

Editorial

**Hypnosis: From Neural Mechanisms to Clinical Practice**

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Hypnosis is the oldest psychotherapy and is one of the oldest and most popularly-practiced methods for control of pain and other stress-related chronic disorders. The chequered history shows unsurpassed adaptive power of hypnosis, enabling it to survive till date [1].

Though having witnessed variations over centuries, the current interest in hypnosis has become stronger; hypnosis has emerged both as a useful topic for scientific research and an effective technique in clinical applications and therapeutic interventions.

Hypnosis has remained poorly understood for long primarily due to lack of knowledge about objective neurobiological markers of trance state, but continuous advances in neuroscience in past several decades, largely due to the introduction and refinement of sophisticated electrophysiological and neuroimaging techniques, have opened up a “bridge of knowledge” between the classic neurophysiological studies and psychophysiological studies of cognitive, emotional, and sensory systems [1]. Still many of the basic questions regarding hypnosis remain unanswered.

The Society of Psychological Hypnosis, Division 30 of the American Psychological Association, has defined hypnosis as “a state of consciousness involving focused attention and reduced peripheral awareness characterized by an enhanced capacity for response to suggestion” [2].



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Of late, hypnosis has gained huge popularity in the health care and education sectors [3]. However, the exact role of hypnosis remains incompletely explored, and the mechanisms of its precise neural, biophysical, biochemical, and neurochemical actions remain inadequately understood. This Special Issue addresses some of the crucial questions relating to the neural mechanisms of hypnosis and improves understanding of hypnotic practices.

Thirteen acclaimed researchers and clinicians from all over the world were invited to present their perspectives, research findings, and recommendations for future work. The articles in this issue offer critical analysis, cutting edge research, clinical perspectives, and directions for future research and clinical practice. Through focusing on experimental research, this issue will prove extremely insightful for the clinicians, researchers, academicians, and medical scientists, thereby filling the gap between basic research and clinical practice, offering amply-useful therapeutic interventions.

In taking stock, Green *et al.* [4] (*this issue*) critically discuss the historical link between hypnotic responsiveness and dissociation. The Authors utilize scales of non-pathological dissociation and of pathological dissociation, failing to find any significant correlation with hypnotic responsiveness. In contrast, expectancies were the most influential in terms of variance accounted for in predicting hypnotizability.

Low-to-moderate statistically significant correlations were found between behavioral measures of hypnotizability with absorption and fantasy-proneness, with moderate-to-high correlations of measures of dissociation with measures of fantasy-proneness, suggesting that these constructs map on to a common domain of immersion in imaginative experiences.

It is of paramount importance to fill the gap between basic research and clinical practice. Vanhauzenhuysen *et al.* [5] (*this issue*) investigates how neuroimaging studies help clinicians to better understand the mechanisms of hypnosis in terms of brain modulation, especially of pain. Hypnotic suggestions dramatically influence not only the primary consciousness and self-consciousness networks but also the attentional and somatosensorial networks. Resultantly, the subjects feel disengaged from their external stimuli combined with the modification of sensations related to their body, their affective resonance, and cognitive appraisal.

Schmidt *et al.* [6] (*this issue*) propose an innovative application of hypnotic procedural techniques in clinical practice. An important stressor and source of chronic suffering in the intensive care unit is non-invasive ventilation. Positive therapeutic suggestions under hypnosis can help patients in intensive care units to enhance their well-being by helping them deal with specific stressors like being ventilated. The authors set up a clinical design to assess the effects and safety of standardized therapeutic suggestions under hypnosis in patients on non-invasive ventilation during intensive care.

Relieving pain is one of the oldest and most important applications of hypnosis [7], however, mechanism of relieving pain remains largely unexplored. In the neurophysiological context, De Benedittis [8] (*this issue*) reviewed recent evidence supporting the notion how hypnotic suggestions of analgesia can modulate pain processing at multiple hierarchical levels and sites within the central nervous system (CNS). Hypnotic suggestions of analgesia could directly modulate both sensory and affective dimensions of pain perception, with the affective dimension registering more significant reduction compared to the sensory one. Moreover, highly hypnotizable subjects possessed stronger attentional filtering abilities and greater cognitive

flexibility in comparison to the low hypnotizable subjects, thus allowing diversion of attention from the nociceptive stimulus as well as better ignoring the irrelevant stimuli in the environments.

Flynn [9] (*this issue*) provides a review of theories and biomedical paradigms of pain, including the biopsychosocial model that takes into account biological, psychological, and social factors that modulate the pain experience. He argued that it might be useful for clinicians who practice hypnotherapy to understand pain paradigms. As key brain areas involved in the processing of pain have been shown to be influenced by hypnosis and hypnotic analgesia, an experienced therapist who wishes to obtain optimal results with their pain patients/clients should include these targets in their treatment approach [10]. Biopsychosocial models emphasize the key role of psychological processes in the physical experience of pain, such as Fear-Avoidance and Fear-of-Pain [11]. A moderate- to- large positive association between pain-related fear and disability was observed, suggesting that pain-related fear may be considered an important risk factor for pain-related disability with implications in the treatment of pain [12]. Understanding and targeting these psychological variables may empower clinicians practicing hypnotherapy in tailoring suggestions specific to their pain patients to derive optimal results.

There is increasing evidence demonstrating that hypnosis can be effective in down-modulation of pain sensation in both acute and chronic pain states [13]. A summary of the recent systematic reviews would help better understand the quality of evidence regarding the efficacy of hypnosis, and provide the right direction for future research. Pathak et al. [14] (*this issue*) conducted a scoping review of systematic reviews and meta-analyses on the efficacy of hypnosis for the management of clinical pain conditions and concluded that there was low-quality evidence for beneficial effects of hypnosis in the management of procedural pain, headache, and pain associated with breast cancer care. Hypnosis may be an effective treatment for a variety of clinical pain conditions; its efficacy for clinical pain treatment is yet to be ascertained in large trials. Improvement of clinical designs and recommended guidelines are needed to avoid the methodological shortcomings of previously published trials.

Modern research does not offer due weight to the topic of the subjective experience in hypnosis. Hypnotizability scales focus mostly on behavioral responses, not on the subjective experience of the trance state. However, the brain/mind interface can better be explored by taking into account the first-person self-report and trying to link together behavioral, neurophysiological, and subjective experiences. Pekala & Creegan [15] (*this issue*) introduce noetic qEEG analysis as a neurophenomenological method to quantify the mind during hypnosis in a reliable and valid manner. The differences in qEEG results may relate to differences in noetic experience under hypnosis and possibly altered states of consciousness.

Hypnosis offers effective treatment in disorders involving the autonomic nervous system (ANS). However, studies investigating the nature of its effect on the ANS have reported contradictory results. Kasos et al. [16] (*this issue*) investigate the effects of hypnosis on electrodermal activity (EDA) to objectively assess the activity of the sympathetic branch of the ANS. Their findings show that sympathetic arousal is bilaterally reduced during hypnosis induction, which is persistent across different levels of hypnotizability. At the same time, lateral differences define unique EDA patterns in the induction phase, characterizing high, medium, and low hypnotizability. These findings confirm with those in previous studies that highlighted the reduction in the sympathetic tone under hypnosis by means of heart-rate variability power spectrum analysis (HRV) [17].

Although significant research has been done to evaluate the neurobiological aspects underlying the phenomenon of consciousness, there is a lack of information regarding the effect of clinical and sociodemographic variables relating to altered states of consciousness and hypnosis. Ciaramella [18] (*this issue*) investigates clinical and sociodemographic factors on three hundred and forty-nine subjects from the general population in a single session. The age of the subjects was observed to be a negative predictor of hypnoidal state, intended to be a general measure of trance. Age also contributes to changing the phenomenology of consciousness, predicting greater vividness of imagery, reduction in time sense, fear, arousal, anger, negative affect, and perception. Female subjects were found to be more hypnotizable than the male subjects as they experienced a reduced memory of suggestions and an increase in the depth of trance. Subjects with a history of psychological trauma were found more prone to have reduced memory of suggestions than the normal ones. The subjective experience of a trance state results from a combination of several individual predisposing traits and variables that are contextual to a specific situation and influence the quality of sensation, emotion, volition, and thought, which are fundamental for an appropriate response to suggestions.

According to Casula [19] (*this issue*), 'therapist's focused attention, open awareness, and kind intention are basic ingredients for creating a relationship of trust with the subject from the very first session. When the attention of a non-judgmental therapist is centered on how the subjects express themselves and what contents they propose, the subjects rely more on the competent care of the therapist. The author emphasized that to empower patients, it is essential to accept their vulnerabilities, awaken hidden resources, and pursue realistic therapeutic goals. In this manner, each session focuses on the perceptual, cognitive, emotional, and behavioral changes that the subject can make during the session and implement after the session by themselves. Some clinical cases have outlined the significance of this empathic and interactional approach.

Resilience—the capacity of a system to adapt to the changes caused by external agents/factors—may be regarded as the key player in psychotherapy as well as the remedy for all sources of distress in both medicine and psychological disorders. Facco [20] (*this issue*) explores the potential of hypnotherapy to promote and enhance resilience by empowering patients to better cope with adverse events and with precipitating sources of suffering and pain and emphasizes the role of both Eastern and pre-Socratic philosophy in exploring the inner-outer world relationship, thereby allowing a deep resilience. The counterpart of resilience in modern Western culture is still to be explored.

Moss [21] (*this issue*) focuses on integrative medicine that attends the psychosocial dimensions of chronic lifestyle-based disorders comprehensively and seems to offer better promise for the patients, clinicians, and researchers. Despite being evidence-based, person-centered, and attuned to subjective and comprehensive dimensions of a human being, hypnosis currently receives relatively less attention in integrative medicine, and it remains untapped despite the availability of many effective clinical protocols for a wide range of medical conditions. The author introduces and discusses emerging paradigms in integrative healthcare in order to improve educational preparation for hypnosis practitioners to comply with these paradigms.

Hypnotizability is a psychophysiological trait associated with several patterns, including the level of functional, neuroanatomical equivalence between imagery and perception. This pattern is stronger in easily hypnotizable subjects (highs) than in low hypnotizable subjects (lows).

Ruggirello et al. [22], (*this issue*) explored the correlation between electroencephalogram (EEG) of imagined arm/hand movements (MI) and actual movements performed in the absence of suggestions (M) and in the presence of suggestions of arm/hand anesthesia (MA) in easily and low hypnotizable subjects. *Highs* reported better imagery during MI, greater perceived influence of the suggestion of anesthesia during MA, and lower cognitive efforts than the *lows* for both the tasks. As revealed in previous studies, the spectral analysis did not reveal significant restructuring of the cortical activity during tasks in *highs*, whereas *lows* showed cortical changes during MI and MA indicating that they were able to mentally simulate movements and accept suggestions for anesthesia during voluntary movement, despite having low hypnotizability scores.

Nowadays, hypnosis is increasingly being recognized by the international scientific community not only as an effective clinical intervention to control several psychosomatic disorders but also as a valid and flexible physiological tool to explore the central and peripheral nervous system. This appears to be a real Copernican revolution in the field [1, 13].

This special issue compiles landmark studies and traces the evolution of hypnosis and charts its future therapeutic potential as well. It is hoped that the compendium of articles in this issue may raise more questions than answers, stimulating critical thinking, research at the leading edge of the fascinating and intriguing domain of hypnosis.

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The future of hypnosis depends greatly on the capacity of hypnosis researchers and clinicians to integrate hypnosis research and practice in broader areas of medicine, psychology and psychotherapy by building bridges of understanding.

### Author Contributions

GDB wrote the manuscript and reviewed the final manuscript.

### Competing Interests

The author has declared that no competing interests exist.

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