HYPNOSIS FOR PAIN RELIEF

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1. Historical Background

1.1 Historical roots of misconception and scepticism towards hypnosis.

Medical hypnosis benefits from a growing interest, new researches show the brain activity in hypnosis and explain how it can work and be helpful in acute and chronic pain control. Despite more evidence and studies, there is still a widespread scepticism, and to understand that a travel in time can help explain it.

1.2 18th century Mesmerism

Franz Anton Mesmer (1784-1814) a Viennese doctor believed in animal magnetism, the existence of a universal fluid. He explained disease as a result of obstacles to the flow of the fluid. He used his “magnetic forces” with special passes over the body, later by magnetizing a “baquet” and having patients hold rods. Disease he believed could be cured by the redistribution of magnetic fluid to create a proper harmony or alignment within the patient. (Hammond, 2013). Mesmerizing broke through the obstacle by producing a “crisis” often signaled by convulsions, and then restoring «harmony», a state in which the body responded to the salubrious flow of fluid through all of nature. On the initiative of king Louis XVI, a commission of the French Academy of Sciences was established to evaluate his practice, and came to the conclusion that Mesmer’s fluid did not exist, termed him a deceiver and ascribed Mesmer's "healings" to the fantasy of the individual. Hénin De Cuvelier (1755-1841),was one of the first to publish scientific studies on hypnotic techniques. The main objective of his work was to demystify hypnosis and to demonstrate it is not a placebo-effect. He questioned theories of the universal fluidum as healing means, had the courage to criticize the magnetists and their “false” system. Most important, he discovered that imagination is the most important part of the healing which explains the effect of the practice. (Côté, 2017).

Marquis de Puységur (1751-1825), a student of Mesmer, focused on what he called “artificial somnambulism” – the relaxed, hypnotic, sleep-like state so characteristic of more modern hypnotic work and emphasized the relationship or “rapport” between the hypnotist (magnetist) and subject, and that the will of the doctor was the catalyst for creating the various phenomena (Hammond, 2013).

1.3 Braidism, Hypnosis and Hypno-Anaesthesia

James Braid (1795-1860), explained the phenomenon he observed as a form of "nervous exhaustion" (due to overexcitation of the optic nerve) and sleep induced by concentration on a bright object. This made him call it "hypnosis", emphasizing similarities with sleep. Braid worked just prior to, and at the time when anaesthetics were first being discovered, and he used hypnosis successfully to perform surgery.

His work represented a major contribution in the progression of hypnosis away from the use of mesmeric passes and magnetic fluid theory, and toward an emphasis on relaxation, the use of induction techniques resembling modern methods, and a theoretical conception of hypnosis as a state of increased suggestibility and a form of sleep. (Edmonston, 1986).

James Esdaile (1818-1859) a Scottish physician, who began practicing medicine in the early 1830s in India, worked as a surgeon for the East India Company in Calcutta. He performed thousands of surgical operations, first with the use of Mesmeric passes, and later using Braid's hypnotism. e reportedly achieved complete insensibility in 80-90% of his patients (Elliotson, 1846). At a time when surgical mortality was approximately 50%, Esdaile amazingly discovered that this form of hypnosis was not only effective for pain relief, but also resulted in only a 5% surgical mortality rate. (Edmonston, 1986).

John Elliotson (1791-1868), an innovative physician, was open to utilizing hypnosis in his work, including as an anaesthetic for minor and major surgeries (leg amputation or removal of a breast) and obstetrical anaesthesia, and published the results of 76 surgeries (Elliotson, 1843), where hypnosis was the sole anaesthetic. This was really a great humanitarian advancement in an age of surgery without anaesthesia as it was not until 1846 that ether was discovered, and 1847 before chloroform was introduced, developments which were to soon minimize the need for hypno-anaesthesia in surgery.

1.4 19th century : Controversy between the Salpétrière school (Paris) and the Nancy school.

Jean-Marie Charcot (1825-1893), a neurologist continued the research following Braid's theories. He theorized that hypnosis could only be produced in predisposed hysterical individuals, and considered hypnosis as a form of psychopathology associated with simulation. (Bogousslavsky, 2010).

This viewpoint led to intense controversy between his group and the Nancy School, established by Ambroise-August Liébault (1823-1904) and joined by Hippolyte Marie Bernheim (1840-1919). In the early 1860s Liébault began using Braid's techniques and gave suggestions for relaxation, sleep, ego-strengthening and symptom amelioration. (Hammond, 2013). Bernheim

stressed that the hypnotic state increased suggestibility and he introduced the hyper-suggestibility theory. The Nancy school managed to successfully dispel earlier theories of trance induction that postulated mind control by some magnetic force or by the hypnotist's supposedly superior willpower, but now came to the idea that hypnotists could control their subjects'minds by means of direct, authoritative suggestion.

1.5 19th century : Dissociation and Hypno-Analysis

Pierre Janet (1859–1947) introduced a new theory concerning the nature of hypnosis, suggesting that it is possible to create a dissociation between conscious and unconscious parts of the mind. He believed dissociative processes occurred progressively in hypnosis, and the deeper the patient went into a hypnotic state, the more fully the unconscious took over control (Janet, 1923).

Sigmund Freud (1856-1939), had attended Charcot's, Liébault and Bernheim's clinic. He was impressed by the therapeutic potential of hypnosis for neurotic disorders. On his return to Vienna he used hypnosis to help neurotics recall disturbing events that they had apparently forgotten. As he began to develop his system of psychoanalysis, theoretical considerations, as well as the difficulty he encountered in hypnotizing some patients, led Freud to discard hypnosis in favour of free association (Kline, 1958).

1.6 The standardized approach.

Advocates of the school of standardized approach, (referred to as traditionalists or experimentalists) recognized that hypnotic trance was a phenomenon produced by the subjects themselves and not by some mysterious "power" possessed by the hypnotist. Success or failure depended solely on whether a subject happened to have been born inherently "susceptible" or non-hypnotizable (Rosenfeld, 2008). For that reason, they introduced a measure to everyone's inborn "degree" of trance capacity, the "Hypnotic Susceptibility Test". The standardized approach became the most scientifically approach to the study of hypnotism. Trance capacity was seen a trait, and the induction would be quite simple. In the hypnotic susceptibility scales, the ability of subjects is tested to exhibit certain specific phenomena. The belief that most people are not responsive to hypnosis by virtue of some biological or characterological deficit is widely accepted by both the public and health care professionals.

1.7 The utilisation approach

Milton H. Erickson (1901-1980), an American Psychiatrist, excited professional interest by demonstrating the power of hypnosis as a clinical tool. He made innovations in the way it was used and developed his own unique approach.

The Early Erickson in the 1930s, 40s and 50s wrote and taught that the hypnotic trance was a special condition. In contrast with earlier practices where a therapist issued standardized instructions to a passive patient, Erickson stressed the importance of the interactive therapeutic relationship. He pointed out that this state might occur in our daily lives, so in that respect it was a natural event. But the sustained, clinically useful hypnotic state was relatively rare. He wrote that hypnosis was not merely relaxation, nor a moment of inattention or confusion, but rather that it was an unusual extended state. It might last for minutes or sometimes even for hours. Erickson also believed that some people could develop the hypnotic state more easily, readily, and competently than others. (Barber, 1982).

The Later Erickson of the 60s and 70s inspired the multitude of 'Ericksonian' therapists. The utilization approach, based on Milton Erickson's teaching and views is based on the assumption that everyone is more or less hypnotizable when the induction is individually tailored. "Neither hypnotist nor subject is of prime importance: what is of major importance is the interaction between the two" . The utilization approach also assumes that each person is unique in terms of the strategies used to create his or her own experience and that, consequently, the hypnotist's effectiveness depends upon how well he is able to adapt his strategies to those of a given subject. (Gilligan, 1982).

1.8 Hypnosis definitions

The origin of the term is attributed to James Braid (1785–1860). In the early 1800s, Braid had adapted the method of mesmerism to his medical practice and initially thought the process was similar to sleep and thereby coined the term *hypnotism* from the Greek word *hypnos* for sleep (Braid, 1853). After the 1993 definition of hypnosis by the executive committee of Division 30 of the American Psychological Association (Society of Psychological Hypnosis) and the 2003 new definition, on March 24, 2014, the revised definition was approved unanimously by the attending members of the executive committee (Elkins *et al*., 2015).

It stipulates different definitions for each aspect:

1. Hypnosis. "A state of consciousness involving focused attention and reduced peripheral awareness characterized by an enhanced capacity for response to suggestion."
2. Hypnotic induction. "A procedure designed to induce hypnosis."
3. Hypnotizability. "An individual's ability to experience suggested alterations in physiology, sensations, emotions, thoughts, or behaviour during hypnosis."
4. Hypnotherapy. "The use of hypnosis in the treatment of a medical or psychological disorder or concern."

The definitions seek to provide clarity to terms that are essential to advancing research and clinical practice in hypnosis. (Elkins *et al*., 2015).

2. Global diffusion of hypnosis and its impact on healthcare

2.1 The evolution of hypnosis and hypnotherapy

Hypnosis for purposes of medical treatment goes back a long way. It is the oldest of all psychotherapies and one of the most practiced clinical methods for the control of pain. This enviable history denotes and reflects its unsurpassed adaptive power (De Benedittis, 2012).

In fact, the introduction of hypnosis by Franz Anton Mesmer represented the birth of modern psychiatry in the 18th century. Subsequently, hypnosis earned respect and academic prestige with Charcot, enjoyed widespread popularity with Bernheim and Liebault, and contributed to the birth of psychoanalysis with Freud in the 19th century. But at the dawn of the 20th century, hypnosis seemed to have begun a downward spiral.

It took more than half a century and two world wars until the 'New Hypnosis' could rise again. The innovation introduced by Erickson can be considered as one of the most significant advances of the 20th century in the field of psychotherapy in general and of hypnotherapy in particular.

Despite its unexpected renaissance, hypnosis remained the prisoner of an evil spell. On one hand, it has continued to attract a multitude of weak thinkers and strong and wily spinners, often enhanced and amplified by the media; on the other hand, particularly on clinical grounds, it has struggled between supporters who are sometimes a bit too interested and hypocritical, and snooty detractors often full of prejudices. As a consequence, the acceptance of hypnosis in the scientific community has been slow.

The British Medical Association endorsed the use of hypnosis in somatic medicine in 1955, on the basis of case reports and series backed up by expert consensus, and the American Medical Association followed suit in 1958 (BMA, 1955; Council of Health, 1958).

But something has changed dramatically in the hypnotic scenario during the last few decades. It is no secret that hypnosis was, and yet remains, at least in part, a marginal topic in the mainstream of scientific research, mainly because of its empirical and anecdotal approach and a lack of evidence-based controlled studies. It is true that the absence of evidence is not the evidence of absence (of a given effect), but no discipline can be scientifically recognized in the absence of adequate standards. This also applies to hypnosis. Moreover, hypnosis has long been an elusive concept for science due to the lack of objective neurobiological markers of the state of trance. But the relentless advances in neuroscience in the last few 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.

Of course, a bridge is designed to connect two realities bidirectionally. This holds true also for the ‘hypnotic brain’ (De Benedittis, 2012). While recent advances in neuroscience have undoubtedly contributed to unravelling the Veil of Maya of hypnotic reality - that is its neuro-cognitive structure - hypnosis is also increasingly being recognized by the international scientific community as a real psychobiological state and process, and a valid and flexible physiological tool to explore the central and peripheral nervous system . This seems to be a real Copernican revolution in the field (De Benedittis, 2004).

Parallel to a better understanding of the neural mechanisms of hypnosis and hypnotic applications (De Benedittis, 2015), the clinical scenario of hypnosis has expanded considerably over time, though it has gone through periods of great popularity and significant decline, like a swinging pendulum. But in the last decades, the hypnotic field has experienced a long-lasting period of robust growth worldwide, receiving renewed and increasing attention from scientists and gaining clinical recognition worldwide in medicine and psychotherapy.

In 2009 a Medical Hypnosis Primer (Barabasz *et al*., 2009)) on Clinical Hypnosis was produced by the major USA hypnosis societies to encourage WHO *(World Health Organization)* to research and publish guidelines on the effectiveness of clinical hypnosis, as a reinforcement for a whole range of health care treatments.

In 2011 The International Association for the Study of Pain (IASP) included hypnosis in the core curriculum for professional education in pain (IASP, 2011). Acceptance of hypnosis has evolved worldwide and major institutions such as NIH, NCCIH, CDC, BMA and major university medical schools like Harvard, Stanford, Johns Hopkins etc. recommend hypnosis as a viable, effective tool for treating discrete disorders (*e.g*., pain, psychosomatic and psychiatric disorders, etc.).

In 2017, the International Society of Hypnosis (ISH) and the European Society of Hypnosis (ESH) set up a joint Task Force, chaired by Prof. Giuseppe De Benedittis, aimed at obtaining recognition by WHO.

In 2018, the “*Blue Book: An Evidence-Based Guide to Hypnosis*” (De Benedittis *et al*., 2018), a reference book on the evidence-based efficacy of clinical hypnosis, was produced by the Italian Society of Hypnosis to promote academic research and clinical practice in the hypnotic field and to encourage WHO to publish approved guidelines.

2.2 Global spread and impact on health policy

The global diffusion of hypnosis and its impact on health policy is reflected by the boasting interest in the field (66.500.000 references in Google search results, as of December 31, 2019 !), the increasing clinical use of hypnosis in the health setting (hospitals, universities, etc.), the explosive number of scientific papers devoted to this topic (14832 citations in PubMed, as of December 31, 2019) and the establishment of numerous scientific societies.

Even though the history of international congresses on hypnosis dates back to the end of 19th century, the recent history of hypnosis started in Uppsala (Sweden) in 1973 with the formation of the International Society of Hypnosis (ISH). International Congresses of Hypnosis have been held every three years in different places around the world. World Congresses of Hypnosis (*e.g.*, such as the Paris Congress in 2016) have been attended by more than 2.000 participants from all over the world. Training programs have been set by ISH to promote hypnotic clinical use in developing countries.

ISH has boasted a membership of 1600 members, and 36 constituent societies from 29 countries around the world. These are: Australia, Austria, Belgium, Brazil, Canada, China, Denmark, Finland, France, Germany, Hungary, Iceland, India, Iran, Italy, Japan, Mexico, Morocco, Netherlands, Norway, Poland, Portugal, Russia, South Africa, Spain, Sweden, Switzerland, United Kingdom, USA.

In an ever changing world of economic and political upheavals, with vast technological and administrative challenges, ISH remains dedicated to its mission to stimulate and to improve research, discussion, and publications pertinent to the scientific study and clinical application of hypnosis. It continues to encourage cooperative relations among scientific disciplines with regard to the study and applications of hypnosis, and to bring together persons who use hypnosis, and to set standards for professional training and adequacy in the field. Since the '50's ISH publishes the *International Journal of Clinical and Experimental Hypnosis,* the most authoritative journal in the field.

The *European Society of Hypnosis (ESH)* was formally established in 1990 and boasts 14800 members (doctors, psychologists, dentists) from 48 Constituent Societies in 24 European Countries, including: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Hungary, Iceland, Israel, Italy, Latvia, Luxembourg, Netherlands, Norway, Russia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and United Kingdom. The official journal of ESH is *Contemporary Hypnosis and Integrative Therapy*.

Asian Society of Hypnosis. During the recent 1st Asian Congress of Clinical Hypnosis, held in Mashhad (Iran) in 2019, the *Asian Society of Hypnosis* has been established, including countries like Armenia, Iran, India, Indonesia, China and Japan.

2.3 Public's views and attitudes toward hypnosis and hypnotherapy

What does the public think about hypnosis and hypnotherapy ?

Two recent studies (Krouwel *et al*., 2017; Palsson *et al*., 2019) assessed views and experiences of clinical hypnosis in UK and USA populations. Key findings showed that most people are positive (38,6%) or neutral (48,4%) towards hypnosis and believe that hypnotherapy is beneficial for psychological issues and is supportive of medical interventions (Palsson *et al*., 2019).

7.6% of respondents had undergone hypnosis treatment, and 63.1% reported some resulting benefit; 54.9% of individuals who had never undergone hypnosis treatment indicated that they would consider seeking such treatment; 45.6% of all respondents thought there was moderate or strong scientific evidence supporting hypnosis as a real phenomenon (Palsson *et al*., 2019).

Another study (Sohl *et al*., 2010) investigated overall intentions to use hypnosis to control side effects of cancer and its treatment. Results suggest that the vast majority of patients (89%) would be willing to use hypnosis to control side effects associated with cancer treatment. These results indicate that in the general public, there is a willingness to consider the use of hypnosis and this broad acceptance of hypnosis argues for more widespread dissemination.

3. Hypnosis for Pain Relief

3.1 Acute and Chronic Pain: Definition and Magnitude of the Problem

The *International Association for the Study of Pain* defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Bogduk & Merskey, 1994).

Pain is the most common reason for physician consultation in most developed countries. (Debono *et al*., 2013) It is a major symptom in many medical conditions, and can interfere with a person's quality of life and general functioning (Breivik *et al*., 2008).

Pain that lasts a long time is called chronic or persistent, and pain that resolves quickly is called acute. Chronic pain is defined as pain that persists or recurs for more than 3 months or beyond the expected period of healing (Treede *et al*., 2019).

Pain is the main reason for visiting an emergency department in more than 50% of cases (Cordell et al., 2002) and is present in 30% of family practice visits (Hasslestrom *et al*., 2002). Epidemiological studies have found that 10.1% to 55.2% of people in various countries have chronic pain (Harstall & Ospina, 2003) .

A world-scale epidemiology report produced by Tsang *et al*. (2008) shows an age-standardized prevalence of chronic pain conditions in the previous 12 months of 37.3% in developed countries and 41.1% in developing countries, with an overall prevalence of 38.4%.

Pathogenetic Pain Phenotypes, Pain can be categorized basically in nociceptive pain and neuropathic pain. Nociceptive pain is caused by stimulation of sensory nerve fibers that respond to stimuli approaching or exceeding harmful intensity (nociceptors), and may be classified according to the mode of noxious stimulation (*e.g*., inflammatory or cancer pain).

Neuropathic pain is caused by damage or disease affecting any part of the nervous system involved in bodily feelings (the somatosensory system) (Jensen T.S *et al*., 2011) .

Economic Burden of Pain . Pain surely worsen the quality of life of sufferers, but it also represents an economic burden, both for individuals and health care systems.

Individual costs are constituted from direct costs (*e.g.*, paying for medical care) and indirect costs (*e.g*., paying for activities people are no longer able to perform). Among the indirect costs, lost work productivity represents the majority of overall costs associated with pain (Henschke *et al*., 2015). Furthermore, workforce is in continuous ageing in many countries, and this could lead to a major economic impact whether these individuals will need to retire due to painful health condition.

Access Treatment for Pain Relief as Human Right. According to international human rights law, countries have to provide pain treatment medications as part of their core obligations under the right to health. Despite the importance and magnitude of the problem and the existence of inexpensive and effective pain relief treatments, inadequate treatment of pain, particularly of chronic pain, is widespread (Dohlman & Warfield, 2012). Tens of millions of people around the world continue to suffer from moderate to severe pain each year without relief. Failure to take reasonable steps to ensure that people who suffer pain have access to adequate pain treatment may result in the violation of the obligation to protect against cruel, inhuman and degrading treatment.

The *International Association for the Study of Pain* (2010) advocates that the relief of pain should be recognized as a human right, that chronic pain should be considered a disease in its own right, and that pain medicine should have the full status of a specialty.

3.2 Addressing Pain Beyond Medications

Chronic Pain is not primarily a biomedical problem, and is therefore not easily resolved with a single simple biomedical treatment. Rather, chronic pain is a biopsychosocial problem that requires the

consideration of, and treatments that address, their many biological, psychological and social factors that can contribute to its severity and impact (Jensen M.P. *et al*., 2015b).

Because of the limited efficacy - simple pain medications are useful only in 20% to 70% of cases (Moore *et al*., 2015) - and frequent significant side effects of medications, pain is the most common reason for people to use complementary and alternative medicine (Eisenberg *et al*., 1998).

The experience of pain can be dramatically affected by cognitive modulation (De Benedittis, 2003). Among cognitive interventions of pain modulation, hypnosis may be the most effective (Hauser *et al*., 2016; Jensen & Patterson, 2014; Stoelb *et al*., 2009).

3.3 What is Hypnosis ?

The term "hypnosis" is used to mean a state of consciousness involving focused attention and reduced peripheral awareness characterized by an enhanced capacity for response to suggestion (Elkins *et al*., 2015) At the same time this term is referred to the procedure by which this state is induced. During a hypnotic trance physiological, cognitive, and affective processes as well as behavior can be modified. A hypnotic state and hypnotic phenomena can be induced by another person (therapist) or alone (self-hypnosis). The subjective experience of hypnosis is characterized by focused attention, absorption capacity, a high degree of authenticity (experienced as real) involuntariness ("it happens by itself") and cognitive/perceptual flexibility (De Benedittis, 2015).

Hypnosis has long been an elusive concept for science due to the lack of objective neurobiological markers of the state of trance. But the explosive advances in neuroscience in the last few 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. (De Benedittis, 2015). These studies have shed new light on the neural basis of the hypnotic experience. Furthermore, an ambitious new area of research is focusing on mapping the core processes of psychotherapy and the neurobiology/underlying them. Hypnosis research offers powerful techniques to isolate psychological processes in ways that allow their neural bases to be mapped. The *Hypnotic Brain* (De Benedittis, 2012) can serve as a way to tap neurocognitive questions and our cognitive assays can in turn shed new light on the neural bases of hypnosis. This cross-talk should enhance research and clinical applications.

Hypnosis is no longer a matter of dispute and controversy in the international scientific community as it has not only been established as a viable, valid, and reliable intervention for controlling discrete clinical syndromes, but it has been eventually recognized as a real psychobiological state and process (De Benedittis *et al*., 2018; De Benedittis, 2016).

Despite an increasing body of evidence suggesting a rather discrete *Neuromatrix* for the Hypnotic Brain, hypnotic states and processes are probably best explained by more comprehensive models that stem from biopsychosocial domains (Jensen M.P. *et al*., 2015).

3.4 Neural Correlates of Hypnosis

Current hypnosis research focuses on two major areas (De Benedittis, 2012): (a) *intrinsic research*, that is the research line concerned with the functional anatomy of hypnosis per se, in the absence of specific suggestions, the so-called 'neutral hypnosis' or 'default hypnosis', and the neurophysiological mechanisms underlying the hypnotic experience in dynamic conditions, and (b) *instrumental research* (or extrinsic studies) , the use of hypnosis and suggestion for studying a wide range of cognitive and emotional processes as well as for creating 'virtual analogues' of neurological and psychopathological conditions in order to elucidate their underpinnings and eventually positively change the way we treat them.

A wide array of novel electrophysiological and neuroimaging techniques have contributed to significant advances in our knowledge of hypnotic phenomena, including functional neuroanatomy of neutral hypnosis. These include electrophysiological studies (*e.g., EEG, ERP,* bispectral analysis), neuroimaging - *e.g*., single-photon emission computed tomography (SPECT), functional magnetic resonance imaging (fMRI), positron emission tomography (PET)) - advanced neuroimaging (*e.g.,* real-time fMRI and brain-computer interface), and neurofeedback (De Benedittis, 2012).

EEG studies.

Hypnotic states and hypnotic responding (including hypnotic analgesia) are associated more often with increase in theta and gamma activity, with higher levels of theta tending to be associated with higher hypnotizability and hypnotic responding (Jensen M.P. *et al*., 2015a; Jensen M.P. *et al* 2015b).

Neuroscience has not only contributed to validating and defining the state of trance; it has also enabled us to differentiate between altered states of consciousness and ordinary states of consciousness. Bispectral electroencephalographic analysis, a sophisticated and complex evolution of spectral analysis, has proved to be effective in differentiating between subjects awake and subjects in trance on the basis of the bispectral (BIS) index (De Benedittis, 2008).

Neuroimaging studies.

Several neuroimaging (fMRI, PET) studies - see reviews in De Benedittis, 2016; De Benedittis, 2015 - (Landry *et al*., 2017; Del Casale *et al*., 2012 ; Cojan *et al*., 2009 ; Rainville *et al*., 2002; Faymonville *et al*., 2000; Maquet, 1999) have contributed to creating a map of Regions of Interest (ROI) in the brain during 'neutral' or 'default' hypnosis (*i.e*., hypnosis in the absence of any specific suggestion), including the occipital cortex (involved in visualization processing, which is so important for the induction and the experience of hypnosis), thalamus, anterior cingulate cortex (ACC), inferior parietal cortex, precuneus (that normally mediates imagery and self-awareness) (Cojan *et al*., 2009), and dorsolateral prefrontal cortex. Perhaps we are not far from being able to draw a "Neurosignature" (functional neuroanatomy) of hypnosis. Moreover, neuroimaging findings suggest a potential anatomical (morphological and volumetric) basis for hypnotizability, linking variations in the rostrum of corpus callosum to differences in attentional and inhibitory processes (Horton *et al*., 2004).

3.5 Neural Mechanisms of Hypnotic Analgesia

Hypnotic analgesia represents a significant paradigm of how neurophysiological and neuropsychological research has contributed decisively to a better understanding of the mechanisms of multidimensional pain control in trance. Given the complex, multidimensional nature of the pain experience, it is likely that hypnotic analgesia involves multiple mechanisms of pain modulation.

A robust body of evidence offers a broader conceptual scheme, postulating that dynamically distributed processing in large-scale networks, possibly operating in parallel, can integrate and modulate at different neural levels and sites the experience of pain. This combined evidence suggests that the concurrent activation of this network of central and peripheral neural structures might constitute the "Neurosignature" of the hypnotic modulation of pain.

Although research on neurophysiological mechanisms of hypnotic analgesia has focused mainly on peripheral and spinal mechanisms of nociception, the activation of these mechanisms is neither necessary nor sufficient to produce the perception of pain (Jensen M.P., 2008). Pain is perceived when complex integrated cortical and subcortical (supraspinal) systems are engaged with or without the presence of nociception; and pain can be relieved when these same systems are disengaged or interrupted. As a consequence, the main mechanism of pain relief by means of hypnosis is a top-down mechanism, rather than a bottom-up.

Supraspinal central mechanisms.

EEG-ERP Studies. Evidence that differences in attention levels may account for hypnotic depth and individual differences in hypnotizability is provided with traditional EEG rhythms,

event-related potentials, 40 Hz and gamma EEG activity (see reviews in De Benedittis, 2015; 2003). The alteration of stimulus perception may be a secondary effect with respect to allocation of attentional resources.

A growing body of research has shown that the magnitudes of different brain oscillation patterns are associated with response to hypnotic inductions and suggestions (Jensen M.P. *et al*., 2015a). Hypnosis has been shown to be associated with more theta oscillations, and hypnotic responding has been shown to be associated with changes in patterns of gamma oscillations (with potentially increases, decreases, or changes in timing of gamma oscillations), depending on many factors including the suggestions given (Jensen M.P. *et al*., 2015a).

Laser-evoked potential (LEP) experiments have shown that hypnosis may significantly reduce pain and LEP N2-P2 complex amplitudes as compared with the control condition (Squintani *et al*., 2018). These findings support the hypothesis that hypnosis inhibits afferent nociceptive transmission; the physiological mechanism of hypnosis may involve sub-cortical gating processes on cortical activation that underlies decreased subjective pain perception and LEP modulation reported by subjects under hypnosis.

Valentini and co-workers (2013) studied whether hypnotic suggestion of sensory and affective hypoalgesia (down condition) or hyperalgesia (up condition) differentially influenced subjective ratings of laser-induced pain and nociceptive-related brain activity in high and low hypnotically suggestible individuals. They found a significant hypnotic modulation of pain intensity and unpleasantness in highly suggestible patients and P2 modulation in the up and down conditions, suggesting a top-down modulatory effect on both evoked and induced cortical brain responses triggered by selective nociceptive laser inputs. These studies provide evidence for the higher efficacy of hypnotic analgesia in highly hypnotizable subjects. Taken together, these findings indicate that "high hypnotizables" may possess an enhanced ability to generate focused attention (or disattention) to information and activity controlled by the so-called pain matrix cerebral areas. the reduction in the N2-P2 complex after hypnotic induction may have resulted from modulation of pain matrix activity, particularly of the ACC, i.e., the brain area that plays a primary role in generating the vertex complex.

One possible explanation for the increased analgesic efficacy of hypnosis in highly hypnotizable subjects as compared with the low hypnotizables is related to greater cognitive flexibility *(i.e.,* the ability to adaptively modify cognitive strategies and awareness) (Crawford, 1994 ; Crawford & Gruzelier, 1992). In addition, highly hypnotizable subjects possess stronger attentional filtering capabilities and expression of fronto-limbic attentional activities. This allows the subject in trance to be more effective in refocusing their attention and diverting attention away from nociceptive or undesirable stimuli, as well as ignoring irrelevant environmental stimuli (Crawford, 1994). Cognitive control

processes are associated with a supervisory attentional system (SAS), whose activity involves fronto-temporal cortical structures (Shallice, 1988).

Taken together, these studies indicate that clinical hypnosis can play a key role in maximizing both behavioral and neurophysiological responses since hypnosis is a cognitive phenomenon that affects central nociceptive processing. Furthermore, these finding support the greater cognitive flexibility (*i.e.,* the subjective capacity to shift from one "state" to another) of high in contrast to low hypnotizables (De Benedittis, 2015).

Neuroimaging studies. Neuroimaging techniques have contributed in a decisive way to revealing the putative mechanisms of cognitive modulation of pain, including hypnotic analgesia. In a pioneering study using SPECT, De Benedittis & Longostrevi (1988) reported a significant decrease of the regional cerebral blood flow (rCBF) in the primary sensorimotor cortex (S1) during suggestions of hypnotic analgesia in highly hypnotizable subjects only, possibly associated with a selective neural inhibition.

The turning point in neuroimaging studies of hypnotic analgesia was determined by the pivotal studies of a Canadian team headed by Pierre Rainville using PET. In the first of these studies (Rainville *et al*., 1997), it was shown that hypnotic manipulation of the degree of negative affective resonance (unpleasantness) evoked by a nociceptive stimulation in a group of volunteers concomitantly induced corresponding changes in the activities of the brain structures (*i.e.,* increased/reduced activation of the Anterior Cingulate Cortex, ACC) involved in coding the motivational-affective component of pain. No change was observed in the activity of the primary sensorimotor cortex (S1) involved in processing the sensory-discriminative component of the nociceptive stimulus. The extraordinary selectivity of hypnotic suggestion to manipulate differentially the two main components of the painful experience was documented by a striking linear correlation between the intensity of negative affective resonance, as suggested in hypnosis, and the level of activation of the ACC.

This pioneering study was followed by others of the same group and by Belgian researchers (Hofbauer *et al*., 2001; Faymonville *et al*., 2000), which confirmed and extended the results of the aforementioned study, suggesting that the ability of hypnosis in differentially modulating the different aspects of pain perception is not rigid, structural, and unidirectional, but dynamic and dependent upon the structure and formulation of hypnotic suggestions.

Brain imaging studies also revealed increased activity during hypnotic analgesia in several regions of the prefrontal cortices and the brain stem (Faymonville *et al*., 2000; Rainville *et al*., 1999). Furthermore, increased connectivity was found between the ACC and the mesencephalon in the region of

the periaqueductal grey (PAG) (Faymonville *et al*., 2003). This activation is consistent with the putative activation of descending pathways involved in pain regulation.

A recent review of functional neuroimaging studies on pain perception under hypnosis (Del Casale *et al*., 2016) indicates that hypnosis-induced modifications of pain perception are related to functional changes in several ROI's, including not only the cingulate (mainly ACC), but also the prefrontal, insular and pregenual cortices, the thalamus and the striatum. The ACC seems to be the key target in reducing pain perception, whatever the nociceptive stimulus applied, emphasizing its critical role in hypnosis-induced modification of sensory, affective, behavioral and cognitive aspects of nociception.

Contrary to what had been previously believed (Hilgard & Hilgard, 1994 : De Benedittis *et al*., 1989), it is becoming increasingly clear that hypnosis can modulate effectively not only the motivational-affective component of pain but also the sensory-discriminative one (more directly linked to the intensity of the nociceptive stimulation), albeit to a lesser extent. These findings confirm the great cognitive- perceptual flexibility mediated by trance and will certainly exert a significant impact in the clinical context.

Taken together, these data support the notion that cognitive (hypnotic) modulation of pain alter dramatically the cortical Pain Matrix. The hypnotic modulation of pain intensity produces changes in pain related activity mainly in the primary somatosensory cortex (S1), while modulation of pain unpleasantness induces changes mainly in the anterior cingulate cortex (ACC), with the anterior (mid)cingulate cortex possibly modulating both sensory and affective components of pain. (Peyron *et al*., 2002; Faymonville *et al*., 2000).

Spinal mechanisms.

Hypnotic analgesia may also depend on the activation of descending inhibitory systems that specifically modulate the spinal transmission of the nociceptive input. The involvement of these systems during hypnotic suggestions of analgesia has been demonstrated by electrophysiological studies that have documented that hypnosis significantly reduces the amplitude of the nociceptive flexion reflex (R-III), believed to be linearly related to the intensity of perceived pain (Danziger *et al*., 1998; Kiernan *et al*., 1995) and the effect was proportional to the level of hypnotic suggestibility.

Autonomic and peripheral mechanisms.

In addition to the spinal and supraspinal mechanisms, there is increasing evidence that hypnosis also modulates the activity of the autonomic nervous system (ANS) and possibly the peripheral

nervous system (PNS). The sympatho-vagal interaction of ANS during trance was analysed for the first time with spectral analysis of the heart rate variability signal (RR interval) by De Benedittis *et al*. (1994). The study showed that hypnosis modulates the RR interval by shifting the balance of sympatho-vagal interaction towards an increased parasympathetic output, concomitant with a reduction in the sympathetic tone. The effect is positively correlated with hypnotic susceptibility.

It has also been shown (Langlade *et al*., 2002) that the heat pain threshold assessed by thermal stimuli is significantly elevated during hypnosis, suggesting that hypnosis can down-regulate neuronal inflow from A delta and C fibres stimulation. Finally, a recent study (Paqueron *et al*., 2019) assessed whether a focal glove hypnotic hand anaesthesia induced thermal changes within the area of hypnotic protection. Analgesic glove induced a statistically significant difference in temperature variation within the hand, wrist and distal forearm on the glove side, compared with proximal forearm and control side. Hypnotic glove analgesia provides significant changes in skin temperature within protected areas.

Summarizing, current evidence strongly supports multiple, hierarchical pain control systems during hypnotic suggestions of analgesia at different levels and sites within the nervous system (see review in De Benedittis, 2016; De Benedittis, 2003). At peripheral level, hypnosis may modulate nociceptive input by down-regulating A delta and C fibers stimulation and reducing the sympathetic arousal, relevant for inducing and maintaining some chronic pain states. At spinal level, hypnosis is likely to activate descending inhibitory systems by reducing the nociceptive R-III reflex, parallel to self-reported pain reduction. At supraspinal cortical level, neuroimaging and electrophysiological studies have shown that hypnotic suggestions of analgesia can modulate directly and selectively both sensory and affective dimensions of the pain perception (the latter being reduced significantly more than pain). Moreover, highly hypnotizable subjects possess stronger attentional filtering abilities than do low hypnotizable subjects. This greater cognitive flexibility might result in better focusing and diverting attention from the nociceptive stimulus as well as better ignoring irrelevant stimuli in the environment.

Neuropsychological mechanisms of hypnotic analgesia are likely to be diverse. They include factors related to reinterpretation of the meanings associated with pain and factors related to reduced pain intensity. The latter can result from either dissociative mechanisms or mechanisms related to focusing on alternative or reduced sensations. Some factors, in turn, are accompanied by modulation at cortical levels, as in the case of modulation of activity within ACC but not S1 cortex during reinterpretation of meanings. Other factors relate to endogenous circuitry that descends to brain stem and spinal levels and inhibits nociceptive transmission within cells of origin of ascending pathways, and modulate motor and autonomic responses (Rainville & Price, 2012).

Taken together, these data support the notion that cognitive (hypnotic) modulation of pain alter dramatically the cortical Pain Matrix (De Benedittis, 2016; De Benedittis, 2003).

Hypnosis modulates empathy for pain .

Brain responses to pain experienced by oneself or seen in other people show consistent overlap in the pain processing network, particularly anterior insula, supporting the view that pain empathy partly relies on neural processes engaged by self-nociception (Braboszcz *et al*., 2017).

A recent study has shown that inducing analgesia through hypnosis leads to decreased responses to both self and vicarious experience of pain (Braboszcz *et al*., 2017). Activations in the right anterior insula and amygdala were markedly reduced when participants received painful thermal stimuli following hypnotic analgesia on their own hand, but also when they viewed pictures of others' hand in pain. Hypnotic modulation of pain responses was associated with differential recruitment of right prefrontal regions implicated in selective attention and inhibitory control. These findings provide novel support to the view that self-nociception is involved during empathy for pain, and demonstrate the possibility to use hypnotic procedures to modulate higher-level emotional and social processes (Braboszcz *et al*., 2017).

3.6 Efficacy of Hypnosis for Pain Management

There has been a growing number of randomized clinical trials that have evaluated the efficacy of hypnosis for both (medical) procedural and chronic pain management in the past few decades. A PubMed/MEDLINE search performed on October 30, 2019 requiring that the terms "hypnosis" and "pain" be in the title yielded 268 articles; limiting the search to clinical trials yielded 55 articles. At the same time, there has also been a growing number of reviews that have summarized the findings from these trials. For example, a PubMed/MEDLINE search performed on October 30, 2019 requiring that the terms "hypnosis" and "pain" be in the title and limiting the search to reviews, meta-analyses, or systematic reviews, yielded 48 articles.

In order to obtain the most reliable conclusions regarding the current state-of-science knowledge of the efficacy of hypnosis, here we sought to perform a summary of reviews (also known as "umbrella review" or "review of reviews") of the most recent systematic reviews and meta-analyses regarding the effects of hypnosis on procedural and chronic pain. We limited the summary to recent reviews (defined here as reviews published in 2014 or later) because earlier reviews would not include the most recently published clinical trials. We also limited this summary to systematic reviews and meta-analyses only (and not, for example, selective or narrative reviews), because such reviews are more likely to provide more reliable (unbiased) conclusions regarding questions of efficacy.

For this summary, PubMed/MEDLINE, Scopus, the Cochrane Library, and PsychInfo databases were searched for systematic reviews and meta-analyses published in 2014 or later that reviewed the findings from randomized clinical trials of hypnosis for procedural or chronic pain. This search yielded 12 reviews (Adachi *et al*., 2014; Birnie *et al*., 2014; Chesaeux *et al*., 2014; Cramer *et al*., 2015; Flynn, 2018; Kendrick *et al*., 2016; Madden *et al*., 2016; Montgomery *et al*., 2017; Provencal *et al*., 2018; Zech *et al*., 2017; Zhang *et al*., 2015; Eason & Parris, 2018). However, one of the high quality reviews identified, which focused on hypnosis for symptom control in cancer patients at the end-of-life, did not find any high quality randomized controlled trials to review (Montgomery *et al*., 2017). As a result, they were unable to draw any conclusions regarding the efficacy of hypnosis for symptom management in this population. Another one of these 12 reviews did not assess the methodological quality of the clinical trials reviewed (Eason & Parris, 2018). This increases the potential of bias in their conclusions. Finally, although four of the identified reviews did assess the methodological quality of the clinical trials reviewed, they did not consider this when drawing final conclusions regarding the efficacy of hypnosis (Adachi *et al*., 2014; Kendrick *et al*., 2016; Madden *et al.*, 2016; Zech *et al*., 2017). This left six higher quality systematic reviews and meta-analyses that will be reviewed here in the order that they were published.

Summary of findings from higher quality systematic reviews and meta-analyses

In 2014 Cheseaux and colleagues performed a systematic review of the effects of hypnosis treatment provided before diagnostic or therapeutic medical procedures on various outcomes, including pain severity (Cheseaux *et al*., 2014). They identified 18 RCTs which evaluated 968 patients (830 adults and 138 children), and which had sample sizes ranging from 20 to 200 patients. The hypnosis treatments in provided in the trials they reviewed were single face-to-face hypnosis or audio recordings that lasted from 10 to 30 minutes. All but one of the studies had a large number of patients. The authors of this review concluded that the available studies had too many methodological limitations to draw firm conclusions regarding the effects of a brief hypnotic interventions prior to medical procedures on the symptoms associated with those interventions.

Also in 2014, Birnie and colleagues performed a systematic review and meta-analysis of both distraction and hypnosis for needle-related pain and distress in children (Birnie *et al*., 2014). They identified seven trials that provided data needed to evaluate the effects of hypnosis on needle-related pain and distress in 255 children aged 3 to 16 years old; five of these studies (176 subjects) provided data needed to be able to evaluate the effects of hypnosis on pain and distress. Unfortunately, details (*e.g*., number and length of treatment sessions, specific hypnotic suggestions provided) regarding the hypnosis interventions used in the clinical trials they reviewed were not provided. It appears, however, that these

hypnosis interventions varied to a great extent, and included Ericksonian procedures, training in self-hypnosis, and both direct and indirect hypnotic suggestions for symptom management. These authors found significant effects for hypnosis relative to the control conditions used in the studies on reducing both pain and distress. However, the reviewers rated the quality of evidence as low due to methodological limitations of the studies, including (most commonly) a lack of blinding of treatment allocation, lack of blinding of outcome assessors in all studies, and a lack of details regarding important procedures that would allow for a determination of potential bias. While the first issue is a limitation in all hypnosis research (it is not possible blind treatment allocation in psychological intervention studies), the latter issues can be addressed by (1) assessing outcomes by research staff blind to treatment condition and (2) providing greater details regarding the study procedures. Thus, although the reviewers concluded that hypnosis appears to be effective for reducing needle-related pain and distress in children (due in part to the consistency of effects across the studies reviewed), they also noted that improvements in the methodological quality of clinical trials in this area are needed.

Cramer and colleagues performed a systematic review of RCTs evaluating the efficacy of hypnosis for breast cancer care in 2015 (Cramer *et al*., 2015). Their aim was broad – to evaluate the efficacy of hypnosis interventions for treating a large variety of symptoms (pain, distress, fatigue, nausea/vomiting, and hot flashes) in women undergoing breast cancer treatment (including biopsies) and in breast cancer survivors. They identified 13 RCTs that studied the effects of hypnosis ion 1357 women. As is often the case in this area of research, the hypnosis interventions studied in these RCTs varied to some extent. Although the majority of studies evaluate the effects of "live" (in person) administration of a standardized intervention, the number of sessions provided varied from one to 48, and lasted up to 12 months. Based on the findings from three RCTs, they concluded that hypnosis treatment reduces pain and distress in women undergoing breast biopsy. One RCT found that hypnosis treatment had positive effects on pain (as well as distress and fatigue) in a sample of women who received breast cancer surgery. Three RCTs each found that (1) hypnosis improved distress and reduced hot flashes in samples of women experiencing hot flashes, and (2) hypnosis reduced pain and distress in sample of women with metastatic breast cancer. The authors concluded that there is "sparse but promising evidence for the effectiveness of hypnosis in breast cancer care" (p. 5, Cramer *et al*., 2015).

Zhang and colleagues performed a systematic review and meta-analyses of studies evaluate the effects of hypnosis and relaxation therapies for temporomandibular disorders (TMD) (Zhang *et al*., 2015). However, they were only able to identify three RCTs (studying 159 patients), and all three studies were of low quality and had a high risk of bias. Details regarding the hypnosis interventions studied in these trials (*e.g.,* number and length of sessions) were not provided. The findings from the three studies identified suggested that hypnosis and/or relaxation therapy may have a beneficial effect on worst pain

intensity, but these treatments to not appear to have beneficial effects on average pain or pressure pain thresholds (*i.e*., the amount of muscle sensitivity to palpitation) in patients with TMD. They concluded that more studies with low risk of bias are needed to determine the reliability of these preliminary findings.

In 2016 Madden and colleagues performed a Cochrane review of the effects of hypnosis for pain management during labour and childbirth (Madden *et al*., 2016). They identified nine RCTs that studied the effects of hypnosis in 2954 women. Although study quality was variable, they were able to identify and include in their review a number of high quality RCTs. All but one of the studies provided the hypnosis treatment before labour and birth (starting as early as the first trimester); one provided treatment during labour. Training in self-hypnosis was often taught in group classes, although in some studies treatment was provided in individual sessions. Treatment was sometimes augmented by the use of audio recordings that participants could listen to between the treatment sessions. In this review, the authors concluded that hypnosis treatment may reduce analgesia use during labor, but does not appear to impact epidural use. They also noted that there were no consistent differences were found between hypnosis and control conditions with respect to satisfaction with pain relief. They concluded that future well-designed RCTs are needed to draw firm conclusions regarding the effects of hypnosis for pain management in labour and delivery.

A systematic review and meta-analysis of the effects of hypnosis treatment on burn wound care was reported by Provencal *et al*., (2018). These authors identified six RCTs that evaluate the effects of hypnosis for burn wound care in a total of 234 patients. Hypnosis treatment was usually provided as a single session before or during the burn wound care procedures (with the suggestions consisting of post-hypnotic suggestions for comfort that would occur during the subsequent wound care). One study augmented treatment with audio recordings of the hypnosis session that the participants listened to on the day of their wound care. In the meta-analysis, the authors noted statistically significant differences in both pain intensity and anxiety favoring hypnosis over the control conditions across the six studies. However, the authors also concluded that this finding should be viewed as preliminary, given the relatively low sample sizes in the reviewed studies.

Finally the most recent higher quality review published since 2014 was a systematic review and meta-analysis of 85 controlled experimental trials (Thompson *et al*., 2019). This comprehensive study analyzed the effectiveness of hypnosis for reducing pain and identify factors that influence efficacy. Analgesic effects of hypnosis were found for all pain outcomes, with optimal pain relief obtained in high and medium suggestibles under direct suggestions, who respectively demonstrated 42% and 29% clinically meaningful reductions in pain. Minimal benefits were found for low suggestibles. These findings suggest that hypnotic intervention can deliver meaningful pain relief for most people and

therefore may be an effective and safe alternative to pharmaceutical intervention.

Summary of this review.

This body of available research indicates that (1) while some of the published clinical trials to date are of high quality, the majority are rated as having low quality for making strong conclusions about the efficacy of hypnosis, mostly due to low sample sizes and lack of reporting of essential details, and (2) in both low and high quality studies, hypnosis treatment is often, but now always, found to be effective for reducing both procedural/acute and chronic pain intensity. Hypnosis treatment also often has additional benefits on other pain-related outcomes, such as anxiety. Hypnosis is also associated with very few and very minor adverse events, when such events were monitored. While more high quality studies are needed to confirm the beneficial effects of hypnosis in a number of pain populations, the findings are consistent enough to conclude that hypnosis should be offered as a potentially effective treatment for procedural and chronic pain.

3.8 Hypnosis in Anaesthesiology

The documented use of hypnosis as an adjunct to surgical therapy dates back to around 1830 when Jules Cloquet (mastectomy) and John Elliotson (numerous operations) performed major surgical procedures with hypnosis as a sole anesthetic agent. Remarkable was the work of James Esdaile (1808-1859), scottish surgeon, a pupil of Elliotson, who, when the most excellent surgeons in Europe were skeptical, traveled to India to improve his knowledge by learning from some castes that were familiar with the procedure. Esdaile performed thousands of small operations and three hundred major surgeries in India. He then obtained from the British Medical Association to open a mesmeric hospital in Calcutta, paving the way for the spread of hypnosis in English hospitals (Wobst, 2007). With the discovery of ether and chloroform (1846-1847), hypnosis was progressively relegated to be an entertainment instead of clinical practice.

Mainstream medicine was slow to reintroduce this form of therapy after the widespread use of pharmacological anaesthesia. It was not until 1955 that the British Medical Association officially accepted to teach hypnosis at the school of medicine, and later, the American Medical Association joined, also condemning the recreational use of hypnosis (Simpkins & Simpkins, 2002).

To understand the efficacy of the combination of pharmacological anaesthesia with hypnosis it is sufficient to point out that, while at the end of the nineteenth century the mortality due to anaesthesia with ether and chloroform was one in four hundred anaesthesias in university hospitals, in 1906 Alice Magaw reported 14.000 consecutive anaesthesias without deaths at the Mayo Clinic. The way she had managed to get such a result was to use the hypnosis. Hypnosis had been taught to her by her father. She

induced with drugs and continued with hypnosis (thus reducing the overall dose of the administered drugs), and reopened the ether at the end, at the wound closure (Fredericks, 2001; Magaw, 1906).

The interest in clinical applications of hypnosis in anaesthesia has been fluctuating since the end of World War II. Clinically, hypnosis has been used sporadically in a wide variety of contexts. It has been studied as a complementary technique, rather than as an alternative to anaesthesia while pharmaceutical companies developed new drugs to reduce side effects and anaesthesia-related mortality rates.

Hypnosis though, nowadays, is gaining more and more interest in the field of Anaesthesia (Facco, 2016) **,** for**:**

a) significantly enhanced recovery after surgery

b) decreased cost/benefit ratio

c) reduced use of drugs

Among modern hypnosis applications, it is possible to distinguish the following:

Hypnosis and general anaesthesia

1. as an adjuvant technique in pre-, intra- and post-operative phases in patients undergoing general anaesthesia
2. as an adjuvant to pharmacological anaesthesia (local anaesthesia, sedation or both)
3. as anesthetic only, in minor surgery or invasive maneuvers, and selected patients

The available data support the efficacy of hypnosis, and a 2008 meta-analysis (Schnur *et al*., 2008) shows beyond any doubt positive effects on perioperative emotional distress, physiological parameters, duration of surgery, and outcome.

Hypnosis in intensive care

The intensive care patients form a heterogeneous population that will benefit from the effects of hypnosis in relation to the underlying pathological condition (Fredericks, 2001).

Hypnosis in emergency conditions

Interesting is the effect of hypnosis on patients suffering from burns, as it can prevent the progression of lesions from lower to upper level through suggestions of cold that can influence the reaction of the tissues to the stimulus. In general, if patients respond, there is less edema, less inflammation, and less fluid loss (Ewin, 1986).

Hypnosis in particular populations: children

In the Cochrane review published in 2015 (Manyande *et al*., 2015), all non-pharmacological interventions in anaesthesia were assessed. Only one study about hypnosis had the criteria to be included in the Cochrane review (Calipel *et al*., 2005). In a single trial of 50 children, fewer children were anxious in the hypnotherapy group compared with the midazolam premedication group, and, as a secondary outcome, fewer children demonstrated negative behavior postoperatively.

Hypnosis for anaesthetic procedures outside the operating room: NORA (Non-Operating Room Anaesthesia)

The analysis of 29 randomized controlled trials (RCTs) (Kendrick *et al*., 2016) shows that hypnosis reduces pain compared with standard care and attention control groups, and it is at least as effective as other behavioral and psychological therapies. If hypnosis is performed in multiple sessions before the procedure, it achieves the highest percentage of results and is the most effective technique in small surgical procedures. As underlined by Kendrick, beneficial effects with using merely one hypnosis session also suggest cost-effectiveness. Many previous studies evaluated the economical properties of hypnosis as an adjunct treatment for medical procedures and its favourable cost/effectiveness (Lang *et a*l., 2006; Lang & Rosen, 2002). Interesting are the studies conducted by Lang and colleagues that show the effectiveness of staff training in improving patient compliance with Resonance procedures (Lang *et al*., 2010) or how hypnosis has also been used to reduce the discomfort of interventional radiology procedures (Lang *et al*., 2000).

4. Hypnosis in Dentistry

4.1 Dental Pain

Within the area of dental pain the evidence for the effect of hypnosis is limited. This chapter will focus on the experimental studies of dental pain, clinical studies of the use of hypnosis during dental treatment ,and the use of hypnosis in chronic pain conditions.

Experimental studies.

A few randomized controlled experimental studies have been conducted using standardized dental pulp stimulation as pain stimuli with subjects serving as their own control. Hypnotic suggestions for anaesthesia of the right mandibular arch and posthypnotic suggestions for persisting analgesia increased the pain threshold significantly and as well as in the posthypnotic test (Facco *et al*. 2011). Subject´s use of self-hypnosis during the pulp stimulation of upper anterior tooth raised the pain threshold and pain was scored lower than without hypnotic intervention (Wolf *et al.,* 2016a). In a similar study the effect of hypnosis was compared with local anaesthesia (Wolf *et al,.* 2016b). Both hypnosis and local anaesthesia had effect on pain threshold and pain score, but local anaesthesia was superior to hypnosis.

In an experimental setting it was tested if patients with painful temporomandibular disorders were able to reduce pain stimuli with hypnosis and if this was related to changes in brain activation (Abrahamsen *et al.,* 2010). Nine-teen patients participated and served as their own control. Identical repetitive pin-prick pain stimuli were delivered on the skin over the mental nerve during fMRI scan in three randomized conditions: control, hypnotic analgesia, and hypnotic hyperalgesia. Pain and unpleasantness were reduced significantly during hypnotic analgesia compared to the control condition and significant decreases in the evoked brain activity of right posterior insula and BA21, as well as left BA40 were demonstrated.

4.2 Dental surgery: clinical cases and studies

A single case report of an implant placement of an upper left first molar demonstrated that hypnosis was effective for pain during dental surgery without anaesthesia (Montenegro *et al*., 2017).

In a case-control study twenty-four patients served as their own control (Abdeshahi *et al.,* 2013). Each subject had a third molar removed in one side during hypnosis and the opposite side with the use of local anaesthetic. In hypnosis patients (8.3 %) reported less pain compared to after local anaesthetics (33.3 %). The postoperative pain intensity at five- and twelve hours also exhibited significant differences. The need of postoperatively analgesic was less after hypnosis (41.7 %) compared to local anaesthetics (91.7 %). In a prospective comparative clinical study of patients undergoing oral and maxillofacial treatment the effectiveness of clinical hypnosis and its long-term effect was evaluated (Eitner *et al*. 2006). Forty-five highly anxious and non-anxious subjects participated. Anxiety was the main focus of this trial, however some objective measures related to pain were also evaluated. During and after hypnosis a significant reduction of systolic blood pressure, respiration rate and significant positive changes of the EEG were found.

Audio recordings with hypnosis can be effective to help patients overcome pain during surgery. A prospective comparative clinical study similar to the above study with main focus on anxiety also revealed effects on objective measures related to pain. An audio pillow with recorded hypnotherapy instructions or relaxation music was offered to eighty-two dental-implant surgery patients. During surgery, the average diastolic blood pressure and heart rate decreased in the hypnosis group and increased in the control group (Eitner *et al.* , 2011). In an older study of sixty-nine patients undergoing dental surgery the hypnosis group listened for a week before surgery to recordings with hypnosis (Enqvist & Fischer, 1997). Postoperative consumption of analgesics was significantly reduced in the experimental group compared to the control. Another randomized controlled study evaluated the use of hypnosis as an adjunct to a standard dose of intravenous sedation in patients having 3rd molar removal in an outpatient setting (Mackey 2009). One hundred patients participated and were randomly assigned to listen in

headphones to either hypnosis or music alone. Intraoperative propofol administration, patient´s postoperative pain ratings, and postoperative consumption of analgesics were all significantly reduced in the hypnosis group compared to the control group.

Dentin Hypersensitivity.

This study was conducted in clinical practices and compared the efficacy of two conventional treatments for dentin hypersensitivity: desensitizer, fluoridation, with hypnotherapy (Eitner *et al*., 2010). A total of one hundred and two subjects including one hundred and eighty-six teeth were analyzed. There were no significant differences in success rates between the three groups. However, for both desensitizer and hypnotherapy treatments, onset of effect was very rapid and hypnotherapy effects had the longest duration.

4.3 Children and pain during administration of local anaesthesia

A few randomized controlled studies have examined the effect of hypnosis or control, when children were given local anaesthesia before dental treatment. A study included thirty children in the age five to twelve years (Huet *at al*., 2011). In the hypnosis group both the pain score and the objective pain score (mOPS) was significantly lower than in the control group. Significantly more children in the hypnosis group had no or mild pain. In another study of forty children in the age five to nine years compared heart rate variability (HRV) before and during the injection (Ramírez-Carrasco *et al*., 2017). There was an increase in HRV, but significantly less in the hypnosis group compared to the control group.

4.4 Chronic orofacial pain

Hypnosis was found to be effective in relieving the pain in twenty -three out of twenty-eight patients with temporomandibular disorders (TMD), but this study had no control group (Simon & Lewis, 2000). In a study of forty patients with myofascial pain, patients were randomized to one of three groups: 1: hypnosis 2: conventional treatment, and 3. minimal treatment. Both conventional and hypnosis were more effective than minimal treatment, but hypnosis was most effective in relieving the muscle pain (Winocour *et al.,* 2002). In a controlled study of forty-one patients suffering from persistent, idiopathic facial pain a condition which usually is difficult to treat patients were randomized to hypnosis treatment or relaxation. In the hypnosis group the daily pain and consumption of weak analgesics were reduced effectively compared to the control group, especially in the highly hypnotizable (Abrahamsen *et al.* ,

2008). In similar study of forty TMD patients hypnosis was significantly effective in reducing daily pain compared to the control group (Abrahamsen *et al*., 2009)**.**

5. Hypnosis for Labour Pain

5.1 Labour Pain

For many women, childbirth is a period of extreme pain. Medical techniques exist which would ameliorate the suffering, but they can be detrimental to the baby (*e.g*., from the use of opioids) or may prolong the labour (a possible outcome of using an epidural). With evidence that difficult labours can lead to a higher incidence of postnatal depression or posttraumatic stress disorder, there is every reason to find other ways of making the birth process easier for the mother.

Hypnosis has become relatively well known as an adjunct to childbirth, with the expectation that it will make the whole process easier. It is often towards the end of the second semester that the mother-to-be starts a series of sessions, being taught the use of hypnosis. Generally, the hypnosis training is combined with attendance at the more common antenatal procedures. Although the primary purpose of the hypnosis is undoubtedly to assist with pain management, there are claims that its use shortens the duration of labour, particularly the first stage (the period of uterine contractions). Since Stage 1 is generally experienced as the most painful period, making it shorter would, if nothing more, reduce the duration of the pain. Other benefits of hypnosis, not directly linked to pain, have also been claimed. These include better Apgar scores (a measure of the health of the neonate) and a reduced incidence of depression in the mother.

5.2 Clinical Evidence.

To begin this brief overview, a good place to start is with research conducted around three decades ago. Harmon *et al.* (1990) used a randomised control study, whereas many others have used self-selection for the hypnosis group, or had no formal controls at all. These researchers also used a measure of hypnotic susceptibility, for both the hypnosis and the control groups. This is valuable in two ways. First, if hypnosis is effective in this role, then it might reasonably be anticipated that its impact would be greater on those of higher susceptibility. Second, in any study using relatively small numbers, if there is no measure of susceptibility used, then a failure to show a positive effect of hypnosis can be dismissed as possibly due to the participants having low hypnotizability. A final, distinctive feature of this study was that it gave women practice in reducing pain. During the series of hypnosis or control (relaxation) training sessions,

women were able to take part in an ischemic pain test, which measured the time for which they could tolerate the pain produced by wearing an inflated blood pressure cuff. From session to session the participants became more tolerant of the pain but, predictably, the tolerance increase was greater in the hypnosis group and among those of higher hypnotic susceptibility. This effect was later replicated in the birth context, with hypnotic 'Highs' in the hypnosis group reporting (with statistical significance) the least discomfort. These subjective measures were reflected in a whole series of significant effects, showing that the hypnosis group had shorter Stage 1 labours, required less pain-relieving medication and enjoyed more spontaneous deliveries.

The authors of the above study acknowledged that their training program was unlikely to be widely replicated, because of the time required. The participants had three hypnosis training sessions and were given recordings of the suggestions to take home and listen to on a daily basis. Additionally, and doubtless importantly, they were able to practice a pain control technique and observe for themselves that they had learned to do well. Normal health service maternity units would be unlikely to support this level of intervention. Nevertheless, the results do illustrate what can be achieved with hypnosis when the circumstances permit.

Coming far more up to date, a helpful review paper (Landolt & Milling, 2011) supports the earlier findings. The authors selected only those papers (13) that included some form of control group, against which hypnotic interventions could be judged. Their overall conclusions were that, "Hetero-hypnosis and self-hypnosis were consistently shown to be more effective than standard medical care, supportive counselling, or childbirth education classes, in reducing pain." In addition, support was given to the other common claims concerning the positive impact of hypnosis on the general wellbeing of the mother and neonate.

Many factors will influence the level of impact that hypnosis can produce. Among these is the relatively fixed factor of the mother's hypnotic susceptibility, but others will be the type and extent of the hypnotic training, and whether the mother is taught to use self-hypnosis, or expects to be guided by someone such as her partner. It is likely to be beneficial for the midwives involved to have at least some familiarity with hypnotic procedures.

6. Hypnosis for Neurorehabilitation

6.1 Introduction. The restoration of functional physical and psychological capacities of individuals who have suffered functional losses due to traumatic injuries or illnesses is the essence of rehabilitation. The rehabilitation process is a bio-psychosocial effort and a holistic health model through its interdisciplinary nature. Rehabilitation also involves learning to adapt to disability and obtaining an accommodation for the deficits (De Benedittis, 2018).

Pain is frequent in the setting of neurorehabilitation. Most patients undergoing rehabilitation for neurological diseases complain of pain. It is increasingly recognized that treating pain is crucial for effective care within neurological rehabilitation (Castelnuovo *et al*., 2016).

6.2 Clinical Evidence.

An extensive and recent systematic review (Castelnuovo *et al.*, 2016) has shown that psychological interventions and psychotherapies play an important role in an integrated, multidisciplinary approach for patients undergoing neurological rehabilitation for pain because of their efficacy and the general absence of side effects. The different interventions can be specifically selected depending on the disease being treated.

Neurorehabilitation represents a fascinating but almost unexplored area of application of hypnosis (De Benedittis, 2018). The specific literature is very limited, but encouraging. One of the main contributions of hypnosis to rehabilitation is its potential to facilitate change and accelerate learning (Appel, 2016; Appel, 2003). Hypnosis is able to enhance the functional recovery of the patient, improving compliance with long and often demanding physiatric treatments and significantly reducing the timing of treatment (De Benedittis, 2018).

The hypnotic techniques are aimed at implementing the motivations of spinal/brain injury/disease patients, often tried by the physical disability and the frustrating sense of functional impotence, to counteract the associated psychopathological correlates (anxiety, depression), but also and above all to optimize functional recovery, where it is possible, taking advantage of the principle of the "supra-maximal response" by Emile Couè (2006), or the ability to elicit sensorimotor performances higher than those normally obtainable in the waking state. Finally and most importantly, hypnosis can optimize the therapeutic response to physiatric rehabilitation by relieving pain and reducing spasticity, where present.

Hypnosis is increasingly used in the rehabilitation of patients with neurological problems. Neurological patients with a loss of motor skills, often associated with pain which can worsen significantly their functional inability, achieve successful rehabilitation through sensorimotor imagery during hypnosis. The underlying mechanisms of "how" and "where" hypnosis acts at the brain level, however, are largely unknown. To identify the brain areas involved in motor imagery under hypnosis, an fMRI study was conducted in which healthy subjects were asked to both imagine and perform repetitive finger movements during a hypnotic trance (Müller *et al*., 2012). Increases in the fMRI signal were observed to be exclusively related to hypnosis in the left superior frontal cortex, in the left anterior

cingulate gyrus and in the left thalamus. While the superior frontal cortex and the anterior cingulate were active more in relation to the performance of the movement than to the imaginary, the thalamus was activated only during the motor imagery. These areas represent the central nodes of the salience network that connects the primary and upper motor areas. Therefore, these data confirm the idea that hypnosis improves sensorimotor imagination.

In a pilot clinical study of six post-stroke patients with motor deficits, Diamond *et al.* (2006) observed qualitative improvements in the motor function related to increase range of motion, greater grip strength and reduced painful spasticity of the paretic upper limb. Subjects consistently reported improved prospects, increased motivation and greater awareness, less pain and reduced effort to perform motor tasks with the paretic limb.

Another important rehabilitation area concerns memory. Working memory impairment is frequent in patients with brain injuries. Unfortunately, rehabilitation efforts for this impairment have so far produced little or no effect. A randomized controlled trial (Lindeløv *et al*., 2017) showed that working memory performance can be effectively restored by suggesting hypnotized patients to regain the pre-injury level of working memory functioning. Hypnotic suggestion can actually improve working memory after acquired brain injury. The speed and consistency with which this improvement occurred indicates that there may be a residual capacity for normal information processing in the damaged brain.

7. Hypnosis and Complementary & Integrative Medicine

7.1 The increasing role of integrative & complementary health care

Although recent advances in biology/medicine have greatly enhanced our understanding and treatment of diseases, a large segment of population still depends on so-called complementary alternative medicine (CAM) as the preferred form of health care. In industrialized countries, health-promoting cultural practices such as hypnosis, meditation, acupuncture, relaxation, are becoming increasingly popular as alternative or complementary techniques to western scientific medicine. Specifically, hypnotic therapy is now recommended for the treatment of several disorders and chronic conditions where modern pharmaceutical agents have proved inadequate. Many practitioners of evidence-based medicine view the increasing recognition of traditional health systems as a failure by modern medicine to satisfy the health-care needs of society particularly in terms of risk/cost benefits. This is particularly true in emerging countries con limited economic resources.

When describing these approaches, people often use “alternative” and “complementary” interchangeably, but the two terms refer to different concepts. If a non-mainstream practice is used *together with* conventional medicine, it’s considered “complementary”; if a non-mainstream

practice is used *in place of* conventional medicine, it's considered "alternative." (NCCIH, 2019). Most people who use non-mainstream approaches also use conventional health care.

Integrative health care often brings conventional and complementary approaches for which there is some high-quality scientific evidence of safety and effectiveness together in a coordinated way. It emphasizes a holistic, patient-focused approach to health care and wellness - often including mental, emotional, functional, spiritual, social, and community aspects - and treating the whole person rather than, for example, one organ system. It aims for well-coordinated care between different providers and institutions (NCCIH, 2019).

The use of integrative approaches to health and wellness has grown within care settings cross industrialized countries as well as in developing countries. According to a 2012 national survey in USA, more than 30 percent of adults and about 12 percent of children use integrative/complementary health care approaches that are not typically part of conventional medical care or that may have origins outside of usual Western practice (Clarke *et al*., 2015). Researchers are currently exploring the potential benefits of integrative health in a variety of situations, including pain management and programs to promote healthy behaviors.

The *National Center for Complementary and Integrative Health (NCCIH),* established in 1991, is a United States government agency which explores complementary and integrative medicine. Its stated mission is: "to define, through rigorous scientific investigation, the usefulness and safety of complementary and integrative medicine interventions and their roles in improving health and health care" (NCCIH, 2019).

In 2014 the *World Health Organization (WHO)* has introduced the new 2014-2023 TCM (Traditional and Complementary Medicine) Strategy with the key objectives: building the knowledge base, strengthening effectiveness, promoting universal health coverage, integrating T&CM services and self-health care into national health systems. Guidelines for Complementary and Alternative Medicine were approved on June 22, 2014 (World Health Organization, 2019).

Complementary and Integrative therapies can be loosely grouped into five categories (Hartmann & Zimberoff, 2011) :

1. Biologically based practices, such as herbal remedies, vitamins, other dietary supplements

2. Mind-body techniques, such as hypnotherapy, meditation, guided imagery, yoga are among the most popular mind and body practices used by adults.

3. Manipulative and body-based practices, such as massage, reflexology, chiropractic, Feldenkrais method, Pilates, Rolfing Structural Integration.

4. Energy therapies, such as magnetic field therapy, Reiki, healing touch, Qi Gong.

5. Ancient whole medical systems, such as traditional Chinese medicine, Ayurvedic medicine, acupuncture, homeopathy.

7.2 Advantages of Integrative Medicine vs Conventional Medicine

Since modern medicine has emerged in the last 200 years, on one hand it has brought to us the necessary research to deliver medicines that save lives, prevent outbreaks of contagious diseases and help us to tolerate pain. On the other hand, the price we've paid for that medical model is to give over our inner wisdom and innate healing abilities to people and machines that can't or don't take into account the deeper meaning of our illnesses.

The traditional health system employed an outdated dichotomy: that all symptoms should be viewed as either real biologic disease or else psychosomatic . The corollary belief is that healing those symptoms of real biologic disease is a matter of applying the appropriate physical intervention (medication or surgery), while resolving the symptoms of psychosomatic origin is a matter for psychologists to deal with.

The integrative medicine paradigm discards the dichotomy as simplistic, and postulates interrelated combination of biological, psychological, social and spiritual factors lead to onset, maintenance, or exacerbation of illness. It implies a more holistic, systemic combination of approaches. Instead of regarding non-conventional healing modalities as an alternative to traditional practices, or adding them as a supplement or complement to traditional treatment, this model emphasizes an integration of traditional and non-conventional modalities based on empirical evidence of their efficacy (Hartmann & Zimberoff, 2011).

7.3 Hypnosis and Mind/Body Healing as an adjunct to Conventional Therapies

Within this paradigm shift, hypnosis is invaluable in the dynamic process of mind/ body healing. It is used increasingly for healthcare applications in hospitals, clinics, and psychotherapy practice. A substantial body of research demonstrates the efficacy of hypnosis as part of the integrative treatment of many conditions that traditional medicine has found difficult to treat (*e.g.*, Pinnell & Covino, 2000; Elkins, Jensen, & Patterson, 2007).

Acceptance of hypnosis and hypnotherapy by conventional medicine was officially acknowledged in 1958, the year that the American Medical Association and Canadian Medical Association endorsed hypnosis as a valid medical therapy. However, acceptance by medical practitioners has often been slow.

But in recent years there has been mounting evidence for the efficacy of adding hypnosis and hypnotherapy to conventional treatment of many medical conditions.

The American Society of Clinical Hypnosis suggests the following uses of hypnosis in medicine (Hartmann & Zimberoff, 2011):

a) Gastrointestinal Disorders (Ulcers, Irritable Bowel Syndrome , Crohn's Disease);

b) Dermatologic Disorders (Eczema, Herpes, Neurodermatitis, Itching , Psoriasis, Warts);

c) Surgery/Anesthesiology (in unusual circumstances, hypnosis has been used as the sole anesthetic for surgery, generally in highly hypnotizable subjects and in selected cases);

d) Acute and Chronic Pain. "Hypnosis has earned a secure place in the modern armamentarium against pain.";

e) Burns: Hypnosis is not only effective for the pain, but when hypnotic anaesthesia and feelings of coolness are created in the first few hours after a significant burn, it appears that it also reduces inflammation and promotes healing.;

f) Nausea and Vomiting associated with chemotherapy and pregnancy;

g) Childbirth: approximately two thirds of women have been found capable of using hypnosis as the sole analgesic for labor;

h) Hemophilia: Hemophilia patients can often be taught to use self-hypnosis to control vascular flow and keep from requiring a blood transfusion;

i) Allergies, asthma;

j) High blood pressure (hypertension);

Another way to organize the uses of hypnosis and hypnotherapy in the medical setting, rather than by symptom, is by function. For example these are valuable uses (Hartmann & Zimberoff, 2011):

a) Improving patient compliance with medical treatment protocols.

b) Improving motivation for self-care.

c) Reducing anxiety and depression about being ill.

d) Facilitating visualization to promote health improvement.

e) Providing a sense of mastery and control over the disease when the patient may feel an overwhelming dread about the future and a depressing sense of their life spinning out of control. Hypnosis, or self-hypnosis, is a simple, portable, self-contained therapeutic technique by which they themselves can exert some control over their illness.

f) Ameliorating side effects of medications, such as nausea, vomiting, and fatigue.

g) Facilitating palliative and end-of-life care.

In conclusion, hypnosis has earned a secure place in the modern armamentarium of integrative medicine .The future looks bright and an important aspect of that future belongs to a renewed collaboration between the fields of allopathic medicine and hypnosis/hypnotherapy.

8. Training and Educational Profile of Hypnosis for Pain Relief

Access to pain and symptom control is part of the fundamental right to health (Lohman *et al*., 2010). In countries where pain medicine does not yet exist as a specialty and where prevention and relief of pain from trauma or burns or surgery are inadequate, clinicians trained in palliative care can fill this therapeutic void. On the other hand, in the current emerging healthcare system, the growing consensus is that evidence-based practice offers the most responsible course of action for the health professionals and by far, pain relief is the most document-based clinical application of hypnosis. Pain is a multidimensional sensory experience, mainly based upon a three-factorial model: sensory-discriminative, motivational-affective and cognitive. Hypnosis seems to be effective in all the three dimensions (De Benedittis, 2003). Hypnotic suggestions lower both the unpleasantness (*i.e*., affective components via ACC) and the perceived intensity (*i.e*., sensory component via primary somatosensory cortex) of the noxious stimuli. (Price & Bushnell, 2004).

Like any other approach, hypnosis will work if the clinicians learn and use the techniques correctly and be supervised adequately. Here are some training and educational guidelines and a training curriculum proposed to utilize as an educational profile of “Hypnosis for Pain Relief”.

There is no doubt that the clinicians intended to utilize hypnotic techniques for any purposes should first be familiar with the scientific definition of hypnosis, its document-based mechanisms of action, the concept of hypnotizability and its significance in patient selection and outcome expectations, the code of ethics, and hypnosis in forensic medicine. They then should learn general hypnotic induction, deepening, and re-alerting techniques. Since it is assumed that the practitioners are familiar with all the basic prerequisites of hypnosis and hypnotherapeutic interventions, the above-mentioned titles are not included in the following training course.

The main topics addressed in the training and educational curriculum are :

1. Neurobiological mechanisms underlying hypnosis and hypnotic pain control;
2. Physiological and psychological differences in approach to and treatment of acute and chronic pain;
3. Hypnotherapeutic techniques for pain relief including but not limited to direct suggestion, time distortion, mind control chambers, displacement, sensory adaptation, confusion, attention switching and selective attention, clenched fist, color vapor, sleep

bag, icy hat, spatial balance, paradoxical intention, mindfulness, glove anaesthesia, using appropriate metaphors, storytelling (especially for children), utilization, etc.;

4. Specific applications of hypnosis for pain relief like SSRD (Somatic Symptom and Related Disorders), fibromyalgia, childbirth, dentistry, neuropathic pain, recurrent headaches (*e.g.,* tension-type headache, migraine), etc. in their own scope of practice via using the learned techniques.

Curriculum of a 48-hour training course "Hypnosis for Pain Relief"

(Basic hypnosis and hypnotherapy training curriculum is not included)

Subject	Overall goal	Specific Behavioral Objectives (SBO)	Learning domain	Time required
Neurobiology of Pain	Understanding the neural correlates of pain	Explain the Gate Control Theory and other mechanisms underlying pain perception and control	Knowledge Attitude	180 min.

Psychobiology of Pain	Learning psychological determinants of pain	Explain the role of psychological factors (anxiety, depression) in the pain experience	Knowledge Attitude	180 min.
Neurobiology of Hypnotic Pain Control	Learning neurophysiology of hypnotic pain control	Explain the brain mechanisms underlying hypnotic pain control	Knowledge Attitude	180 min.
Acute and Chronic Pain	Understanding differences of acute and chronic pain	Explain the differences in approach to and management of acute and chronic pain	Knowledge Attitude	180 min.
Hypnotherapy for Acute Pain 01	Learning hypnotherapeutic techniques in controlling acute pain	Implement and practice the hypnotherapeutic techniques of Direct Suggestion, Time Distortion, and Mind Control Chambers	Knowledge Attitude Skill	180 min.
Hypnotherapy for Acute Pain 02	Learning hypnotherapeutic techniques in controlling acute pain	Implement and practice the hypnotherapeutic techniques of Paradoxical Intention, Mindfulness, Temperature Metaphor, and Glove Anaesthesia	Knowledge Attitude Skill	180 min.
Chronic Pain	Learning therapeutic approaches to controlling chronic pain	Explain the client-oriented approach towards chronic pain with direct and indirect hypnotherapeutic techniques	Knowledge Attitude	180 min.
Hypnotherapy for Chronic Pain	Learning general hypnotherapeutic approach to chronic pain patients	Implement indirect, ericksonian hypnotherapeutic techniques like Time Regression, Time Progression, Displacement, Sensory Adaptation, & Confusion	Knowledge Attitude Skill	180 min.
Hypnotherapy for Headaches and Orofacial Pain	Learning therapeutic approach to primary headache and orofacial pain	Explain therapeutic approaches to and differences of primary headaches including tension-type headache, migraine and TMJ syndrome	Knowledge Attitude Skill	180 min
Hypnotherapy for Back Pain	Learning therapeutic approach to cervical and low back pain	Explain therapeutic approaches to and differences of cervical, low back pain and failed-back syndrome	Knowledge Attitude Skill	180 min.
Hypnotherapy for Fibromyalgia	Learning hypnotherapeutic techniques in controlling fibromyalgia	Implement and practice the hypnotherapeutic techniques of Clenched Fist, Color Vapor, Sleep Bag, Icy Hat, & Spatial Balance	Knowledge Attitude Skill	180 min.
Hypnotherapy for Neuropathic Pain	Learning hypnotherapeutic techniques in controlling neuropathic pain	Implement and practice the hypnotherapeutic techniques for painful neuropathies, herpes zoster,spinal pain, thalamic syndrome	Knowledge Attitude Skill	180 min.
Hypnotherapy for Cancer Pain	Learning palliative hypnotherapeutic techniques in controlling cancer pain	Implement and practice the hypnotherapeutic techniques for cancer pain, palliative care, chemotherapy-induced pain	Knowledge Attitude Skill	180 min.
Hypnotherapy for Labour Pain	Learning hypnotherapeutic techniques in controlling labour pain	Implement and practice the hypnotherapeutic techniques for labour pain	Knowledge Attitude Skill	180 min.
Hypnotherapy for Dental Pain	Learning hypnotherapeutic techniques in controlling dental pain	Implement and practice the hypnotherapeutic techniques for dental pain, bruxism, masticatory pain	Knowledge Attitude Skill	180 min.
Hypnotherapy for Neurorehabilitation	Learning hypnotherapeutic approach to neurorehabilitation	Implement and practice the hypnotherapeutic techniques for sensory-motor rehabilitation (including pain)	Knowledge Attitude Skill	90 min.
Hypnotherapy for Procedural Pain	Learning hypnotherapeutic techniques in controlling procedural pain	Implement and practice the hypnotherapeutic techniques for procedural pain (*e.g.*, venipuncture)	Knowledge Attitude Skill	90 min.

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