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NEUROPHYSIOLOGIC AND NEUROPSYCHOLOGICAL MECHANISMS OF HYPNOSIS AND MEDITATION FOR THE REHABILITATION OF CONSCIOUSNESS AND AWARENESS

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Summary. This paper considers possible ways of further studies of neurophysiological mechanisms of clinical hypnosis, mechanisms and meditations states in order to improve the psycho-physiological rehabilitation of consciousness and awareness in disabled and elderly patients with chronic illnesses in case of practical implementation.

Clinical hypnosis and meditation contribute to the psychological rehabilitation of consciousness and awareness and improve cognition due to the increase of the work of sensory system, emotions and experience.

Key words: hypnosis, meditation, attention, rehabilitation, consciousness

This paper is a proposal to examine the studies of the neurophysiological mechanisms of clinical hypnosis, mindfulness and meditative states to improve the psychological rehabilitation of consciousness and awareness in disable and elderly patients with chronic illnesses.

This state is frequently achieved through mindfulness and meditative states, which are practices that cultivate non judgmental awareness of the present moment.

Mindfulness (from Pali: sati, and Sanskrit: smṛti; also translated as awareness) is a spiritual or psychological faculty (indriya) that is considered to be of great importance in the path to enlightenment according to Buddha's teaching. It is one of the seven factors of enlightenment. «Correct» or «right» mindfulness is the seventh element of the noble eightfold path. Mindfulness meditation can also be traced back to the earlier Upanishads, part of Hindu scripture.

In 2011 NIH's National Center for Complementary and Alternative Medicine (NCCAM) released finding of a study where in magnetic resonance images of the brains of 16 participants, 2 weeks before and after mindfulness meditation practitioners, joined the meditation program were taken by researchers from Massachusetts General Hospital, Bender Institute of Neuroimaging in Germany and the University of Massachusetts Medical School. It concluded that "these findings may represent an underlying brain mechanism associated with mindfulness-based improvements in mental health" (Research Spotlight: Mindfulness Meditation Is Associated With Structural Changes in the Brain. NCCAM. January 30, 2011. http://nccam.nih.gov/research/results/spotlight/012311.htm).

Consciousness is extremely elusive from the empirical point of view.

Scientists of consciousness usually proceed as if such a definition were already available: in clinical hypnosis, mindfulness and meditative states, we assume that consciousness is an object and exists in an observer-independent way.

A primary point of contention between the major theories of consciousness is whether attention is generally necessary for consciousness.

The neurogenetics of consciousness has three main components:

1) neurophysiologic neurogenesis, brain morphogenesis and neuron maturation, which are all under the guidance of genes.

2) the neuron based continuum of consciousness, that involves neurologic and epigenetic factors, microtubules and neuroplasticity.

3) the end of life processes that involves neurodegeneration.

This suggests that it is important to go beyond the mask of brain anatomy to explore the fine spatio-temporal patterns and underlying the mechanisms of consciousness.

Life, mind and consciousness are the complex multi-leveled patterns that emerged from and then organize matter/energy, electric and magnetic-field interactions in living biochemical organisms. Nearly all other neuroscientists are concentrating on the electric signals that travel through and among neurons and see quantum physics as an answer to the problem of explaining consciousness.

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The human brain consists of about one billion neurons, and each neuron has synapses of the order of 1000. Thus, capability of the human brain is 1016 operations per seconds.

We know that each neuron in the human brain consists of a large number of microtubules. Hameroff (2007) proposed that consciousness involves sequences of quantum computation in microtubules inside brain neurons.

Both fMRI and electrophysiology suggest that attention and consciousness share neural correlates.

«Hypnosis is a state of inner absorption, concentration and focused attention. It is like using a magnifying glass to focus the rays of the sun and make them more powerful. Similarly, when our minds are concentrated and focused, we are able to use our minds more powerfully. Because hypnosis allows people to use more of their potential learning self-hypnosis is the ultimate act of self-control» (ASCH American Society of Clinical Hypnosis- definition of hypnosis).

All professional therapists in Palliative Care have in common the goal of helping their patients become more knowledgeable, sensible, but self-directing.

The successful therapist helps his patients acquire knowledge and skills needed to become psychologically good and serene at the end of life.

The therapist offers to the patient information, skills and self-esteem. Recent researches support the view that hypnotic communication and suggestions, changes aspects of the persons' physiological and neurological functions effectively.

They teach their patients, the therapists are morally and ethically obligated, to provide them with available and helpful information, and respect their dignity.

We would like to underline the beneficial relationships created by clinical hypnosis and mindfulness, with patients.

Whatever therapists believe about their patients, and whatever the methods, they use to help them. All therapists probably began their efforts thinking that they would make significant contributions to the lives of their patients.

There is an ever reoccurring question in the medical practice: do the positive attitudes and communication of the medical staff make any difference? The ability to use language makes our species unique. This ability made the emergence of culture possible, which still seems to be a human-specific attribute, and which we like to think of as something that elevates us above other animals. Speech expanded since has followed us on our evolutionary journey; since so long that substantial physiological apparatus is built around it, like the structures in the central nervous system responsible for communication or the vocal apparatus [2, 3].

Therapists are the primary instruments through which patients become knowledgeable about their specific problems. Hypnosis is an efficient technique, which increases a positive and empathic relationship with the patients.

MATERIALS AND METHODS

Recent research supports the view that hypnotic communication and suggestions change aspects of the persons' physiological and neurological functions effectively.

Practitioners use clinical hypnosis in three main ways.

First, they encourage the use of imagination. Mental imagery in hypnosis is very powerful, especially in a focused state of attention. The mind seems capable of using imagery, even if it is only symbolic, to assist us in bringing about the things we are imagining. For example, a patient with chronic pain be asked to imagine what his or her distressed pain looks like. If she imagines it as very red and inflamed, the patient may be encouraged in hypnosis (and in self-hypnosis) to imagine this perception changing to a healthy one.

A second basic hypnotic method is to present ideas or suggestions to the patient. In a state of concentrated attention, ideas and suggestions that are compatible with what the patient wants to seem to have a more powerful impact on the mind.

Finally, hypnosis may be used for unconscious exploration, to understand better underlying motivations or identify whether past events or experiences are associated with causing a problem. Hypnosis avoids the critical censor of the rational and conscious mind, which often defeats what we know to be in our best interests. The effectiveness of hypnosis appears to lie in the way in which it bypasses the judgmental observation and interference of the conscious mind allowing the client's intentions for change to take effect.

Some individuals seem to have higher native hypnotic talent and capacity that may allow them to benefit more readily from hypnosis. It is important to keep in mind that hypnosis is like any other therapeutic modality: it is of major benefit to some patients with some problems, and it is helpful with many other patients, but individual responses vary.

Many therapists assert that hypnosis is an 'altered state of consciousness' (ASC), like the meditative states, that is qualitatively different from normal waking consciousness. Whether hypnosis produces an altered state of consciousness has been a key debate in the academic study of hypnosis and has come to be known as the 'altered state debate'.

The consciousness approach trough clinical hypnosis and meditative states can be used not only in a verbal channel, but also in patients with cognitive disorder's trough feelings, positive emotions and perceiving sensations.

The realm of emotional responses constitutes the personal sphere wherein one interacts with the

environment, past, thoughts and one's and other's persons' immediate and ultimate values.

Components of emotional events include liminal-subliminal perception of real, or imaging of imaginary, objects, representations of those objects, reflexive motor responses and a range of unattended, higher and higher-order emotional experiences.

The problem faced by both sciences and psychology is dualism: the apparent duality between subjective and objective or consciousness and matter.

The solution is in clinical hypnosis and mindfulness: it is not to side either with brain, but somehow whether through neuroscience, psychology, philosophy or spiritual practice, to attain non-duality.

Consciousness study has been the focus of an extensive practice in transcendent traditions since ancient times.

Many spiritual meditations have provided detailed revelations of different states of consciousness.

It is enlightening to study clinical hypnosis, mindfulness and the modified states of consciousness in different traditions, to achieve the primary objective of self-realization and higher consciousness.

We can reduce pain, suffering and anxiety, and improve the rehabilitation of consciousness and awareness with clinical hypnosis, mindfulness and meditative states [2, 3, 5, 7].

We introduce you the project of our study to improve not only pain and anxiety relief, but improve the consciousness expansion (self-esteem and Higher consciousness in cancer and disabled patients). We promote this study that could be a multicentric study.

We have organized a group of patients with physical chronic pain and suffering, evolving in psycho somatoform disorders, utilizing the group therapy with direct and indirect clinical hypnosis, mindfulness and meditation, by metaphors and relaxing musical video.

This methodology to teach hypnosis, is conducted at University of Verona, Department of Anesthesiology, Intensive Care, and Pain Therapy, Hospital GB. Rossi, Verona, Italy, to a pain education group. A series of workshops are conducted on chronic pain assessment and management on various themes such as hypnotherapy, fibromyalgia, neuropathic pain, cancer pain, cognitive behavior therapy, chronic pain, and somatoform pain disorders.

The hypnotherapy group is a psychodynamic group therapy, where the people context and group process is explicitly utilized with clinical hypnosis as a mechanism of change by developing the manifestations of conscious energy, exploring and examining interpersonal relationships within the group, to discover the benefits of consciousness expansion.

Consciousness expansion and the purpose of the group, is to help patients develop their self-awareness and self-esteem. The group is organized around the following themes and experiential exercises: clinical hypnosis, self-hypnosis, meditation, mindfulness. We have organized 20 lessons (5 for month) of two hours each to educate to hypnosis and self-hypnosis, patients with chronic pain.

Participants are asked to complete four self-evaluations before the first lesson, and a follow–up after six months.

1. VAS the visual analogical scale for the evaluation of their pain
2. HAMA Hamilton anxiety scale
3. Hamilton Depression scale
4. Mc Gill pain questionnaire short form.

The participants are also asked to give in their details like name, age, sex.

The participants are assured about confidentiality and the use of these data only for an academic purpose. Informed consent was sought for this purpose.

The data will be computed, and the frequency data of pain, anxiety and depression, before and after six months' follow-up of different statements will be derived.

The group therapy will investigate the responses to patients' pain and suffering, and the suffering' rehabilitation of consciousness and awareness, with clinical hypnosis and meditative techniques.

The study researches results of evaluations of pain, anxiety and depression symptoms are carried out at six and 12 months. Long-term results will be studied later as the patients will be followed to 18 and 24 months.

The therapist introduces the participants to a variety of meditative exercises, in order to address different preferences. Similarly, within the research literature, meditation has been reported to be useful, to decrease pain and anxiety. Along the same lines, for some of the group participants, hypnosis and self-hypnosis, are connected with spirituality's visualizations.

Grounded-theory analysis of group sessions and individual interviews with the participants, demonstrate that the participants perceive the group to be helpful in developing their self-awareness and self-esteem, with decreased pain anxiety and suffering.

Generally, we know various «states of consciousness», in particular, wakefulness, dreams and sleep: the physiologists divide this last into «slow sleep» and «paradoxical sleep».

Methods of relaxation allow describing a «modified state», as a particular state of consciousness, to which we can give a special worth. This state comprises peace, serenity, absorption, even presence, ineffability.

We are studying the neurophysiological correlation of any brain changes during hypnosis and meditative states. The first outcomes of these studies in this emergent field, are promising for improving future researches.

Mystical experiences usually occur when the person is alone and in a relaxed mental state.

Many things can produce mystical experiences

such as dreams, words, phrases, music, art, sounds, smells, daydreaming, the play of light upon land and sea, nature, or near-death experience (NDE), meditative states, prayers, modified states of consciousness as clinical hypnosis.

DISCUSSION

All sentient beings suffer during their lives, in diverse manners, and often dramatically. As a result, many fields of consciousness and human activity are concerned, from their own points of view, with some aspects of suffering. These aspects may include the nature of suffering, its processes, its origin and causes, its meaning and significance, its related personal, social, and cultural behaviors, its remedies, management, and uses.

The word suffering is sometimes used in the narrow sense of physical pain, but additionally, it refers to mental or emotional pain, or more often yet to pain in the broad understanding, i.e. to any unpleasant feelings, emotions or sensations.

A brain training refers to practices that adapted the mind in a way that improves cognition, and performance in domains beyond those involved in the training [13]. We argue that brain training includes network training through repetitive practices, like clinical hypnosis, mindfulness and meditative states, which could change the mind state, in a better way that influences cognition. Researchers have found that, as in exercises, meditation results in physiological changes throughout the brain. There is evidence to suggest that people with aphasia (PWA) may have deficits in attention stemming from the inefficient allocation of resources. Given the lack of treatment options for improving attention in aphasia, Mindfulness Meditation, shown to increase attention in neurologically intact individuals, may prove effective in enlarging attention in PWA [10].

Ivnyev Borys and colleagues in 2008, studied features of EEG in older persons under cognitive loading.

During disorders associated with ageing of the central nervous system, they noted that internal braking, mobility and steadiness of nervous processes all suffered. These phenomena underlie reduction in mental activity and attention, a delay of psychomotor reactions, and infringement of memory. Objectively, reorganization of psychological functions can be determined as a change of neurophysiological parameters, which were registered with the EEG.

Background electric activity of the brains of older persons was characterized by the following parameters: a dominating alpha-rhythm, which had reduced capacity from occipital (48.91 + 30.98 standard units (su) (M + m) up to frontal (24.73 + 11.03 su) cortical areas with insignificant hemisphere asymmetry – from 2% up to 10%.

Capacity of beta1-rhythm in occipital areas was 25.7 + + 4.21 su, and in frontal - 18.8 + 3.86 su. Distribution of other EEG frequency components was the following: theta-rhythm – occipital areas 22.8 + 2.64 su, frontal areas 18.6 + 3.43 su; delta-rhythm: occipital points 17.3 + + 5.21 su, frontal – 20.0 + 3.76 su.

Depression of alpha-rhythm and substantial growth frequency components total EEG in a delta-rhythm in frontal points was observed in all examinees during cognitive loading [8].

This research has determined the topographical distribution of spectral capacity EEG in a control group at cognitive loading. It is necessary to note that for this functional condition, a decrease in alpha-rhythm EEG frequency components in all points increased capacity of a delta–rhythm. In frontal areas, Fp1 and Fp2 showed characteristic EEG-desynchronization. The maximal depression of an alpha-rhythm during cognitive loading was determined in Ò5, Ò6, *3, *4 leads. Changes in EEG were determined as suppression of alpha and beta-components of EEG in young people during performance of tasks involving intellectual loading [8].

Tai Chi Chuan (TCC) (Taoist Tai Chi is an exercise form of T'ai Chi Ch'uan practice of body exercises and meditation), can influence the intrinsic operational architecture of the human brain, in older adults [15]. To examine TCC-associated changes in rehabilitation, resting-state functional magnetic resonance images (fMRI) were acquired. The recent study, results from 40 older individuals including 22 experienced TCC practitioners (experts) and 18 demographically matched TCC-naïve healthy controls: their local functional homogeneities across the cortical mantle were compared. Compared to the controls, the TCC experts had significantly greater and more experience-dependent functional homogeneity in the right post-central gyrus (PosCG) and less functional homogeneity in the left anterior cingulate cortex (ACC) and the right dorsal lateral prefrontal cortex. Increased functional homogeneity in the PosCG was correlated with TCC experience [15].

Recently, in western countries, mindfulness has been adopted as an approach in contemporary psychology, for increasing awareness and responding skillfully to mental processes that contribute to emotional distress and maladaptive behavior.

Physical and psychological suffering experiences, that are bereft of spirituality, fail to connect with our true consciousness, awareness and the inner Self. The stress starts from within; the solution also lies within. The physical body functions with consciousness and awareness, which is the real Self. So it is important for us to gain knowledge of consciousness, awareness and the Self.

Trough the knowledge of the mystical experiences in different religions, we can have the key of the connection, between meditative states and clinical hypnosis, to help our patients, not only in suffering but also at the end of life, in Palliative Care [2, 3].

Interest in religion and spirituality, not only in clinical hypnosis, as a source of resilience in coping with serious physical illness, has seen a dramatic increase in recent years.

Health care professionals providing medical care to patients with serious illnesses, should consider the roles that they can play in meeting patients' psychological and spiritual needs.

Mindfulness practice is a specific form of psychotherapy and meditation. Jon Kabat-Zinn explained that the key to mindfulness meditation is an appreciation for the present moment and the cultivation of an intimate relationship with it through a continual attending to it with care and discernment. While mindfulness lies at the root of Hindu Spirituality, Buddhism (and yoga practice), Taoism, it is also found in the works of Emerson, Thoreau, and Whitman, and in Native American wisdom.

Clinical hypnosis has the same meaning to cure the rehabilitation of consciousness. «Hypnosis typically involves an introduction to the procedure during which the subject is told that suggestions for imaginative experiences will be presented. The hypnotic induction is an extended initial suggestion for using one's imagination, and may contain further elaborations of the introduction. A hypnotic procedure is used to encourage and evaluate responses to suggestions. During hypnosis one person (the subject) is guided by another (the hypnotist) to respond to suggestions for changes in subjective experience, alterations in perception, sensation, emotion, thought or behavior. Persons can also learn self-hypnosis, which is the act of administering hypnotic procedures on one's own». (American Psychological Association Division 30-definition of hypnosis).

Our clinical experience is with people who require constant care and have significant deficiencies with activities of daily living (cancer, disabled and elderly people in palliative care). These people include the elderly and younger adults with physical or mental disabilities, cancer and chronic pain. Many patients experience anxiety, distress, physical and psychological pain and suffering.

Hypnosis is recognised in medicine as an effective complementary therapy in pain and anxiety and to improve the rehabilitation of consciousness and awareness in disabilities and suffering [1, 2, 3, 11, 14].

The empirical support of hypnosis, mindfulness and meditative states, for chronic pain management and to improve the rehabilitation of consciousness and awareness in incurable diseases have flourished over the past decades in western countries. Clinical trials show that hypnosis is effective for reducing chronic pain, although outcomes vary between individuals. The findings from these clinical trials also show that hypnotic treatments have a number of positive effects beyond pain control. Neurophysiological studies reveal that hypnotic analgesia has clear effects on brain functioning, that differ as the role of the specific hypnotic suggestions made, providing further evidence for the particular effects of hypnosis [2, 3, 9, 12].

Mindfulness, as both a process and a practice, has received substantial research attention across a range of health conditions, including chronic pain. Previously proposed mechanisms underlying the potential health-related benefits of mindfulness and mindfulness-based interventions (MBIs) are based on a strong theoretical background [2, 3, 4].

Nondirective meditation techniques are practiced with a relaxed focus of attention that permits spontaneously occurring thoughts, images, sensations, memories, and emotions to emerge and pass freely, without any expectation that mind wandering should abate. These techniques are thought to facilitate mental processing of emotional experiences, thereby contributing to wellness and stress management: nondirective meditation, which permits mind wandering, involves more extensive activation of brain areas associated with episodic memories and full of feeling processing, then during concentrative practicing or regular rest [16].

CONCLUSIONS

Both Spinoza and Freud remarked that our behavior was determined only partially by our conscious would be but much more by something else. For Spinoza this something was our feeling, for Freud it was our unconscious. Often these distinct forces (conscious will versus feeling/unconscious) cause conflicts. Eastern spiritually holds that if we are no longer attached to our feeling, then we are free.

Clinical Hypnosis and mindfulness in therapy may be useful to:

- have a valid relaxation of body and mind
- analgesia, anesthesia, pain relief
- have good acute and chronic pain relief
- altered perception of pain
- reduce anxiety reduce panic
- facilitate brand new patterns of thoughts, feelings and consciousness
- reduce depression
- reduce sleep disturbances
- reduce pre-operative anxiety
- redefine a problem or situation
- bypass normal ego defenses
- suggest solutions, and unknown options
- provide a gateway between the conscious and the unconscious mind
- increase communication and empathy with patients
- facilitate retrieval of resource experiences
- improve mind-body relationship

- improve Psychology of Self, and self-realization
- facilitate Higher consciousness, at the end of life, in Palliative Care.

The phenomena of our consciousness are a combination of five components: sensory input, feeling (positive, negative and neutral), perception (i.e. classification of the input), conditioning (that can be seen as an output of our body mind system, that is the way we behave) and finally, awareness.

Meditation and self-hypnosis are powerful techniques to help all of us make more of our own potential, and to relate better to others in the workplace, at home, in the community, and in our lives generally.

We hope many new researchers will investigate if the cognitive benefits of clinical hypnosis and meditation are the results of increased plasticity in the brain, and increased plasticity in consciousness.

«The Self, who is to be realized by the purified mind and the illuminated consciousness, whose form is light, whose thoughts are true; who like the ether, remains pure and unattached; from whom proceed all works, all desires, all tastes; who pervades all, who is beyond the senses, and in whom there is fullness of joy forever - he is my very Self, dwelling within the lotus of my heart» (Chandogya Upanishad).

Relaxation, mindfulness and hypnotic trance attempt to accelerate a patient's ability to reorganize thinking, to have a unique experience and simultaneously to learn the responsibility of personal suffering relief, through the self-involvement.

As we look at consciousness closely, we see that it can be analyzed into many parts: neurophysiology of brain and neuropsychology of mind.

However, these parts function together in a pattern: they form a system. While the components of neurophysiologic consciousness can be studied in isolation, they exist as parts of a complex and unified system, the consciousness, and can be fully understood only when we see this function in the overall system.

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The authors declare that they have no competing interests.

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НЕЙРОФІЗІОЛОГІЧНІ І НЕЙРОПСИХОЛОГІЧНІ МЕХАНІЗМИ ГІПНОЗУ І МЕДИТАЦІЇ ДЛЯ ВІДНОВЛЕННЯ СВІДОМОСТІ І РІВНЯ НЕСПАННЯ

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Резюме. У цій статті розглядаються перспективи подальшого вивчення нейрофізіологічніх механізмів клінічного гіпнозу, уваги та медитації з метою поліпшення практичного застосування психологічного відновлення свідомості та рівня неспання у людей з обмеженими можливостями, похилого віку та пацієнтів з хронічними захворюваннями.

Клінічний гіпноз може сприяти психологічному відновленню свідомості та рівня неспання і відноситься до свідомого розуміння когнитивних функцій, роботи сенсорних систем, емоцій та досвіду.

Ключевые слова: гипноз, медитация, внимание, реабилитация, сознание

НЕЙРОФИЗИОЛОГИЧЕСКИЕ И НЕЙРОПСИХОЛОГИЧЕСКИЕ МЕХАНИЗМЫ ГИПНОЗА И МЕДИТАЦИИ ДЛЯ ВОССТАНОВЛЕНИЯ СОЗНАНИЯ И УРОВНЯ БОДРСТВОВАНИЯ

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Резюме. В данной статье рассматриваются направления дальнейшего изучения нейрофизиологических механизмов клинического гипноза, внимания и медитативных состояний, чтобы при практическом применении улучшить психологическое восстановление сознания и уровня бодрствования у инвалидов, пожилых лиц и пациентов с хроническими заболеваниями.

Клинический гипноз может помочь психологическому восстановлению сознания и уровня бодрствования и относится к сознательному спокойному пониманию когнитивных функций, работы сенсорных систем, эмоций и опыта.

Ключевые слова: гипноз, медитация, внимание, реабилитация, сознание