The Neurocognitive Update of the Two-Factor Theory of a Hypnotic Experience

by

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September 2019

FEATURE

Editor's Note

Therapeutic Hypnosis in the clinical context, has a deep history of theoretical and practical research which, unfortunately, can be diminished and even disregarded in the shade of populist practices of hypnosis for stage entertainment, comedy and single purpose suggestion. The issue that is often lost in the argument is that the experience of trance is well known as a natural shift in mental state that can be spontaneously achieved without the intervention of a facilitator - a *hypnotist*. The argument about the sincerity, effectiveness and ethics of imposing something on another person rages in many fields including psychotherapy, psychology, medicine, education and even on the sporting field. Pop psychology and pop hypnosis are forms of practice that need to be considered, but considered separately. For this article, I ask you to turn your mind to the serious investigation of this natural phenomenon that is a particular emergent quality from human focus and attention. Because hypnosis is utilized in therapeutic circumstances, it is incumbent on us to know what is being done, why and how to do it more effectively and more safely. Ernest Rosi has been at the vanguard of this endeavor and it is wonderful to see him joined by Kathryn Rossi and one of Rossi's students, Jan Dyba.

The following article puts forward an integration of current research into the neuroscience of hypnosis with the classical electrodynamic research done by Leonard Ravitz in the mid to late 20th century as a framework for an actualized two-factor theory of hypnosis (see Hilgard, 1986 & Hammond, 2005). A simplistic description of the 2-factors is that hypnosis is achieved by the quality of the subject's expectancy or because it is an ability/trait of the subject. Other authors have some variation of specific description of those fundamentals and some suggest they cannot be integrated. The model presented in this paper also integrates two opposite positions on the role of attention in hypnosis; an impaired attention approach with a focused attention perspective. The purpose of the article is to present a useful research-based framework for clinical hypnosis and its utilization in the clinical context of generating more tailored and detailed interventions.

INTRODUCTION

Hypnosis is broadly applied in the field of psychotherapy, rehabilitation, as well as in general medicine (Erickson & Rossi, 1979; Haley, 1973, 1985a, 1985b, 1985c; Lankton & Lankton, 1983; Patterson, 2010; Patterson & Jensen, 2003; Rossi, 2004; Yapko, 2002), and though its effectiveness is widely confirmed in research across multiple domains, it's nature and foundations are still not clear (Weitzenhoffer, 2001). The following article utilizes the *two-factor theory* of hypnotic experience to propose a theoretical clinical framework, that has a potential to create a common ground for many contradictory research results concerning hypnosis, done in the fields of cognitive neuroscience. The model described in this article aims to integrate together a pioneering work of Leonard Ravitz (1950, 2002) and Ernest L. Rossi (Erickson & Rossi, 1981; Erickson, Rossi, & Rossi, 1976; Rossi & Rossi, 2016b, 2016a, 2016c) in the field of electrodynamics of hypnosis, theories of impaired and focused attention in hypnosis and current research in the field of neuroscience of hypnosis.

We will begin the exploration with a brief outline of the classical electrodynamic research of the hypnotic phenomena, after that we will describe two factor theory of hypnosis and integrates it with research on attention in hypnosis. Then we will review some key research on the neurobiology of the hypnotic phenomena to finally integrate all of the above in the framework of a neurocognitive model of the two-factor theory of hypnosis.

FIRST ELECTROMAGNETIC FIELD MEASUREMENTS OF THE HYPNOTIC STATE

The first electromagnetic field measurements of hypnotic state were taken and published by Leonard Ravitz in *Science* magazine (Ravitz, 1950) using Burr-Lane-Nims microvoltmeter as a measuring device (Burr, Lane, & Nims, 1936; Matthews, 2007). Utilizing Milton H. Erickson hand levitation hypnotic induction technique, he describes his results as follows:

> During hypnosis, the EMF (electromagnetic force) tracing becomes more regular, and potential difference either gradually increases or decreases in magnitude. At trance termination, there is usually a dramatic voltage shift, and the tracing eventually returns to that of the normal waking state. (...)
>
> Catalepsy, when used to induce hypnosis, sometimes produced marked emf changes (...). When this occurred during the trance, or when the subject voluntarily raised an arm, minimal changes were recorded. (Ravitz, 1950, pp. 341–342)

In his later research on the hypnotic phenomenon, Ravitz (1951, 1959) found that apart from smoothing of the potential difference in the tracing, it may increase or decrease across subjects as well as in the same subject at different times. Additionally, catalepsy, when associated with the induction causes considerable increases in voltage, but phenomena like hallucinations, dreams and regressions do not influence the typical hypnotic pattern unless associated with strong emotions (Ravitz, 1951, 1959, 2002). the above results may be interpreted as an indication, that the alterations of the clas-

sical Ravitz hypnotic pattern may be associated with specific alterations of the focus of attention, presumably towards more emotionally involving absorption. Ravitz himself considers the alterations of the electrodynamic field in the trance state as an indication of the trance depth (Ravitz, 1950, 1951). According to the main thesis of this paper, it can be more specifically assigned to certain alterations in the attentional processes, which will be discussed in the following sections.

TWO FACTOR THEORY OF HYPNOSIS

While working with Milton H Erickson and Leonard Ravitz on the electrodynamic signature of hypnotic states, Rossi developed two factor theory of hypnotic experience based on gathered research data. The original theory, that will be a subject of the following article, was described as follows (Erickson & Rossi, 1981, pp. 53-54 *italics added here*):

> While the pendulum of current scientific thought has swung to the opinion that no objective measure of hypnotic trance exists, there is a long scientific tradition of measuring catalepsy. As early as 1898 Sidis published remarkably clear and convincing sphygmographic records distinguishing normal awakeness from catalepsy experienced during hypnosis. More recently Ravitz (1962, 1973) published tracings of the body's D.C. electrical activity (measured on high-impedance recorders) that underwent *characteristic changes during the induction of catalepsy*. The junior author has utilized a high-impedance recorder (input impedances ranging from 10 to 1000 megaohms with nonpolarizing electrodes placed on the forehead and the palm of one hand) for a number of years in his clinical practice as a convenient and convincing indicator of an objective alteration that takes place during trance. The record of a highly intelligent, normal, 24-year-old female subject during her first hypnotic induction is presented in Figure 3 3 [figure 1 in the following article]. The erratic, *fast activity at the beginning of the record (A) is characteristic of normal waking awareness. Every impulse to activity seems related to an upswing, which then drops as soon as the impulse is carried through. During simple relaxation, meditation, and hypnosis the record smoothes out and usually drops dramatically as the subject gives up any active effort to direct mind or body (B).* In Figure 3 a *few slow upswings* are noted during the beginning of the hypnotic induction, as the subject makes an effort *to attend to the therapist's remarks (C).* These drop out as trance deepens, and the record shows a *characteristically flat, low plateau with only low-amplitude slow waves (D).* With more trance experience even this low-amplitude activity drops out, and a smooth line record is obtained. As long as the subject remains mentally quiescent with an immobile (cataleptic) body, there are no peaks or valleys in the record. *When the subject initiates mental activity or moves, peaks and valleys are usually recorded*. The awakening period is also followed by a typical pattern (E). *The waking-fast activity usually appears at a higher level than the initial basal waking level*. This higher level is maintained for a few minutes until the record comes back to normal.

The difficulty with accepting such records as

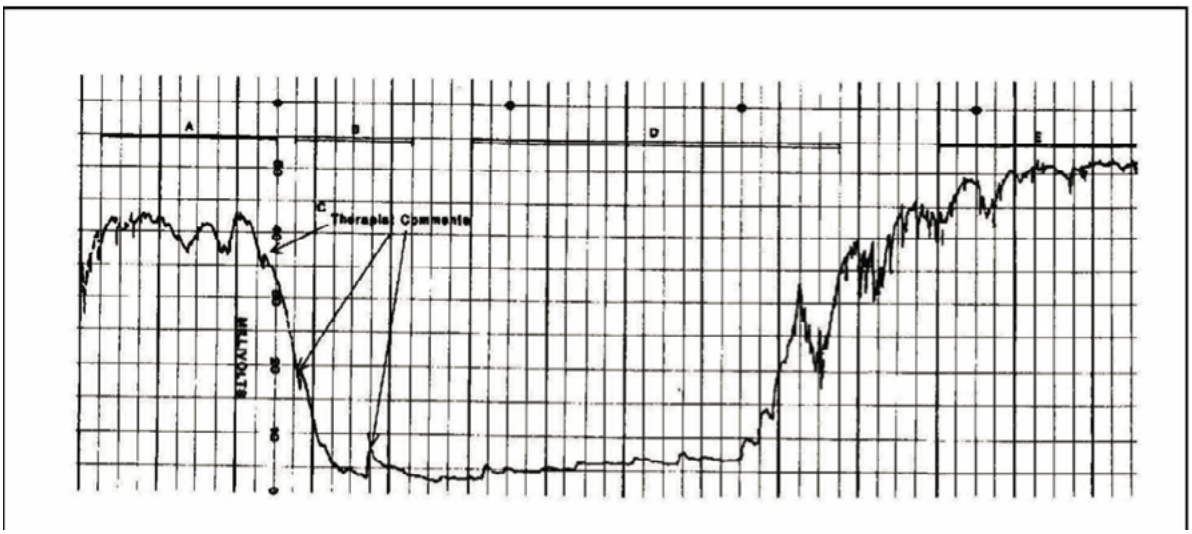

Figure 1: Electronic monitoring of DC body potential during catalepsy – milivolts on vertical axis: (a) normal awakeness; (b) drop in DC potential during relaxation of hypnotic induction; (c) momentary response to therapist remarks (probably emotionally significant) (d) characteristically low activity during catalepsy; (e) typical awakening pattern at higher level than (a). (retrieved with permission from Erickson & Rossi, 2014, p. 65)

> valid measures of trance is that they appear whenever the subject quiets down during relaxation, meditation, or sleep, whether or not hypnosis has been formally induced. We would therefore offer a two-factor theory of hypnotic experience. *First, there must be a state of openness and receptivity wherein subjects are not making any self-directed efforts to interfere with their own autonomous mental activity or the suggestions of the therapist*. Ravitz's measurements, like those in Figure 3, are probably an effective indication of this state of quiet receptivity. The second factor might be called *"associative involvement."* This is the process whereby the *hypnotherapist engages and utilizes a subject's associations, mental mechanisms, and skills to facilitate a hypnotic experience*. We regard this process of utilizing a patient's own mental associations as the *essence of "suggestion*." Hypnotic suggestion is not a process of insinuating or placing something into the subject's mind. Hypnotic suggestion is a process of helping subjects utilize their own mental associations and capacities in ways that were formerly outside the subjects' own ego controls.

At first Rossi describes the so called electrodynamic field signature of hypnosis (Rossi & Rossi, 2016b), as described in the previous section of the following work. Then he distinguishes two distinct factors that together constitutes the state of hypnotic experience. The first factor is a state of *openness and receptivity wherein subjects are not making any self-directed efforts to interfere with their own autonomous mental activity or the suggestions of the therapist*, and the other would be *"associative involvement"*, which is a process whereby *hypnotherapist engages and utilizes a subject's associations, mental*

mechanisms, and skills to facilitate a hypnotic experience. In other words, a hypnotic state, as defined by the classical two factor theory of hypnotic experience is a state of heightened receptivity or sensitivity of the client or patient to a particular set of suggestions or instructions, aiming at helping them to recognize, utilize and creatively reorganize, re-synthesize or reframe their own personal inner resources.

In the following sections, we are going to attempt to update the classical Two Factor Theory of Hypnotic Experience with research from current cognitive neuroscience to gain deeper understanding of the mechanisms underpinning the phenomena of therapeutic hypnosis and its efficacy in treating various psychological problems and mental disorders.

Before we start our review of current state of research, we need to conceptualize exactly, what we are actually looking at, when we refer to the electrodynamic field recordings of the hypnotic state. The Burr-Lane-Nims microvoltmeters were actually recording the human body direct current (DC) (Burr et al., 1936; Matthews, 2007; Ravitz, 1950, 2002) in millivolts, or as Rossi states, the electrodynamic quantum field of hypnosis (Rossi & Rossi, 2016a, 2016b), which as all other variations of quantum field may reflect on higher levels, for example in wave nature of mind-body rhythms (Lloyd & Rossi, 1992, 2008) like for instance Kleitman's (1982, 1987) Basic Rest Activity Cycle, which can possibly be a foundation of the natural waking trance as well as hypnosis in general (Rossi, 2002, 2004; Rossi & Lippincott, 1992; Rossi & Rossi, 2013). But what is actually reflected in the alterations of the electrodynamic field, or in other words the direct current? What correlates with these changes, that might at least in part account for the changes in the hypnotic state? One of aims of the following paper is to come closer to an answer to that question.

Rossi in one of his papers (Rossi & Rossi, 2016c, pp. 58–59, italics added here) conceptualizes the "recorded field" as:

> ...the recorded field (area, channel, or space) between the head and left and right hands is conceptualized in this paper as a computational image (Tricoche, MacLeod & Johnson, 2008) of the boundaries of the quantum electrodynamic field which, in more familiar terms, could be described as *attention, focus, the bandwidth of consciousness*, and electrodermal activity (Prokasy & Raskin, 1973); or the more recent concepts of biomolecular energy landscapes (Neupane et al, 2016; Wolynes, 2016).

In the quote mentioned above we can clearly see, that Rossi conceptualizes the electrodynamic field records in relation to focus and attention. In the following section we will go through some of the most important research on the relation between attention and hypnosis, and then we will try to relate it to the Two Factor Theory of Hypnotic Experience mentioned above.

IMPAIRED ATTENTION VS. FOCUSED ATTENTION VIEW ON HYPNOSIS AND THE TWO-FACTOR THEORY OF HYPNOTIC EXPERIENCE

When it comes to the role of attention and cognitive control processes in hypnosis, we can distinguish two general distinct orientations to

the problem.

One group of models (Barber, 2009; Tellegen & Atkinson, 1974) promote a notion of focused attention. According to this notion, a state of focus or heightened attention is required to label the experience as "hypnotic".

Theodore X. Barber (Barber, 2009, p. 370) states that clearly in his classical article on the subject as follows:

> Given a minimum of skill on the part of the hypnotist, the necessary and sufficient conditions for a subject to how at least some hypnotic behavior (in an experiment which the subject perceives as involving "hypnosis" or as involving an intimate relationship with another person, viz., a hypnotist) appear to be as follows: (a) the subject must possess the "hypnotic aptitude"—i.e., the ability to quickly and easily become and remain attentive, thinking about, and responsive to selected stimuli — and (b) the subject must possess an "attitude of basic trust toward oneself and others.

On the other hand, there are models (Dienes & Perner, 2007; Hilgard, 1965, 1977; Jamesson & Sheehan, 2004; Woody & Bowers, 1994) which assume, that with the hypnotic state the attention of, at least highly susceptible subject becomes impaired. According for example, to the classical Hilgard's neodissociation theory of hypnosis (Hilgard, 1965, 1977, 1991) a hypnotic induction splits the functioning of the executive control system into separate streams. A hypnotic suggestion acts upon the part of the executive control system, that is dissociated from the rest, and therefore a hypnotic subject is not aware of the process by which the suggestion operates to create the desired outcome.

To actually test the assumptions of above mentioned model groups various researchers mostly used the classical Stroop task (see Egner & Raz, 2007 for a comprehansive review). In this classical attention test (Stroop, 1935) a subject is presented with a series of words in two different conditions – congruent and incongruent – and are then asked to name the color of the letters. In a congruent condition a word is either irrelevant to a color or it depicts a color of the letters. An example of the congruent condition would be, word yellow written with yellow letters. In an incongruent condition the letters are in a different color than the color the word depicts, for example word yellow painted in red. Generally speaking, people need more time to name the color of the words in an incongruent condition than in congruent.

STROOP INTERFERENCE AND ATTENTION IN HYPNOSIS

When it comes to hypnosis (Egner & Raz, 2007), the predictions are as follows: If the focused attention view of hypnotic state is correct, high susceptible subjects should do better on the Stroop task under hypnosis than people with low susceptibility level. Attention fully focused on the task should help override the interference. If the impaired attention view of hypnosis gives better predictions people with higher susceptibility level would achieve poorer results, then low susceptibility subjects, due to impaired attention abilities.

At first glance lot of independent research projects seem to support the impaired attention models of hypnosis. In a trance subject with higher susceptibility level gain poorer results in terms of the Stroop interference, than subjects

with low susceptibility level in the absence of specific suggestions. On the other hand, when a specific suggestion is given to the subject under hypnosis, concerning a use of the specialized cognitive strategy, people with high susceptibility score higher then subjects with low susceptibility in the Stroop test, thus overriding the interference (Egner & Raz, 2007).

In a important study Sheehan with a team of researchers (Sheehan, Donovan, & MacLeod, 1988) found out, that high susceptible subjects score worst than low susceptible in a hypnotic trance condition in the Stroop task. What's even more important, is that these researchers report a total absence of reported strategies in highly susceptible subjects in a hypnotic condition, without any specific suggestions concerning the cognitive strategy useful to improve the Stroop task performance. A situation reverses significantly, when subjects are given a special suggestion, that describes the cognitive strategy meant to decrease the Stroop interference effect under hypnosis. Subjects were instructed to:

> ... narrow and position their field of vision so that perception of the word as a semantic unit was made more difficult. (Sheehan et al., 1988, p. 456)

In such condition subjects with high susceptibility score perform better than subject with low susceptibility on the Stroop task under hypnosis. The authors summarize collected data as follows:

> When *strategies are suggested*, cognitive *resources can be mobilized*; when they are *not suggested*, however, these *resources may not be mobilized* at all in a context that substantially reinforces relaxed responding and in which *cognitive arousal may be lowered*. (Sheehan et al., 1988, p. 459)

Can the abovementioned cognitive arousal be a manifestation of the lowered electromagnetic arousal depicted by the curve described originally by Ravitz (Ravitz, 1950, 2002) and Rossi (Erickson & Rossi, 1981)? Or can these results be better understood in a framework of the Two Factor Theory of Hypnotic Experience? If it is possible to interpret the increased interference and complete lack of cognitive strategies in high susceptible subjects as a result of them being in a special "*state of openness and receptivity wherein subjects are not making any self-directed efforts to interfere with their own autonomous mental activity or the suggestions of the therapist*" – which constitutes the first factor in Rossi's and Erickson's theory (Erickson & Rossi, 1981), and better performance of the high susceptible subject in comparison to low susceptible ones in the Stroop task as "*associative involvement (...)* the process whereby the *hypnotherapist engages and utilizes a subject's associations, mental mechanisms, and skills to facilitate a hypnotic experience*", than we may have found the attentional correlates and foundations of the Two Factor Theory of Hypnotic Experience.

Similar results were obtained in number of other studies (Casiglia et al., 2010; Raz et al., 2003; Raz, Moreno-Iniguez, Martin, & Zhu, 2007; Raz, Pollard, & Nitkin-Kaner, 2006; Raz, Shapiro, Fan, & Posner, 2002). For example Raz with a team (Raz et al., 2002) demonstrated, that subjects with high susceptibility can completely abolish the Stroop interference effect, when presented with a post-hypnotic suggestion to see the letter in a Stroop task as written in foreign language. In a follow-up study (Raz

et al., 2003) they blurred the vision of subjects to test if the reduction in Stroop interference is not caused by means other than the post-hypnotic suggestion itself. They came into conclusion, that significant Stroop interference reduction cannot be attributed to blurring of vision, but it is rather caused by a suppression of lexical word processing.

In yet another study Déry with a team of researchers (Déry, Campbell, Lifshitz, & Raz, 2014) obtained results showing, that specific hypnotic suggestion to sharpen the hearing can override the automatic audiovisual integration in the procedure of McGurk effect. Authors of the paper conclude, that their results demonstrate, that:

> ... even strongly entrenched cross-modal perception - seldom amenable to behavioral interventions - can speedily return, without training, to the purview of cognitive control following a specific suggestion. (Déry et al., 2014, p.36)

In one of his research, Raz with a team (Raz, Fan, & Posner, 2005) made an attempt to identify the neural correlates of the mechanism responsible for the reduction of the Stroop interference effect in highly susceptible subjects. They found, that a specific post-hypnotic suggestion to perceive words as nonsense strings produces modulation in activity in early occipital cortex and anterior cingulate cortex (ACC), as well as a reduced fMRi signal in some parts of the prestriate area. They attribute the Stroop interference reduction effect to the lowering of the visual system activation by reducing attention to the actual visual stream. In addition, the strong modulation of early occipital cortex activity indicates the altered visual processing which in consequence reduced the conflict, that could arise in the brain through the interference effect, thus reducing the activity in the ACC, which is involved in processes of conflict monitoring (PRZYPIS). This also supports the hypothesis, that hypnosis can modulate specific brain structures in response to specially designed suggestion, through a top-down mechanism (Rossi, 1994, 2000, 2001, 2004; Rossi & Rossi, 2013).

A CASE OF HYPNOTIC PARALYSIS AND IT'S NEUROBIOLOGICAL CORRELATES

Ravitz (1950) in his first research obtained a peak in the electrodynamic activity while eliciting a hypnotic catalepsy within a hypnotic subject. To more completely understand, what actually occurs during that higher peak of electric activity we will now shortly review some of the more recent neurobiological studies on hypnotic paralysis.

Cojan with colleagues (Cojan et al., 2009) utilizing an fMRI technology identified changes in the brain activity both specific to the state of trance itself as well as assigned more directly to the hypnotically induced paralysis condition. They noted increased activity in the anterior cingulate cortex and orbitofrontal cortex, regions associated with enhanced focusing and monitoring during hypnosis, across all conditions, independently of the task condition. Specific activation in right inferior frontal cortex was associated with a state of enhanced control and monitoring, recruited in all conditions under hypnosis. The activation in the left ventrolateral prefrontal areas was interpreted as

connected to the maintenance of new action rules imposed by the hypnotic suggestion. This activation was interpreted by the researchers as specific to the state of hypnotic trance (Cojan et al., 2009). Further they outline the summary of their research as follows:

> ... hypnosis produced distributed changes in prefrontal and parietal areas involved in attentional control, together with striking modifications in the functional connectivity of M1 with other brain regions. Changes in connectivity involved a reduced coupling with premotor areas but increased coupling with the precuneus, which was also selectively activated during instructions to prepare left movement during hypnosis. Altogether, these data suggest a disconnection of motor commands from normal voluntary processes, presumably under the influence of brain systems involved in executive control and self-related imagery (...)(Cojan et al., 2009, p. 870)

More specifically, an increased activation was observed in precuneus and extrastriate visual areas during a preparation to move the left, paralyzed hand under hypnosis. Precuneus is a region of the brain involved in mental imaginary and memory, especially in relation to self (Lou et al., 2004). It is activated during the motor preparation, which could be due to its involvement in envisioning future events from the first-person perspective. This means, according to the authors, that a general alteration of consciousness in the hypnotic condition was not present, and a subject was staying in the default mode, when asked to prepare movement with the paralyzed hand. Moreover, precuneus showed stronger coupling with right M1 during hypnotic paralysis, when compared to the normal state, and right M1 activity demonstrated wicker correlation with right premotor cortex during hypnosis, compared to the normal state. This according to Cojan (et al., 2009, p. 871) may suggest a possible neural mechanism by which self-monitoring processes may control hypnotically paralyzed hand movements utilizing internal representations derived from hypnotic suggestions and mental imagery in place of a normal usually present habitual reaction.

Additionally Deeley with a team of researchers (Deeley et al., 2013), comparing subjects with and without induced paralysis, both in a trance state, noted an increased activation of supplementary motor area (SMA) and anterior cingulate cortex in people with induced paralysis as compared with the normal condition.

These authors (Deeley et al., 2013)conclude that the ACC may either mediate the selective inhibition of intended movements in response to specific suggestions, or it may be involved in implementing the selective inhibition of movements following the suggestion. The authors suspect, that it does not directly mediate the sense of involuntariness. SMA on the other hand is involved in the process of preparation to implement the prepotent motor response following instructions to move the limb. Thus, it plays a part in the intention to move the limb. They also suspect, that taken together the activation of ACC and SMA, maybe responsible for the perceived loss of control and difficulty to move the limb in the hypnotic state. Additionally, authors report an activation in the contralateral sensorimotor domains in response to targeted suggestions.

Burgmer with colleagues (et al., 2013) in

another research associate the ACC with motivational and attentional effects in hypnosis, as well as with its conflict monitoring capacity. They suspect, that ACC may be active during hypnotic paralysis, because of the conflict between the intention to move the arm and not being able to do that because of the suggested inability to do so. They also spotted an increased activation during hypnotically induced paralysis in middle frontal gyrus (MFG), that is associated with the attentional processes. Authors (Burgmer et al., 2013) think, that it may be particularly associated with cancelation of prepared movement, formation of different motor representations, experience of self dissociation and enhanced self-monitoring under hypnosis. Another important area, where activation was increased during the hypnotic paralysis was insula. Authors conclude, that it may be involved in the processes of re-representation of interoception as well as alteration in a feeling of agency and body ownership. Taken together, these results indicate, that the hypnotic paralysis is achieved by means of altering of body and motor conceptualization in that condition by re-representation of interoception, reintegration of multimodal sensory information and constant self-monitoring processes. What is also important, hypnosis did not affect the function of mirror neuron system, in contrary to dissociative motor impairment, which means, that early motor processes such as movement initiation, or generation of will to move are intact.

That seems to support Cojan's conclusion (Cojan et al., 2009), that motor intentions and enhanced self monitoring processes are preserved in hypnosis, and thus the paralysis itself is achieved by means of more specific mechanism then a general top-down influence of the hypnotic suggestion (Halligan, Athwal, Oakley, & Frackowiak, 2000).

In summary, it can be observed, that in various presented above research projects different results were obtained, when it comes to a specific mechanism of the catalepsy in a hypnotic state. Is it possible, that this variety can at least in part be explained by uniqueness of each of the experimental settings, suggestions presented and for most by the creative work, that a subject does in response to suggestion presented (Rossi & Rossi, 2007, 2013)? If this was true, isn't that a clear example of a hypnotic subject utilizing and reassociating their own inner resources, life experiences and learnings in order to creatively respond to the suggestion? Milton H. Erickson refers to it as follows:

> Direct suggestion is based primarily, if unwittingly, upon the assumption that whatever develops in hypnosis derives from the suggestions given. It implies that the therapist has the miraculous power of effecting therapeutic changes in the patient, and disregards the fact that therapy results from an inner re-synthesis of the patient's behavior achieved by the patient himself. It is true that direct suggestion can affect an alteration in the patient's behavior and result in a symptomatic cure, at least temporarily. However, such a "cure" is simply a response to the suggestion and does not entail that reassociation and reorganization of ideas, understandings, and memories so essential for an actual cure. It is this experience of reassociating and reorganizing his own experiential life that eventuates in a cure, not the manifestation of responsive behavior which

> can, at best, satisfy only the observer. (Erickson, 2018, p. 46)

Then Erickson further refers to a specific example of hand anesthesia! As follows:

> For example, anesthesia of the hand may be suggested directly, and a seemingly adequate response may be made. However, if the patient has not spontaneously interpreted the command to include a realization of the need for inner reorganization, that anesthesia will fail to meet clinical tests and will be a pseudo-anesthesia. (Erickson, 2018, p. 46)

We hypothesize, that the differences in the results in between conditions and studies presented in this article, may be, at least to some degree assigned to the process of creative inner reorganization and utilization of patients own resources. Thus, we speculate, that the peaks in activation in the electrodynamic charts illustrating electrodynamic signature of hypnotic state reflect an alteration in attention related to a more specific creative process behind defined response to the hypnotic suggestion, in this case a particular set of suggestions leading to the state of catalepsy.

SUMMARY

In the article above we outlined the classical two factor theory of hypnotic experience, along with Leonard Ravitz's electrodynamic research. Then, using some of Rossi's current insights, we conceptualized the electrodynamic chart as associated with attentional processes. Later, based on the newest research on attention in hypnosis, we were able to gain a deeper understanding of the processes involved in the trance state itself, as well as create neurocognitive basis for the two factor theory of hypnotic experience, originally presented by Rossi and Erickson (1981). Lastly we reviewed some of the most recent research on the neuroscientific basis for the phenomenon of catalepsy in hypnosis, gaining a deeper understanding of both the phenomenon itself, as well as the upswings reported by Ravitz (1950) in his work.

The basis assumption, that we based our explorations on is, that a process of hypnotic suggestion, as well as the trance state itself, facilitates or creates a creative experience, that depotentiates the habitual sets and patterns or associations and behavior and enables patients to utilize their own inner resources in a new creative manner (Erickson & Rossi, 1979, 1981; Erickson et al., 1976; Rossi, 2004, 2012, Rossi & Rossi, 2007, 2013). The research quoted in this article demonstrate, that hypnosis is able to create such an environment, in which a subject is able to use their own abilities in a more focused and directed way, that can even result in break or modification of automatic and habitual processes, such as these present, for example in a Stroop effect.

This paper also shows, that classical two factor theory of a hypnotic experience, enriched with its neurocognitive basis explains the attention alterations in the trance state, making it valuable for further research and investigations.

Further research as necessary to determine if there is a relation between the electrodynamic signature of hypnosis and the alterations of attention in a hypnotic process. Better understanding of these processes will enable us to more completely understand what hypnosis

is, and what possibilities it introduces in treatment of various psychological problems, and thus construct better, more targeted and effective therapeutic interventions in a trance state.

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