypnotizability, etc.) may play in the definition of suggestibility. Furthermore, present findings indicate that the weak relationship between sensory suggestibility (SST) and hypnotic susceptibility is due to the nature of SST scale, i.e., it is oriented to measure tendency to judge simulated stimuli as real (Gheorghiu, Netter & Tichi, 1989) and not the tendency to experience suggested changes in sensation, feeling perception, emotional thoughts, or behavior which lies inside the 'domain of hypnosis' (Hilgard, 1973). The SSK-G, on the other hand, is a suggestibility scale constructed to measure the ability for 'sensory imagination', (i.e., a measurement procedure which covers aspects of the imagination syndrome, e.g., the individual tendency to produce perceptual sensations), a dimension known to be related to hypnotic susceptibility (Kirsch, 1997b; Weitzenhoffer, 1980).

Table 4: Stepwise regression for dependent variable SHSS:C, as predicted by the variables reported in Table 3

Step	Variable Entered	No In	Partial R ²	Model R ²	C(p)	F	Prob>F
1	SSK-G	1	0.2005	0.2005	3.5400	14.5430	0.0003
2	ABS	2	0.0671	0.2676	0.5406	5.2249	0.0260
3	L	3	0.0401	0.3077	-0.4432	3.2409	0.0772

Stepwise regression for Dependent Variable SSK-G

Step	Variable Entered	No In	Partial R ²	Model R ²	C(p)	F	Prob>F
1	SHSS:C	1	0.2005	0.2005	1.1596	14.5430	0.0003

Table 5: Pearson correlation matrix and levels of significance (N=45) for Sensory-Imagination Suggestibility (SSK-G), Stanford Hypnotic Susceptibility Scale-Form C (SHSS:C), Dissociative Experiences Scale: Absorption/Derealization (ABS/DER), Depersonalization (DEPERS), Segment Amnesia (SEGAMNE), In Situ Amnesia (SITUAMNE), Dissociation total score (DES), Tellegen Absorption Scale (TAS)

	SSK-G	SHSS:C	DES	ABS/DER	DEPERS	SEGAMNE	SITUAMNE	TAS
SSK-G	1.00000	0.48494	0.19123	0.14199	0.1825	-0.07919	0.37867	0.23039
	0.0	0.0007	0.2083	0.3522	0.2302	0.6051	0.0103	0.1279
SHSS:C		1.00000	-0.03711	0.05494	0.06534	-0.34805	0.06079	0.35732
		0.0	0.8088	0.7200	0.6698	0.0191	0.6916	0.0160
DES			1.00000	0.85012	0.69340	0.70869	0.51513	-0.10115
			0.0	0.0001	0.0001	0.0001	0.0003	0.5085
ABS/DER				1.00000	0.40371	0.38924	0.21589	-0.17698
				0.0	0.0060	0.0082	0.1543	0.2448
DEPERS					1.00000	0.42838	0.26672	0.07145
					0.0	0.0033	0.0765	0.6409
SEGAMNE						1.00000	0.35518	-0.25389
						0.0	0.0167	0.0924
SITUAMNE							1.00000	0.25533
							0.0	0.0905

Table 6: Stepwise regression for dependent variable SHSS:C, as predicted by the variables reported in Table 5

Step	Variable Entered	N In	Partial R ²	Model R ²	C(p)	F	Prob>F
1	SSK-G	1	0.2352	0.2352	6.2235	13.2216	0.0007
2	SEGAMNE	2	0.0965	0.3317	2.2661	6.0634	0.0180

Stepwise regression for Dependent Variable SSK-G

Step	Variable Entered	No In	Partial R ²	Model R ²	C(p)	F	Prob>F
1	SHSS:C	1	0.2352	0.2352	5.5956	13.2216	0.0007
2	SITUAMNE	2	0.1224	0.3576	0.1396	8.0009	0.0071

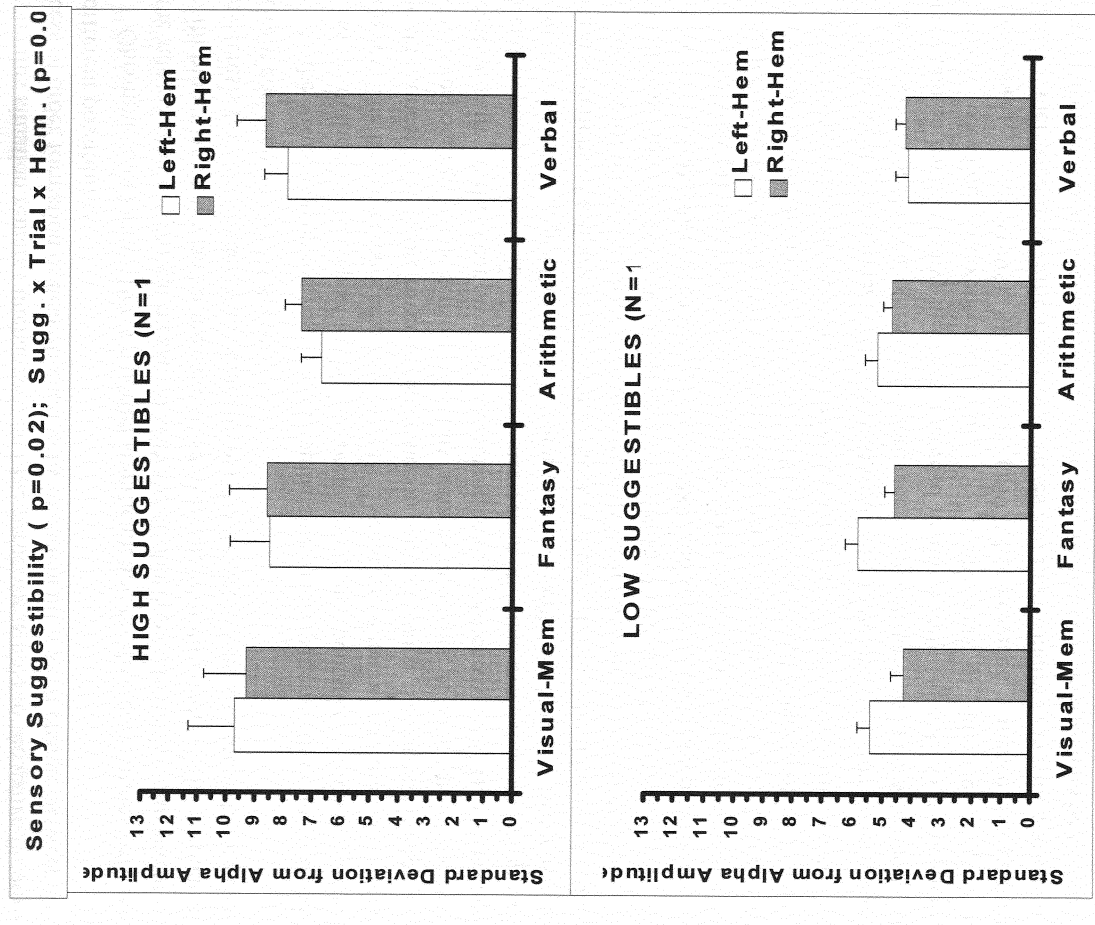


Fig. 1: Standard deviation scores (on the orthogonal axis) from left and right hemisphere alpha amplitudes in high and low sensory suggestible subjects during Visual-memory (Visual-mem), Fantasy (Fantasy), Multiplication (Arithmetic), and Verbal-memory (Verbal) tasks.

Gheorghiu and Kruse's (1991) behavioral findings which supported a higher reversal effect for highly suggestible subjects compared to the lows. A further aim was to investigate how individual differences in sensory suggestibility are reflected in EEG activity and 40-Hz EEG hemisphere functioning during perceptual reversal of multistable figures.

Twenty right handed women (10 high suggestibles and 10 low suggestibles), between the age of 20 and 26 yrs, were selected from a sample of 70 psychology students on the basis of their scores on the SST Scale. Subjects were engaged in three 3-min tasks. Stimuli consisted of two multistable figures (Thiery Blocks and Schroder Staircase) and a control non-reversible one (a Table). In each multistable task subjects were instructed to inspect the figure and to push a button with the thumb of their left or right hand, as soon as possible, when the reversal was occurring. In the control task subjects were requested to gaze at the figure and to push the button every 6-10 seconds.

EEG recordings were made using silver-silver chloride cup electrodes placed on F3 and F4 (anterior sites), in the middle of O1-P3-T5 and of O2-P4-T6 triangles (posterior sites) and on O1 and O2 (occipital sites). For posterior and anterior recordings offline, four 40-Hz EEG signals according to Sheer's method (Raghavan, Glover & Sheer, 1986) were obtained. Forty-Hz EEG response (1s epoch) was analyzed by calculating the maximum of spectral amplitude during 4 time intervals of 250 ms each. Three time intervals preceded the instant in which subjects pushed the button ($t=0$ ms) which indicated the reversal: 750-500 ms, 500-250 ms, 250-0 ms. A time interval of 0-250 ms followed the push button response.

The following behavioral measures were also used: 1) rate of figure reversal (i.e., the number of times that subjects experienced an apparent change within each 3 min. task); 2) hysteresis (i.e., the time, tenths of second, to persist in one stable state, measured from the beginning of each displayed figure); 3) time between reversions (i.e., the averaged time, tenths of second, measured between different stable states); 4) subjective perceptual stability (i.e., at the end of each reversible-figure task, the subject used a 1-7 point scale to rate his/her experienced degree of perceptual stability).

Data analyses showed that: (a) rate of figure reversal increased with sensory suggestibility ($p<0.05$); (b) high suggestible subjects, with respect to low suggestible ones, exhibited a shorter hysteresis time (16.0 s vs 45.9 s, respectively; $p=0.005$) and shorter times between reversions (3.5 s vs. 6.4 s, respectively; $p<0.05$). High suggestibles also rated lower subjective stability scores as compared to lows (2.9 vs 4.2, respectively; $p<0.05$). For more details see the original study by De Pascalis et al. (1993).

In terms of 40-Hz EEG amplitude, high suggestibles, while they experienced depth reversal phenomenon, exhibited a 40-Hz amplitude reduction in the left frontal lead during a 500-250 ms time interval that preceded the subject's signal of the experienced reversal ($t=0$). These subjects also displayed a significant left hemisphere increase over temporo-parietal leads. This last effect was found to be significant for Thiery Blocks during 500-250 ms and 250-0 ms time intervals. The Schroder Staircase task showed a similar effect during a 250-0 ms time interval. Non-reversible figure displayed a hemispheric balancing across all subjects. Low suggestibles did not show reliable hemispheric asymmetries across time intervals that could be associated with the depth reversal phenomenon. More details are given in the original study (De Pascalis et al., 1993, p. 146).

These anticipatory hemispheric shifts of 40-Hz activity preceding the figure reversal phenomenon were interpreted as reflecting a phasic reorganisation process of focalised attention mechanisms that involve the inhibition of the left hemisphere in the frontal areas and the right in the temporo-parietal ones.

In this study, behavioral results confirmed previous findings reported by Gheorghiu and Kruse (1991). High suggestible individuals, as compared to the lows, displayed a higher rate of apparent changes and lower hysteresis times. Because in this study subjective perceptual stability was parallel to the rate of apparent change and to the time between reversions (i.e., lower subjective stability for high subjects compared to the lows), it was hypothesized that an inner-systemic physiological mechanism was operating to build up an individual sensation of perceptual stability. These observations suggest that individual differences in suggestibility may help in understanding processes underlying illusory phenomena.

Study 3

The aim of this study was to verify the validity of the assumption that suggestibility and hypnotizability are expressions of distinct psychophysiological processes.

Evans (1989), after an historical and empirical review, concluded that suggestibility and hypnotizability can be considered as the product of different processes; one is not an exhaustive expression of the other. Hilgard (1973, 1991) also concluded that hypnotic behavior cannot be defined simply as a response to suggestion since there are several forms of suggestion including impersonal suggestions, conformity and placebo responses which do not belong to the hypnosis condition and, viceversa, hypnotic phenomena which cover more than specific responses do not belong to suggestion.

Although there exist a large literature examining psychophysiological concomitants of hypnosis and hypnotic susceptibility (see Crawford et al., 1996; for a review see Crawford & Gruzelier, 1992; Graffin et al., 1995; Sabourin, et al. 1990), there are few, if any, studies examining psychophysiological contributions in the area of suggestibility. This may result from the lack of integrative theoretical approaches to direct research in relation to the variety of suggestive phenomena (Gheorghiu, 1989). However, the present study provided experimental evidence that imagination suggestibility and hypnotizability are expressions of different psychophysiological processes.

Recently, Kirsch (1997a, b) indicated that hypnotic susceptibility scales are better measures of waking suggestibility than they are of hypnotizability. He proposed a definition of hypnosis as changes in experience following suggestions. He argued that hypnotic induction procedures were nothing more than a particular set of suggestions, rather than the means to establish an hypnotic state. This perspective was used to then reinterpret hypnotizability scores as indexes of non hypnotic imaginative suggestibility.

If we assume, according to Kirsch (1997a, b), that hypnotic phenomena are accurately described in terms of individual differences in imaginative suggestibility rather than by individual differences in hypnotizability, then we would expect to find, after the administration of an hypnotic induction, more suggestion-induced differences in

SSK-G x Resting_Condition (p=.039)

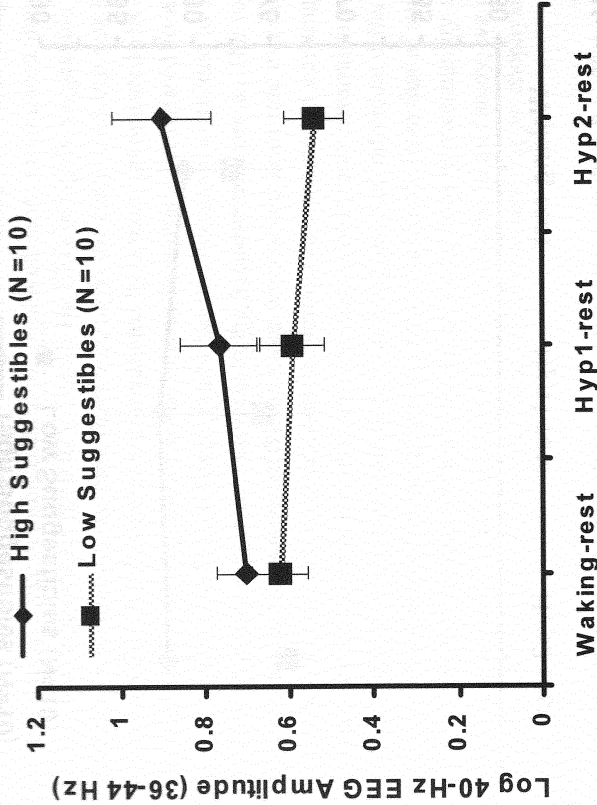


Fig. 2: 40-Hz (36-44 Hz) EEG amplitude in high and low suggestible subjects during Waking-rest, early-rest hypnosis (Hyp1-rest), and late-rest hypnosis (Hyp2-rest) conditions. Suggestibility was measured using SSK-G scale (which covers aspects of sensory imagination; see Gherghiu et al., 1993 for more details).

physiological responding between high and low suggestible subjects than between high and low hypnotizable ones. If suggestibility and hypnotizability refer to similar behavior, then they should share similar patterns of physiological activity.

On the basis of these considerations, we carried out a study (De Pascalis, Ray, Tranquillo & D'Amico, 1998) which aimed to find physiological and cognitive correlates of hypnotizability, imaginative suggestibility and emotional experiences during hypnosis. Ten high and 10 low hypnotic susceptible women were selected such that each high and low hypnotizable group included subjects with differing levels of suggestibility (Gheorghiu et al., 1993). (More details concerning subjects' selections are reported in the original publication (De Pascalis et al., 1998)). After the administration of a standard hypnotic induction, the EEG and heart rate (HR) were recorded during self-generated happy and sad emotions using a relaxation condition as a control. Physiological recordings were also obtained during three eyes-open and eyes-closed baseline periods: (1) waking rest; (2) early-rest in hypnosis (just after the hypnotic induction); (3) late-rest hypnosis (at the end of hypnotic condition). EEG was recorded at frontal (F3, F4), central (C3, C4), and posterior sites (middle of O1-P3-T5 and O2-

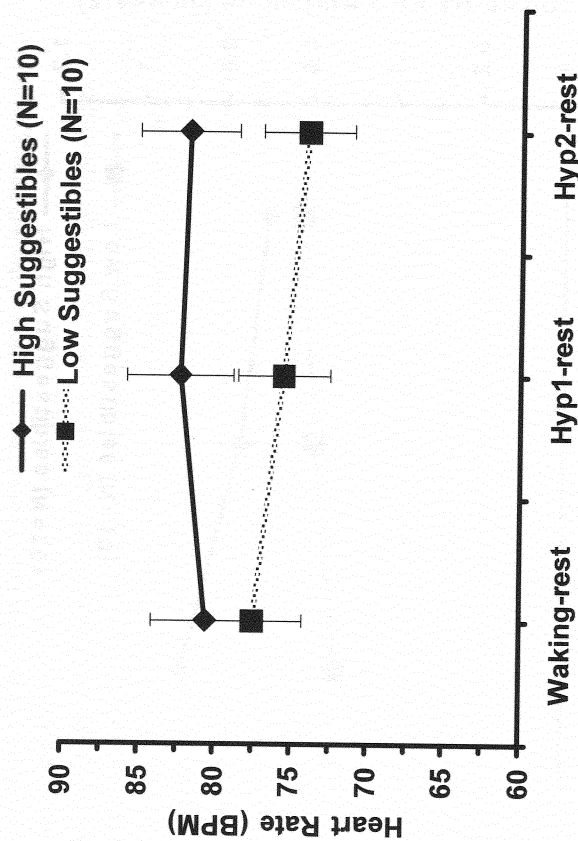


Fig. 3. Mean Heart Rate (bpm) in high and low suggestible subjects during Waking-rest, first hypnosis-rest (Hyp1-rest), and late hypnosis-rest (Hyp2-rest) conditions.

P4-T6 triangles). Using log transform of mean spectral amplitude, eight EEG frequency bands (4-44 Hz) were evaluated. High hypnotizable subjects, as compared to lows, produced a higher theta1 amplitude (4-6 Hz) across both left- and right-frontal and right-posterior areas. These subjects also produced smaller alpha1 amplitude (8.25-10 Hz) over both left and right frontal recording sites. Hypnotizability and not suggestibility was found to moderate emotional processing: high hypnotizable individuals self-reported greater levels of emotional experiences than did low hypnotizables, especially in term of negative emotion.

High hypnotizable subjects, during the happiness condition, showed an increased production of 40-Hz activity in the left frontal and central regions of the scalp, while during sadness they showed an increased activity in the right central and posterior regions. High suggestible subjects, during resting conditions, disclosed higher theta2 (6.25-8 Hz) and alpha1 amplitudes in eyes-closed as compared to an eyes-open condition than did low suggestible subjects. High suggestible subjects also showed, in the hypnosis-rest condition, higher 40-Hz amplitudes (36-44 Hz) and higher HR activity than did low suggestible subjects. Since no significant interactions involving both hypnotizability and imaginative suggestibility were found for physiological variables considered in this study, we concluded that hypnotizability and suggestibility reflect different underlying psychophysiological activities.

In terms of theta2 activity, high suggestible individuals, during waking and first-hypnosis rest conditions, showed an increase of theta2 amplitude in eyes-closed condition as compared to eyes-open one ($p=0.03$). In terms of alpha rhythm, high suggestible individuals, during a eyes-closed condition, produced more pronounced increases in alpha1 than low suggestibles ($p=0.02$). The 40-Hz EEG in highly suggestible subjects also displayed a monotonic increase from waking to the early- and late-rest hypnosis conditions (see Fig. 2). This trend was paralleled by a more pronounced HR increase in high suggestibles during resting conditions in hypnosis as compared to a waking resting one ($p=0.04$, see Fig. 3). These results can be understood as related to the greater reactivity of highly suggestible subjects to the hypnosis task per se. The validity of this interpretation is also supported by the more pronounced heart rate increase found for these subjects in the resting conditions in hypnosis as compared to a resting waking one. The lack of relationship between sensory suggestibility and absorption scores, as well as a lack of EEG theta differentiation, would suggest that individual differences in the capacity to be absorbed in imaginative activity is separate from that of suggestibility. Since no significant interaction effects involving both hypnotizability and suggestibility were found, for each of the variables considered in this study, we maintain that these two dimensions are expressions of different underlying psychophysiological activities.

Conclusion

In this chapter, we have outlined different theoretical approaches which are important for the development of a psychophysiology of suggestion and suggestibility. The present chapter has also pointed out the multicomponential dimensionality of suggestibility and the difficulty of defining this dimension in terms of other related personality components. Finally, the present chapter has yielded experimental evidence which indicates that hypnotic susceptibility is a mediocre predictor of both perceptual suggestibility and imaginative suggestibility: it accounts for only a small portion of the explained variance. Psychophysiological studies carried out between our laboratory have further provided evidence for genuine physiological differences in high and low suggestible persons. It appears that suggestibility and hypnotizability are expression of different physiological mechanisms.

References

- Allport, G.W. (1985). The historical background of social psychology (Vol. 1). In G.Lindzey & E. Aronson (Eds.), *The handbook of social psychology* (3rd ed.). New York: Random.
- Asch, S.E. (1956). Studies of independence and conformity: A minority of one against a unanimous majority. *Psychological Monographs*, 70, 1-12.
- Attneave, F. (1974). Multistability in perception. In R. Held (Ed.), *Image, object and illusion* (pp. 91-100). San Francisco: W.H. Freeman.

Bakan, P. (1969). Hypnotizability, laterality of eye movements and functional brain asymmetry. *Perceptual and Motor Skills*, 28, 927-932.

Barber, T.X. (1969). *Hypnosis: A scientific approach*. New York: Van Nostrand.

Basar-Eroglu, C., Struber, D., Kruse, P., Basar, E., & Stadler, M. (1996). Frontal gamma-band enhancement during multistable visual perception. *International Journal of Psychophysiology*, 24, 113-125.

Bernheim, H. (1888). *Hypnosis and suggestion in psychotherapy* (repr. New York: University Books, 1964).

Bernstein, E., & Putnam, F. (1986). Development, reliability, and validity of a dissociation scale. *The Journal of Nervous and Mental Disease*, 174, 727-735.

Binet, A. (1900). *La Suggestibilité* [Suggestibility]. Paris: Schleicher Freres.

Bowers, K.S. (1983). *Hypnosis for the seriously curious*. New York: Norton.

Bowers, K.S. (1984). On being unconsciously influenced and informed. In K.S. Bowers & D. Meichenbaum (Eds.), *The unconscious reconsidered* (pp. 227-272). New York: John Wiley & Sons.

Bowers, K.S. (1992). Imagination and dissociation in hypnotic responding. *International Journal of Clinical and Experimental Hypnosis*, 40, 253-275.

Bowers, K.S. (1994). Dissociated control, imagination, and the phenomenology of dissociation. In D. Spiegel (Ed.), *Dissociation - Culture, Mind and Body* (pp. 21-38). Washington, DC: American Psychiatric Press, Inc.

Bowers, P. (1982). The classic suggestion effect: Relationships with scales of hypnotizability, effortless experiencing and imagery vividness. *International Journal of Clinical and Experimental Hypnosis*, 30, 270-279.

Brassfield, P.A. (1983). Unfolding patterns of multiple personality through hypnosis. *American Journal of Clinical Hypnosis*, 26, 146-152.

Cardena, E., & Spiegel, D. (1991). Suggestibility, absorption, and dissociation: An integrative model of hypnosis. In J.F. Schumaker (Ed.), *Human Suggestibility* (pp. 93-107). New York: Routledge.

Chertok, L. (1984). Suggestio rediiva. In L. Chertok (Ed.), *Resurgence de l'hypnose*. Paris: Desclée de Brouwer.

Coe, W.C., & Sarbin, T.R. (1977). Hypnosis from the standpoint of a contextualist. *Annals of the New York Academy of Sciences*, 296, 2-13.

Crawford, H., Clarke, S., & Kimer-Triolo, M. (1996). Self-generated happy and sad emotions in low and highly hypnotizable persons during waking and hypnosis: laterality and regional EEG activity differences. *International Journal of Psychophysiology*, 24, 239-266.

Crawford, H.J., & Gruzelier, J.H. (1992). A midstream view of the neuropsychophysiology of Hypnosis: Recent research and future directions. In E. Fromm & M. Nash (Eds.), *Contemporary Hypnosis Research* (pp. 227-266). New York: Guildford Press.

Das, J.P. (1966). Relation between semantic satiation and verbal conditioning. *British Journal of Psychology*, 57, 87-91.

Davies, P. (1987). Conditioning and perception. In G. Davey (Ed.), *Cognitive processes and Pavlovian conditioning in humans* (pp. 183-210). Chichester: Wiley.

De Pascalis, V. (1989). Hypnotic susceptibility, alpha waves and 40-Hz EEG rhythm, and personality. In V.A. Gheorghiu, P. Netter, H.J. Eysenck & R. Rosenthal (Eds.), *Suggestion and Suggestibility - Theory and Research* (pp. 221-239). Heidelberg: Springer.

De Pascalis, V. (1992). Sensory suggestibility and individual differences in EEG-alpha variability. In W. Bongartz, V.A. Gheorghiu, & B. Bongartz (Eds.), *Hypnosis: 175 years after*

Mezmer (pp. 63-73). Proceedings of the 5th European Congress of Hypnosis in Psychotherapy and Psychosomatic Medicine, Constance, August 18-24, 1990.

De Pascalis, V., Gheorghiu, V., Marucci F.S., & Geissler H.G. (1993). The influence of suggestibility on 40-Hz EEG activity during depth reversal phenomenon. In E. Bolcs, G. Guttman, M. Martin, M. Mende, H. Kanitschar, & H. Walter (Eds.), *Hypnosis connecting disciplines* (pp. 143-147). Proceedings of the 6th European Congress of Hypnosis in Psychotherapy and Psychosomatic Medicine, Vienna, August 14-20, 1993.

De Pascalis, V., Ray, W.J., Tranquillo, I., & D'Amico, D. (1998). EEG activity and heart rate during recall of emotional events in hypnosis: relationships with hypnotizability and suggestibility. *International Journal of Psychophysiology*, 29, 255-275.

Edmonston, W.E. (1989). Conceptual clarification of hypnosis and its relationship to suggestibility. In V.A. Gheorghiu, P. Netter, H.J. Eysenck & R. Rosenthal (Eds.), *Suggestion and Suggestibility: Theory and Research* (pp. 69-78). Berlin: Springer-Verlag.

Elbert, T., Hommel, J., & Lutzenberger, W. (1985). The perception of Necker cube reversal interacts with the Bereitschafts potential. *International Journal of Psychophysiology*, 3, 5-12.

Elbert, T., Ray, W.J., Kowalik, Z.J., Skinner, J.E., Graf, K.E., & Birbaumer, N. (1993). Chaos and Physiology - Deterministic chaos in excitable cell assemblies. *Physiological Reviews*, 74, 1-47.

Evans, F.J. (1989). The independence of suggestibility placebo response, and hypnotizability. In V.A. Gheorghiu, P. Netter, H.J. Eysenck & R. Rosenthal (Eds.), *Suggestion and Suggestibility - Theory and Research* (pp. 145-154). Heidelberg: Springer.

Eysenck, H.J. (1947). *Dimensions of personality*. London: Routledge and Kegan Paul.

Eysenck, H.J. (1981). *A model for personality*. New York: Springer.

Eysenck, H.J. (1989). Personality, primary and secondary suggestibility, and hypnosis. In V.A. Gheorghiu, P. Netter, H.J. Eysenck & R. Rosenthal (Eds.), *Suggestion and Suggestibility: Theory and Research* (pp. 57-67). New York: Springer-Verlag.

Eysenck, H.J. (1991). *Is suggestibility?* In J. Schumaker (Ed.), *Human Suggestibility* (pp. 76-90). New York: Routledge.

Eysenck, H.J., & Furneaux, W. (1945). Primary and secondary suggestibility: An experimental and statistical study. *Journal of Experimental Psychology*, 35, 485-503.

Eysenck, S.B.G. (1985). Confronti transculturali tra le personalità di soggetti italiani continentali, siciliani e inglesi. *Bollettino di Psicologia Applicata*, 100, 11-16.

Eysenck, S.B.G., Eysenck, H.J., & Barrett, P. (1985). A revised version of the P scale. *Personality and Individual Differences*, 6, 21-29.

Faith, M., & Ray, W.J. (1994). Hypnotizability and dissociation in a college age population: Orthogonal individual differences. *Personality and Individual Differences*, 17, 211-216.

Gearan, P., & Kirsch, I. (1993). Response expectancy as a mediator of hypnotizability modification. *International Journal of Clinical and Experimental Hypnosis*, 41, 83-91.

Gheorghiu, V. (1989a). The development of research on suggestibility: Critical considerations. In V.A. Gheorghiu, P. Netter, H.J. Eysenck & R. Rosenthal (Eds.), *Suggestion and Suggestibility - Theory and Research* (pp. 3-55). Heidelberg: Springer.

Gheorghiu, V. (1989b). The difficulty in explaining suggestion: some conceivable solutions. In V.A. Gheorghiu, P. Netter, H.J. Eysenck & R. Rosenthal (Eds.), *Suggestion and Suggestibility: Theory and Research* (pp. 99-112). Heidelberg: Springer.

Gheorghiu, V., Koch, E., & Hubner, M. (1993). *A group scale for the influence of suggestion on sensory judgments*. In E. Bolcs, G. Guttman, M. Martin, M. Mende, H. Kanitschar & H. Walter (Eds.), *Proceedings of the 6th European Congress of Hypnosis in Psychotherapy and Psychosomatic Medicine* (pp. 14-17), Vienna, August 14-20, 1993.

- Gheorghiu, V., & Kruse, P. (1991). The psychology of suggestion. In J.F. Schumaker (Ed.), *Human Suggestibility: Advances in theory, research and application* (pp. 59-75). New York: Routledge.
- Gheorghiu, V., Netter, P., & Tichi, H.J. (1989). A test of sensory suggestibility, its dependence on experimental context and its relation to other tests of deception. In K. McConkey & H. Bennet (Eds.), *Proceedings of the 24th International Congress of Psychology*, 3.
- Gheorghiu, V., & Rehyer, J. (1982). The effect of different types of influence of an "indirect-direct" form of a scale of sensory suggestibility. *American Journal of Clinical Hypnosis*, 24, 191-199.
- Girgus, J.J., Rock, I., & Egatz, R. (1977). The effect of knowledge of reversibility on the reversibility of ambiguous figures. *Perception & Psychophysics*, 22, 550-556.
- Graffin, N.F., Ray, W.J., & Lundy, R. (1995). EEG concomitants of hypnosis and hypnotic susceptibility. *Journal of Abnormal Psychology*, 104, 123-131.
- Graham, K., & Pernicano, K. (1976). *Laterality, hypnosis and the autokinetic effect*. Paper presented to the American Psychological Association, Washington, D.C.
- Gudjonsson, G.H. (1989). Compliance in an interrogative situation: A new scale. *Personality and Individual Differences*, 10, 535-540.
- Gur, R.C., & Gur, R.E. (1974). Handedness, sex and eyedness as moderating variables in the relationship between hypnotic susceptibility and functional brain asymmetry. *Journal of Abnormal Psychology*, 83, 635-643.
- Herbert, T., & Cohen, S. (1993). Stress and immunity in humans: A meta-analytic review. *Psychosomatic Medicine*, 55, 364-379.
- Hilgard, E.R. (1973). The domain of hypnosis: With some comments on alternate paradigms. *American Psychologist*, 28, 972-982.
- Hilgard, E.R. (1977). The problem of divided consciousness: A neodissociation interpretation. *Annals of the New York Academy of Sciences*, 296, 48-59.
- Hilgard, E.R. (1986). *Divided consciousness: Multiple controls in human thought and action*. New York: Wiley.
- Hilgard, E.R. (1991). Suggestibility and suggestions as related to hypnosis. In J. Schumaker (Ed.), *Human Suggestibility* (pp. 37-58). New York: Routledge.
- Keil, A., Muller, M.M., Ray, W.J., Gruber, T., & Elbert, T. (1999). Human gamma band activity and perception of a gestalt. *The Journal of Neuroscience*, 19, 7152-7161.
- Kihlstrom, J.F. (1984). Conscious, subconscious, unconscious: A cognitive perspective. In K.S. Bowers & D. Meichenbaum (Eds.), *The unconscious reconsidered* (pp. 149-211). New York: Wiley.
- Kirsch, I. (1985). Response expectancy as a determinant of experience and behavior. *American Psychologist*, 40, 1189-1202.
- Kirsch, I. (1990). *Changing expectations: A key to effective psychotherapy*. Pacific Grove: Brooks/Cole.
- Kirsch, I. (1997a). Suggestibility or hypnosis: What do our scales really measure? *International Journal of Clinical and Experimental Hypnosis*, 45, 212-225.
- Kirsch, I. (1997b). Hypnotic suggestion: A musical metaphor. *American Journal of Clinical Hypnosis*, 39, 271-282.
- Kirsch, I., & Lynn, S.J. (1997). Hypnotic involuntariness and the automaticity of everyday life. *American Journal of Clinical Hypnosis*, 40, 329-348.
- Kirsch, I., & Lynn, S.J. (1999). Automaticity in clinical psychology. *American Psychologist*, 7, 1-12.
- Kirsch, I., Mobayed, C.P., Council, J.R., & Kenny, D.A. (1992). Expert judgements of hypnosis from subjective state reports. *Journal of Abnormal Psychology*, 101, 657-662.
- Kohler, W. (1971). Psychology and natural science. In M. Henle (Ed.), *The selected papers of Wolfgang Kohler* (pp. 252-273). New York: Liveright.
- Kruse, P. (1989). Some suggestions about suggestion and hypnosis: A radical constructivist view. In V.A. Gheorghiu, P. Netter, H.J. Eysenck & R. Rosenthal (Eds.), *Suggestion and Suggestibility: Theory and Research* (pp. 91-98). Berlin: Springer.
- Kruse, P., & Gheorghiu, V. (1992). Self-organization theory and radical constructivism: A new concept for understanding hypnosis, suggestion, and suggestibility. In W. Bongartz, V.A. Gheorghiu, B. Bongartz (Eds.), *Hypnosis: 175 years after Mesmer* (pp. 161-171). Proceedings of the 5th European Congress of Hypnosis in Psychotherapy and Psychosomatic Medicine, Constance, August 18-24, 1990.
- Lohr, J.M., & Souheaver, G.T. (1981). Primary waking suggestibility and classical conditioning of world meaning. *Psychological Reports*, 48, 119-126.
- Ludwig, A.M. (1983). The psychobiological functions of dissociation. *American Journal of Clinical Hypnosis*, 26, 96-99.
- Lundh, L.G. (1998). Normal suggestion. An analysis of the phenomenon and its role in psychotherapy. *Clinical Psychology and Psychotherapy*, 5, 24-38.
- Lutzenberger, W., Preissl, H., Birbaumer, N., & Pulvermuller, F. (1997). High-frequency cortical responses: do they not exist if they are small? *Electroencephalography and Clinical Neurophysiology*, 102, 64-66.
- Lutzenberger, W., Pulvermuller, F., Elbert, T., & Birbaumer, N. (1995). Visual stimulation alters local 40-Hz responses in humans: An EEG-study. *Neurosciences Letters*, 83, 39-42.
- Lynn, S.J., Nash, M.R., Rhue, J.W., Frauman, D.C., & Sweeney, C.A. (1984). Nonvolition, expectancies, and hypnotic rapport. *Journal of Abnormal Psychology*, 93, 295-303.
- Lynn, S.J., Rhue, J.W., & Weeks, J.R. (1990). Hypnotic involuntariness: A social cognitive analysis. *Psychological Review*, 97, 169-184.
- Mathews, A., & MacLeod, C. (1986). Discrimination of threat cues without awareness in anxiety states. *Journal of Abnormal Psychology*, 95, 131-138.
- Mathews, A., May, J., Mogg, K., & Eysenck, M. (1990). Attentional bias in anxiety: Selective search or defective filtering? *Journal of Abnormal Psychology*, 99, 166-173.
- Maturana, H.L. (1970). *Biology of cognition* (Vol.9). University of Illinois, Biological Computer Laboratory, Department of Electrical Engineering.
- Maturana, H.L. (1982). *Erkennen: Die Organisation und Verkörperung von Wirklichkeit* (Recognition: The organization and embodiment of reality). Braunschweig: Vieweg.
- Maturana, H.L., & Varela, F.J. (1980). *Autopoiesis and cognition*. Dordrecht: Reidel.
- Maturana, H.L., & Varela, F.J. (1988). *Autopoiesi e cognizione*. Dordrecht: Reidel.
- Mountcastle, V. (1995). The evolution of ideas concerning the function of the neocortex. *Cerebral Cortex*, 5, 289-295.
- Muller, M.M., Junghofer, M., Elbert, T., & Rockstroh, B. (1997). Visually induced gamma-band responses to coherent and incoherent motion: a replication study. *Neuro Report*, 8, 2575-2579.
- O'Donnell, B.F., Hendler, T., & Squires, N.K. (1988). Visual evoked potentials to illusory reversals of the Necker Cube. *Psychophysiology*, 25, 137-143.
- Orme, M.T. (1970). Hypnosis motivation and ecological validity of the psychological experiment. In W.J. Arnold & M.M. Page (Eds.), *Nebraska symposium on motivation* (pp. 187-265). Lincoln, Nebraska: University Nebraska Press.

- Pavlov, I.P. (1927). *Conditioned reflexes* (G.V. Anrep). London: Oxford University Press.
- Piccione, C., Hilgard, E.R., & Zimbardo, P.G. (1989). On the degree of stability of measured hypnotizability over a 25-year period. *Journal of Personality and Social Psychology*, 56, 289-295.
- Radil, T., Radilova, I., Bohdanecky, Z., & Bozkov, V. (1985). Psychophysiology of unconscious and conscious phenomena during visual perception. In F. Klix, R. Naatanen, & K. Zimmer (Eds.), *Psychophysiological Approaches to Human Information Processing* (pp. 97-127). North-Holland: Elsevier Science Publishers.
- Radilova, J., & Radil, T. (1983a). Influence of geometric conceptualization on the reversibility of the "Schroder staircase" figure. *Studia Psychologica*, 25, 141-149.
- Radilova, J., & Radil, T. (1983b). Necker cube reversal reduced by two dimensional spatial perceptual cue. *Acta Neurobiol. Exp.*, 43, 45-49.
- Raghavan, N., Glover, J.R., & Sheer, D.E. (1986). A microprocessor-based system for diagnosis of cognitive dysfunction. *IEEE Transactions on Biomedical Engineering*, 33, 942-948.
- Ray, W.J. (1996). Dissociation in normal populations. In L. Michelson & W. Ray (Eds.), *Handbook of Dissociation*. New York: Plenum.
- Ray, W.J., & Faith, M. (1995). Dissociative experiences in a college age population: Follow-up with 1190 subjects. *Personality and Individual Differences*, 18, 223-230.
- Ray, W.J., Wells, R., Elbert, T., Lutzenberger, W., & Birbaumer, N. (1991). EEG and chaos: Dimensional estimation of sensory and hypnotic processes. In D. Duke & W. Pritchard (Eds.), *Measuring Chaos in the Human Brain*. World Scientific.
- Reisberg, D., & O'Shaughnessy, M. (1984). Diverting subjects' concentration slows figure reversals. *Perception*, 13, 461-468.
- Sabourin, M.E., Cutcomb, S.D., Crawford, H.J., & Pribram, K. (1990). EEG correlates of hypnotic susceptibility and hypnotic trance: Spectral analysis and coherence. *International Journal of Psychophysiology*, 10, 125-142.
- San Martini, P., Mazzotti, E., & Setaro, S. (1996). Factor structure and psychometric features of the Italian version for the EPQ-R. *Personality and Individual Differences*, 21, 877-882.
- Sarbin, T.R. (1989). The constructions and reconstructions of hypnosis. In N.P. Spanos & J.F. Chaves (Eds.), *Hypnosis: The cognitive-behavioral perspective* (pp. 400-416). Buffalo, NY: Prometheus Books.
- Sarbin, T.R., & Coe, W.C. (1972). *Hypnosis: A social psychological analysis of influence communication*. New York: Holt, Rinehart & Winston.
- Schumaker, J.F. (1991). The adaptive value of suggestibility and dissociation. In J.F. Schumaker (Ed.), *Human Suggestibility* (pp. 108-131). New York: Routledge.
- Sheehan, P.W. (1967). A shortened form of Betts' questionnaire upon mental imagery. *Journal of Clinical Psychology*, 23, 386-389.
- Sheehan, P.W., Donovan, P., & MacLeod, C.M. (1988). Strategy manipulation and the Stroop effect in hypnosis. *Journal of Abnormal Psychology*, 97, 455-460.
- Sheriff, M. (1935). A study of some social factors in perception. *Archives of Psychology*, 187, 60.
- Sheriff, M., & Sherif, C.W. (1956). *An outline of social psychology*. New York: Harper & Brothers.
- Shor, R.E., & Orne, E.C. (1962). *Harvard Group Scale of Hypnotic Susceptibility: Form C*. Palo Alto, Ca: Consulting Psychologists.
- Spanos, N.P. (1982). Hypnotic behavior: A social psychological interpretation of amnesia, analgesia, and "trance logic." *The Behavioral and Brain Sciences*, 9, 449-502.
- Spanos, N.P. (1986). Hypnotic behavior: A social-psychological interpretation of amnesia, analgesia, and "trance logic." *Behaviour and Brain Sciences*, 9, 449-467.
- Spanos, N.P., & Chaves, J.F. (1970). Hypnosis research: A methodological critique of experiments generated by two alternative paradigms. *American Journal of Clinical Hypnosis*, 13, 108-127.
- Spanos, N.P., & Chaves, J.F. (1989). *Hypnosis: The cognitive-behavioral perspective*. Buffalo, NY: Prometheus Press.
- Spiegel, D., Hunt, T., & Dondershine, H.E. (1988). Dissociation and hypnotizability in post-traumatic stress disorders. *American Journal of Psychiatry*, 145, 301-305.
- Stukat, K.G. (1958). Suggestibility: A factorial and experimental analysis. Stockholm: Almqvist & Wiksell.
- Tallon-Buadry, C., Bertrand, O., Bouchet, P., & Pernier, J. (1995). Gamma-range activity evoked by coherent visual stimuli in humans. *European Neuroscience Association*, 7, 1285-1291.
- Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences ("absorption"), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology*, 83, 268-277.
- Trouton, D.S. (1957). Placebos and their psychological effects. *Journal of Mental Science*, 103, 344-354.
- Vickery, A.R., & Kirsch, I. (1991). The effects of brief expectancy manipulations on hypnotic responsiveness. *Contemporary Hypnosis*, 8, 167-171.
- Von Foerster, H. (1981). *Observing systems*. Seaside, California: Intersystems Publications.
- Wagstaff, G.F. (1981). *Hypnosis, compliance, and belief*. Brighton: Harvester.
- Wagstaff, G.F. (1986). Hypnosis as compliance and belief: A socio-cognitive view. In P.L.N. Nish (Ed.), *What is hypnosis? Current theories and research* (pp. 59-84). Philadelphia: Open University Press.
- Wagstaff, G.F. (1991). Suggestibility: A social psychological approach. In J.F. Schumaker (Ed.), *Human Suggestibility* (pp. 132-145). New York: Routledge.
- Warburton, D.M., Wesnes, K., Edwards, J., & Larrad, D. (1985). Scopolamine and the sensory conditioning of hallucination. *Neuropsychobiology*, 14, 198-202.
- Weitzenhoffer, A.M. (1963). *Hypnotism: An objective study in suggestibility* (2nd ed.). New York: Wiley.
- Weitzenhoffer, A.M. (1980). Hypnotic susceptibility revisited. *American Journal of Clinical Hypnosis*, 22, 130-146.
- Weitzenhoffer, A.M., & Hilgard, E.R. (1962). *Stanford Hypnotic Susceptibility Scale, Form C*. Palo Alto: Consulting Psychologists Press.
- Wickramasekera, I. (1979). *A model of the patient at high risk for chronic stress related disorders. Do beliefs have biological consequences?* Paper read at the Annual Convention of the Biofeedback Society of America, San Diego, CA.
- Wickramasekera, I. (1980). A conditioned response model of the placebo effect - Predictions from the model. *Biofeedback and Self-Regulation*, 5, 5-18.
- Wickramasekera, I. (1988). *Clinical behavioral medicine: Some concepts and procedures*. New York: Plenum.
- Wickramasekera, I. (1993). Assessment and treatment of somatization disorders: The High Risk Model of threat perception. In S. Lynn, J. Rhue & I. Kirsch (Eds.), *Handbook of clinical hypnosis* (pp. 587-622). Washington, DC: American Psychological Association.
- Wickramasekera, I. (1994). Psychophysiological and clinical implications of the coincidence of high hypnotic ability and high neuroticism during threat perception in somatization disorders. *American Journal of Clinical Hypnosis*, 37, 22-33.

- Wickramasekera, I. (1995). Somatization, concepts, data, and predictions from the high risk model of threat perception. *Journal of Nervous and Mental Diseases*, 183, 15-23.
- Wickramasekera, I. (1996). On the interaction of hypnotizability negative affect in chronic pain - implications for the somatization of trauma. *Journal of Nervous and Mental Diseases*, 10, 628-635.
- Woody, E.Z., & Bowers, K.S. (1994). A frontal assault on dissociated control. In S.J. Lynn & J.W. Rhue (eds.), *Dissociation: Clinical, theoretical and research perspectives* (pp. 52-79). New York: Guilford Press.
- Woody, E., & Farvolden, P. (1998). Dissociation in hypnosis and frontal executive function. *American Journal of Clinical Hypnosis*, 40, 206-216.
- Zachariae, R., & Bjerring, P. (1994). Laser-induced pain-related brain potentials and sensory pain ratings in high and low hypnotizable subjects during hypnotic suggestions of relaxation, dissociated imagery, focused analgesia, and placebo. *International Journal of Clinical and Experimental Hypnosis*, 42, 56-80.
- Zuckerman, M. (1979). *Sensation seeking: Beyond the optimal level of arousal*. Hillsdale, NJ: Erlbaum.

Vezio Ruggieri

■ Starting from a psychophysiological perspective, the author presents a model in which the phenomenon of suggestion mainly consists of two components. The first component is represented by individual differences in perceptual processes that are dependent on individual differences in the balance between excitation and inhibition processes. The second component is represented by imaginative processes. The model emphasizes the structural similarities between imagery and perception. Differences between perception of reality and imagery phenomena are discussed, including their reciprocal relationship in a wider constructive view of consciousness. In this theoretical framework the author hypothesizes that suggestion is a psychophysiological process strictly related to the imaginative activity. Since there is experimental evidence indicating that imagery shares similar physiological processes with perception, this chapter provides evidence for a leading role played by imagery in the construction of consciousness and in the modulating of experience.

The aim of this chapter is to contribute to the discussion about suggestion and suggestibility from the point of view of a psychophysiologicalist. Special concern is to provide an integrated model which is strictly data-related.

Gheorghiu and co-workers (1993) wrote about suggestion: "Suggestion is not a unitary phenomenon, but this statement alone provides little information about what dimensions of suggestibility really are". They then go on to say, "It is necessary to identify a few subcategories of suggestibility", the principal ones being:

- (1) Imagination (the tendency to confuse fiction and reality);
- (2) Compliance (the tendency to react in accordance with demands such as normatively-based pseudoarguments); and