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., & Bjierring, 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.

"What is Suggestion?" A Psychophysiological Approach

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 psychophysiologist. 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

(3) Involvement (the tendency to get into a new situation or role, like identification).

For us the question is: How do these sub-components interact? This question, however, is related to the solution of another problem. We need also to ask if concepts like imagination, compliance and involvement have the same psychophysiological meaning for all. This main question is basically about the relationships between imagery and perception. This, in turn, alerts us to another issue: Are there individual differences in perception and imagery - a problem that is important in order to explain individual differences in suggestibility?

Individual Differences in Perception

Individual differences in perception are related to differences in modulating the balance between process of excitation and inhibition. This concept is illustrated well by research conducted years ago with my co-workers Milizia and Sabatini (1983, 1985) on the experience of being tickled. A tickle is a cutaneous, pleasurable sensation, different from simple touch, matched with orripilation and slight disquiet. This sensation, according to the literature can be induced by repeated, light tactile stimulations on a relatively wide area of the skin. The stimulus is represented by a wad of cotton of 3 mg. Tipically, the feeling does not appear immediately after the onset of stimulation but only after a latency period in which the simple tactile sensation is present. This phase is generally followed by a variable period of feeling of the tickle, that, after a period of stimulation, is followed again by simple tactile sensation in spite of the continuing stimulation. Variations in sensations appear after stimulation of the same cutaneous area. However, it is important to say that there are very considerable differences among subjects in the duration of each phase. The latency phase and its variability in duration, are determined by a preventive inhibition toward tickle (and pleasurable experience). The "inhibition" or the preventive "inhibition" determines the appearing of the sensation of the tickle (phase 2). The individual regulation of the excitation-inhibition balance, however, produces a new inhibition that modifies the subjective sensations characterized by the presence of the pure tactile sensation. The differences among subjects can be interpreted as styles of control of the excitation-inhibition balance. This way of conceptualizing events can be very useful in experiencing the workings of suggestion.

It seems possible to hypothesize that suggestive responses are related strictly to the preventive tonic inhibition. Elsewhere I have tried to describe, from a physiological point of view, the different forms of inhibition. For us (Ruggieri & Petruzziello, 1988), one of the most employed mechanisms is constituted by a particular form of activity of the muscular system. For example, we have observed very interesting relationships between myographic activity and latency of tickle (Ruggieri, Milizia, Sabatini & Tosi, 1983). The relevant question would be: Does the psychophysiological tonic inhibition facilitate or inhibit the onset of suggestive processes?

About Imagery

Before we can discuss the relationship between suggestibility and imagery, it is necessary to address some interesting aspects of this last process. The first argument refers to the structural similarity between perception and imagery from a physiological point of view.

Relating to vividness of imagery and its measurement, there is a wide literature that I will not consider in this context. Nevertheless it seems instructive to present some relevant research carried out in my laboratory. The first paper I wish to make reference to is titled: "On the hypothesized physiological correspondence between perceptual and imagery processes (Ruggieri, 1991)". The results of this research indicated that when a subject is imagining with open eyes, a modification of the external stimulation of the retina, produced by covering the eyes (randomly the right, the left or both eyes) strongly modifies the imaginative activity. The majority of the subjects revealed a loss of mental image. For the majority of them, the loss of the image was provoked by covering only one of the eyes. Some subjects had a loss of image when separately both right and left eyes were covered; and 7% of the subjects showed, when only one eye was covered, a loss of a part of the mental image. For example, if the image was of a tree, the subject observed a loss of half the tree. On the basis of this result, it was hypothesized that, if a mental image disappeared by covering the eyes (in the majority of cases only one of the two eyes), the eyes have a fundamental role in imagery.

Some results of this research are very curious: Why, for example, did many subjects reveal a loss of mental image when only one eye (eg, the right) was covered? Perhaps this is because the subject is seeing with the right eye? And why did other subjects show a loss of part of the image? Perhaps this is because they constructed their mental image by fusing the separated activity of the two eyes, each producing only a part of the mental image.

This active role of the eyes was subsequently confirmed by another experiment carried out by Giovanna Alfieri (1992). Through an ecographic system the activity of the crystalline lens was examined during real perceptual activity and during imagery.

In this study, subjects were asked to perceive near or far stimuli or imagine reading a word on a page of a book (near-imagined stimuli) or see a ship on the horizon (far-imagined stimulus). Results indicated that the accomodation (i. e. the activity of the crystalline lens) was present, in the same form for real and imagined stimuli. The optical axis of the lens increased for near mental or real stimuli and reduced for real and imagined stimuli. The modification of the crystalline lens was identical in both situations. This phenomenon indicates more than a simple correlation between peripheral processes and mental activity. It seems plausible to argue that subjects in imagining are really seeing what they image.

More recent work conducted in my laboratory adds novel and curious elements to this problem. In this experiment, subjects were asked to imagine with open eyes and to project, looking through a zoom lens, the so-called mental image onto a white screen.

The screen had an absolutely smooth surface. In basal conditions, when subjects only observed the screen and without imagining, they did not show any modification in perception while the experimenter moved the level of the zoom lens placed before their eyes. The subject was not informed about the movement of the zoom. Subjects, in basal conditions observed, after the movement of the zoom, always a white screen. But when the subjects were asked to image and to then project the mental image onto the screen, the movement of the zoom lens in the direction of an enlargement of a hypothetical visual stimulus, provoked in 37% of the group a sudden and unexpected enlargement of the mental image. The other subjects observed a loss, for a very short time, of the mental image.

What happened in this instance? Was it suggestion at work?

Because subjects were not informed about the activity of the zoom lens, and because the enlargement of the image, as the subjects said, was very immediate and surprising, I do not think that cognitive adaptation plays a role in this process. The cerebral cortex, I hypothesize, was implicated only following information coming from the eyes. This phenomenon obviously needs further work, but it is very eloquent in highlighting the involvement of the eyes in imagery.

In another recent experiment (Ruggieri, 1999), subjects were asked to image a running horse. Then they were asked to produce the same mental image of a running horse without moving their eyes and head. Results indicated that when subjects did not move their eyes and head, the running horse stopped. Naturally the ocular and head movements are employed in "perception" to "follow" perceptually a moving stimulus; thus, it seems likely that the inhibition of the movement of the stimulus during imagery indicates that, as in real perception, ocular and head movements are involved also in producing the mental representation of movement.

Following this conceptual framework and the data which support it, it seems that there are no substantial differences, from a physiological point of view, between imagery and perception. Imagery could be considered as a physiological process, involving both the central nervous system and periphery of the body. Imagery then has a concrete physiological consistence.

The Difference between Perception and Imagery

Gheorghiu indicated that the "confusion" between real perception and imagery was a sub-component of suggestion. Findings throw new light on his inference. In order to simplify this concept, both perception and imagery can be said to produce mental "representations". By use of the term "representation", we highlight the substantial identity of the two processes. But also, the two processes are quite different. If we hypothesize that both visual perception and visual imagery utilize the eyes, we must also ask how they are simultaneously present. This issue is significant because the interaction of imagery and actual perception forms the texture of consciousness. At this moment, my actual perception (representation of the environment) is linked with images (internal self-produced representations) of events that are not present (I am thinking of my home) or with images of the past and/or of the future. My actual perception is also linked to my Body Image (representation of the body and of the bodily activity) and with the images of my Self. There are, in fact, many levels of mental representations that are synthetized in order to produce the experience of unity and continuity of my consciousness.

But, we also must ask, how the different levels of representations interact? Recent findings bear directly on this issue.

In a previous investigation (Ruggieri, 1993) subjects were asked to observe (binocularly) a manikin and to project on the surface of the real manikin spontaneously produced mental images. When subjects had simultaneously a clear mental image and the perception of the manikin, the experimenter closed randomly the right, the left or both eyes. Subjects had to say if they observed only change in their "mental images" or "real perceptions".

The results were interesting. By closing both eyes, 76% of the subjects observed a loss of both mental and real images. Ten percent observed the persistence of the mental image only. In these cases, the mental images were very strong. Three percent curiously observed the persistence of the real image. In this case a real perception was transformed in an "imagined representation" of the reality which almost had the quality of an "hallucination". Two percent observed a persistence of both mental image and real perception; thus a tendency to an imaginative representation of the reality was present. When the eyes were separately closed, 25% of subjects had a loss of the mental image by closing the right eye; 10% showed a loss for the left and 29% for both oculars. But the most interesting results were reported by those subjects (10%) who showed a fusion between mental image and real perception. For example a manikin (real stimulus) was seen on the background of the sea (mental image). In this "fusion" the interaction between the right and the left eye played an important role. By closing one eye, some subjects produced a modification of the "real image". For example, in one subject the image of the sea disappeared but the manikin had suddenly blue eyes.

Many subjects showed interesting alterations between mental image and real perception in terms of a play of figure and background. For example, by closing the left eye, one subject observed that the imagined "garden" was placed in a second plane with respect to the manikin.

Thus individual differences clearly characterize the fusion process and differentially modulate the imagery-perception relationship. One question that needs further research is whether there is a particular relationship between individual style and suggestibility.

If imagery and perception are similar physiological processes, how then should we conceptualize the differences between the two events? In real perception we know that there is connection between the visual representation and other sensory systems. For example, in apprehending "reality", other sensory information like tactile and proprio-

ceptive cues play an influential role. The perception of reality is a synesthetic one, so visual mental representations produced by external stimuli are reinforced by a flow of information coming through other sensory routes. The interconnection of all the sensory events produces an experience of coherence that is the basis of our apprehending reality. In this way, the brain constructs, through mental imagery, reality itself; pure mental images, on the contrary, are often fleeting and weak.

Before we return to suggestion and suggestibility it seems relevant to report on other research that explores the relationship between subjective feeling and bodily modification which is an important component of the suggestive process. Examining some aspects of that process, we hypothesized (Ruggieri & Petruzziello, 1988) that a colour is classified, and perceived as warm, because, during the perception of that colour the subject feels little (very little) sensation of warmth. Sensation is related to some increase in bodily temperature. In other words, it seems that a chromatic stimulus can activate two different nervous pathways. The first, which is important for the identification of the stimulus reaches the cerebral cortex directly; the second, probably through the hypothalamus and related circuits, enhances the temperature of the body, which could be the basis of the experience of warmth that finally the subject projects onto the stimulus.

The results of available research go in this direction, which confirms the concrete physiological reality of the subjective sensations, feelings that are often considered as just mental.

One last finding (Ruggieri, Fiorenza, & Sabatini , 1986) demonstrates that the perception of a mimic-expressive stimulus implies a micro-imitation of the stimulus that is self-produced by the subjects. For example, in observing a slide reproducing a girl with a special facial expression, subjects enhanced the activity of the muscles involved in the expressive pattern. So it was hypothesized that the same subject reproduces, in an implicit way, the same expressive pattern. We have called this phenomenon "imitative decodification of the stimulus". Following such a concept we would agree that mental processes are more bodily-oriented than we think and that a mental subjective (reproductive) activity influences consistently the perception-decodification process.

Conclusion

The essential difference among imagery, perception and suggestion lies not in the physiological structural process, but in a particular relationship among psychophysiological events. Perception is a mental event modulated by the external environment which acts on the receptors. In this case, the mechanisms of control and verification of the mental representation (image) are automatically present. The mental event can be conceptualized as "continuously confirmed mental hypothesis".

In imagery, on the other hand, the mechanisms of control and of verification are not always present.

Suggestion represents "mental events" (images that have the same physiological

mechanism of imagery and of perception) which utilize "false verification". But in this process, a physiological mechanism of verification possibly takes place. The mechanism of verification in suggestion is incorrect only from a contextual point of view but not in the physiological basic activity. It is thus hypothesized that in suggestion, mental representations determine an implicit variation of receptor activity which represents the basis of the verification of the mental hypothesis. Other sources of information are not utilized here. This suggestive mechanism, I hypothesize is present in an important physiological process of the construction and stabilization of the Body Image. In previous research (Ruggieri et al., 1993), we hypothesized that the Body Image of obese patients was characterized by a hole in the wall of the abdomen. This mental representation was, we hypothesized, accompained by a real modification of the activity of the musculature of the wall of the abdomen (which was hyper- or hypo-contracted).

In such a case, the mental representation which was constructed on the basis of this peripheral information, controlled the motor efferent activity and modulated the "same" muscular peripheral activity. Impulses, reaching from the central nervous system and the periphery of the body, were oriented to reproduce and maintain the same form of activity. As in suggestion, there is a circular relationship between the activity of the central nervous system and the periphery of the body. As an aside, therapeutic rehabilitation works, with some success, on both levels of imagery (with "day dreaming") and the musculature of the wall of the abdomen (through particular exercises). But independent from such therapeutic applications, present findings are important for theoretically informing us about both real and imagined mechanisms and about suggestion.

To conclude on our reflections, we would argue that suggestion is a psychophysiological process strictly related to imaginative processes. We conclude that imagery, considered as a physiological process that is structurally similar to perception, has an important role in explaining consciousness; it is relevant also to modulating "real" experience. Suggestion must be considered no more as an inconsistent mental event, but as a concrete physiological phenomenon that plays an important role in our everyday life.

References

Gheorghiu, V., Koch, E., & Hübner, M. (1993). *A group scale for the influence of suggestion on sensory judgments*. In E. Bolcs, G. Guttmann, 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.

Ruggieri, V. (1991). On the hypothesized physiological correspondence between perceptual and imagery precesses. *Perceptual and Motor Skills*, *73*, 827-830.

Ruggieri, V. (1993). Immaginazione e percezione si incontrano nello sguardo. *Realtà e Prospettive in Psicofisiologia*, *5-6-7*, 119-132.

Ruggieri, V. (1994). A zoom lens before the eyes during imagery: individual differences and strange, unexpected responses. *Perceptual and Motor Skills*, *78*, 451-154.

Ruggieri, V., & Alfieri, G. (1992). The eyes in imagery and perceptual processes: first remarks.

Perceptual and Motor Skills, *75*, 287-290.

Ruggieri, V., Fiorenza, M., & Sabatini, N. (1986). Visual decodification of some facial expressions through microimitation. *Perceptual and Motor Skills, 62*, 475-481.

Ruggieri, V., Milizia, M., Sabatini, N., & Tosi, M.T. (1983). Body perception in relation to muscolar tone at rest and tactile sensitivity to tickle. *Perceptual and Motor Skills, 56*, 799-806.

Ruggieri, V., & Petruzziello, M.G. (1988). Psychophysiology of connotative decodification:the role of thermic and somesthetic system in decodification of chromatic stimuli. *Perceptual and Motor Skills*, *66*, 435-442.

Ruggieri, V., D'Ippolito, A., & Sapora, L. (1993). Un trattamento integrato dell'obesità. *Realtà e Prospettive in Psicofisiologia, 5-6-7,* 13-32.

Suggestion, Suggestibility, and the Placebo Effect

Lars-Gunnar Lundh

The purpose of the present chapter is to discuss the relation between suggestion, suggestibility, and placebo effects. The first part of the chapter specifically focuses on the nature of placebo effects. In the second part of the chapter, the concepts of suggestion and suggestibility are analyzed, and a theoretical approach to suggestive processes of influence is described. Finally, the third part of the chapter contains a discussion of the relationship between suggestive processes and placebo effects.

The nature of placebo effects

A placebo effect, by definition, is (1) a positive effect on the person's well-being which occurs (2) as the result of some kind of treatment, but which (3) cannot be accounted for by the specific, or characteristic ingredients of the treatment (Grünbaum, 1981, 1984; Lundh, 1987, 1992). It has become increasingly clear that there are non-specific effects of this kind involved in all kinds of medical and psychological treatments. Researchers both in medicine and psychotherapy try to control these non-specific effects in order to find out about the more specific effects of various treatment methods. In pharmacological research this is routinely done by comparing new drugs with pharmacologically inert placebos under double-blind conditions. In this case, all kinds of effects that are not due to the biochemical properties of the drug are lumped together as "placebo effects". During later years, however, researchers have also become increasingly interested in the nature of placebo effects as such (e.g., Critelli & Neuman, 1984; Kirsch & Rosadino, 1993; Harrington, 1997).

A Definition

It is generally assumed that placebo effects are due to various kinds of psychological processes, like the patient's belief in the efficacy of the treatment, response expectancies, or various aspects of the doctor-patient relationship. Some researchers (e.g., Kirsch, 1997; Wagstaff, 1981) tend to define placebo effects exclusively in terms of the patient beliefs or expectancies. But although these kinds of beliefs and expectancies