Acta Biologica Hungarica 53 (4), pp. 499–514 (2002)

HYPNOTIC SUSCEPTIBILITY AND ALTERATIONS IN SUBJECTIVE EXPERIENCES*

I. MÉSZÁROS, CS. SZABÓ** and RITA I. CSÁKÓ

Department of Psychology, University of Debrecen, Egyetem tér 1, Debrecen, Hungary

(Received: June 5, 2002; accepted: July 1, 2002)

Pavlov has described hypnosis as a partial sleep. A contemporary approach to this altered state of consciousness will be discussed. Under laboratory conditions subjective and behavioral data will be analyzed after hypnotic induction, shamanic trance and relaxation with listening to music. Role of different cortical regions will be shown after different hypnotic inductions as a function of hypnotic susceptibility. The importance of context will be underlined as an important factor in the possible alteration of consciousness.

Keywords: Hypnosis – altered state of consciousness – hypnotic induction procedure – subjective experiment – EEG

INTRODUCTION

It is well known that Pavlov's theory of hypnosis was based on physiological approach [41]. He explained this sleep-like state as a transitory process between waking and sleep, so Pavlov has described hypnosis as partial sleep. Unfortunately, he died in 1936, that is why he was not familiar with the first EEG study of hypnosis, published in the same year by Loomis et al. [34]. It was documented that hypnosis is not a sleep-like state. The recorded EEG was characterized with beta and alpha activity and the lack of slow waves which is an essential characteristic of the waking state (see Table 1).

At that time, it was difficult to prove whether hypnosis is a sleep-like state or not. In the middle of the 20th century several studies cleared out the neurophysiological mechanism of sleep: in 1949 of Moruzzi and Magoun [45] were the first who revealed the role of the brain stem Reticular Formation in the regulation of sleep mechanisms. In 1957 Dement and Kleitman [10] discovered the REM phase of sleep. In 1959 Jouvet, Michell and Courjon [29] described a specific phase, the "paradoxical sleep" characterized by fast (β) EEG activity. Several animal studies were con-

* Dedicated to Professor György Ádám on the occasion of his 80th birthday.

** Corresponding author

Table 1
Physiological data

EEG characteristics of hypnosis is identical to the waking (α and β) activity [Loomis, Harvey and Hobart, 1936]
The role of Ascendent Reticular Activating System in the regulation of sleep has been discovered [Moruzzi and Magoun, 1949]
The REM-phase of sleep has been described [Dement and Kleitman, 1957]
Paradoxical Sleep has been discovered [Jouvet, Michel and Courjon, 1959]
Characteristic alterations were found in the power of EEG, in evoked potentials, and in cerebral metabolism after inducing hypnosis [Crawford et al., 1996; De Benedettis, Carli, 1990; De Pascalis et al., 1989; Gruselier, 1988; Mészáros, 1984; Sabourin, 1980; Sabourin et al., 1990; etc.]
The development of Active-Alert hypnosis [Bányai, 1976]

ducted discovering important details of paradoxical sleep, however two neurologists Jouvet and Michell were the first to develop human experiments related to this topic.

Unfortunately, there is not any animal studies on hypnosis. The only scientist who described the famous "experimentum mirable Kircheri", that is the possibility of immobilization of hen, was Anastasius Kircher [cit. 40]. Now we know it exactly that this hypnotic-like state of animals is quite different from human hypnosis. It might be accepted as a startle reaction, or an arrest reaction, or the "tot stellung" in German, which indicates that the neurophysiological mechanism of this immobilization is entirely different from human hypnotic state. There is not any "animal-model" of hypnosis. Therefore it is not possible to examine hypnotic mechanisms in animal studies using deep electrodes or other modern methods. Perhaps, that is why it is so difficult to reveal the neurophysiological mechanisms of it in human hypnotic experiments and to discover the basis of this altered state of consciousness.

Currently there are two mainly different theoretical approaches to the hypnotic process. The first view defines *hypnosis* as a *state,* and the other consider it as a *hypnotic trait* (and deny the state theory) (see Table 2). According to Hilgard's [24] state theory hypnosis is an altered state of consciousness controversially Barber's [5] trait theory views it as a behavior corresponding to a specific task motivation.

Table 2
Different approaches to hypnosis

Hypnotic state	Hypnotic trait
Altered state of consciousness	Behavior according to task motivation
Characteristic changes in the Central Nervous System	No characteristic modifications in the function of the CNS
Hypnotic behavior: hallucinations, altered motor control	No typical changes in the behavior, or sensory system

The state theory is underlying the characteristic functional modifications of the central nervous system and as a result of these changes the perception and the motor control of the hypnotized person is altered according to the suggestion [24]. Consistent with the "skeptical" trait theory no functional alterations can be observed: the behavior of the subject is depending on the task motivation and/or expectancies [55]. However, the trait theory cannot fully explain the phenomena of hypnoanesthesia. Although T. X. Barber [5] and his followers have found an explanation for that, according to which pain is a subjective experience so it cannot be characterized by objective concomitants and as a result it is better to exclude it from scientific research. In accordance with current studies we emphasize that objective behavioral and neurophysiological alterations do occur in hypnosis and these alterations are essential to hypnosis. One of the most important feature of hypnosis is focused attention (see Table 3) that means the ignorance of most external stimuli and involves an introversive thinking-style as the subject focuses his/her attention to inner processes. Archaic involvement is also a well-known phenomenon as regression in thinking and in behavior frequently occurs.

Moreover transfer of motor control to the hypnotist is an especially important sign: the activity of the hypnotized person can be reduced by standard classical relaxation hypnosis (from outside it seems to be similar to sleeping) or augmented as a result of active alert hypnotic induction (showing activity resembling an ecstatic state) described by Bányai and Hilgard [1]. Alteration of reality control is also an important indicator of hypnotic modification: changes in the attitude toward the environment as a response to the incoming signals, or hallucinations can occur, depending on the type of suggestions which means that consistent changes in the perception of the hypnotized subject may arise.

It is widely known that the two hemispheres of the brain are working differently, so as a result the impacts of them are different as well: the left hemisphere is responsible for the cognitive, rational processes, while the right one is responsible for the holistic, emotional signal processing (see Table 4).

Table 3
Alternations characterizing hypnosis

1. Concentrated attention
Ignorance of some signals
Introversive thinking
2. Archaic involvement
Regression of thought
Regression of behavior
3. Transfer of motor control
Activity is augmented or reduced due to suggestion
Initiation is diminished
4. Alteration of reality-control
Change of attitude toward environmental signals
Possibility of hallucinations

Table 4
The role of the hemispheres

Left hemisphere activity	Right hemisphere activity
Cognitive, rational signal processing	Holistic, emotional signal processing
Accentuated activity of frontal lobe	Accentuated activity of parieto-temporal lobe
Characteristic for low susceptible subjects	Characteristic for high susceptible subjects
Diminished flexibility in declared hypnotic circumstances	Higher flexibility in declared hypnotic circumstances

There are three crucial kinds of phenomena in hypnosis: hypnotizability, the hypnotic context, and the alterations of the subjective experiences [61]. Hypnotizability is a capacity that varies from one individual to another [56], and these individual differences are critical factors in defining hypnosis [23]. According to state theories of hypnosis, hypnotic susceptibility is a remarkably stabile trait [25, 27], which was supported by several follow-up studies [44, 48, 59]. However, others have found that hypnotic susceptibility can be modified through special training methods [16–18], or by various contextual manipulations [61]. Contextual factors of hypnosis have important effects on hypnotic experience [2, 3, 4, 35, 52, 62] and they can be particularly important in the development of personal experiences. Contextual factors include definition of the situation as hypnosis [6, 35, 55] and the hypnotic communication style [3, 4, 15, 38, 57, 58, 63].

"The essence of response to hypnotic suggestions lies in the person's subjective experience" [32, p. 269]. Verbally reported subjective experiences are the main focus of interest in the study of hypnosis [62]. A number of investigations have aimed at revealing and understanding the essentiality of private experiences of the hypnotized person [38, 39]. Some studies analyzed the depth of hypnosis [33, 49, 57, 58], others have asked subjects to describe their personal hypnotic experiences [38, 52, 53], to rate them in various dimensions [30, 32], or to indicate changes in the strength of their experience by a dial [39].

The most commonly used scales of hypnotic susceptibility, such as the Stanford Hypnotic Susceptibility Scale form A, B and C [59, 60], and the Harvard Group Scale of Hypnotic Susceptibility [54], focus on the individual's observable response as external indicator of the hypnotic experience. The scales are scored behaviorally, and the ability to be hypnotized is determined by summing up the number of items that they pass. The behavioral responses are assumed to reflect the underlying subjective experience of the individual [39].

Hypnosis is usually induced via relaxation or imagination, but a similar state can be induced through increasing motor activity. This latter method is called active-alert hypnosis. In this kind of hypnosis the subject pedals a stationary laboratory bicycle, while receiving suggestions that the pedaling would not seem difficult for him/her and that his/her alertness would be increased as the pedaling goes on (the state of the subject remains the ecstatic one). In active alert hypnosis, subjects become as sus-

ceptible to suggestion as in the traditional kind of hypnosis [1]. In these experiments it seemed important that the situation was called "hypnosis" [31].

The ancient belief system of the inhabitants of Siberia and Inner-Asia is called shamanism by the literature of ethnography [28]. Its central figure is the shaman who mediates between the human and the spiritual world. One of his main characteristics is that he reaches an altered state of consciousness, which helps him wrestle successfully with the problems.

The shaman cosmology divides the universe into three spheres: the upper-, middle- and underworld. The upper- and underworld are the spiritual spheres, where the Gods, the Spirits and the Ghosts live. The shaman in a state of trance makes his journey into these worlds. His main instrument in inducing trance is his drum. Before using it, the shaman warms it up – or as he says, wake it up – at the fire and then, like a good horse, it flies his owner into the underworld. During the rite, the shaman enters into trance by beating his drum, and visits the world of the Ghosts. The neoshamanism of our days use many elements of the ancient rites. During exercises subjects listen to drums and make journeys into the underworld for self-knowledge or healing [21]. In shaman trance we find many similar changes to subjective experiences as those in hypnosis.

Studies on shamanism usually focus on the behavior and trance of shamans and do not pay much attention to the mental process, which occur in the participants during the rite. Diószegi [13. pp. 95.], reporting a shaman rite, mentions how deeply the people who are present get involved in the rite, how they follow the shaman in his journey and how they become more sensitive to suggestions.

In a recent experiment under artificially laboratory conditions we examined how similar the changes of the experiences and the suggestibility were while listening to a monotonous drumming to the changes in a normal hypnotic state.

Since the 1980s the Department of Psychology at Kossuth Lajos University of Debrecen has carried out a series of hypnosis studies investigating different hypnotic-like experiences in different situations such as shamanic trance or listening to music [9, 57, 58].

This article will discuss tree different experiments which were aimed at on one hand, revealing whether there is any difference in individual experiences during shamanic trance or a short relaxation depending on the subjects' hypnotic susceptibility and on the other hand to reveal whether hypnotic state can modify the electric power of different areas of cerebral hemispheres?

We may expect tendencies that high, medium and low hypnotic susceptibility generally correlate with different values of altered-state experiences because subjects with high susceptibility may have higher ability to feel those alterations in consciousness than those who perform weaker in formal susceptibility scales.

Nevertheless, taking contextual factors into account (such as definition of the situation), it is also possible that subjects with medium and low hypnotic susceptibility have the ability to experience those alterations in a situation defined as "listening to music" or "shamanic trance".

MATERIALS AND METHODS

The experiments were done in three different groups: (a) shamanic journey, (b) listening to music and (c) EEG studies.

The following review describes three different studies:

(a) 29 university students volunteered to participate in the shamanic experiment (22 females and 7 males). None of them had any previous experience in hypnosis. They were told us that the experiment would be a shaman journey. They were given no money and no credit point for their participation. They participated in the experiment individually. The experiments were made in a laboratory in nearly total darkness in order that the subjects would not be disturbed by the light. They were asked to sit in an armchair, close their eyes, and listen to a monotonous drumming presented on magnetic tape. The rhythm of the drumming was 210 per minute and was recorded from a synthesizer. Subjects were asked to take an imaginary journey to the Underworld while listening to the drums [58]. The instructions and the rhythm of drumming were in accordance with Harner's [21] proposals. The journey lasted for 30 minutes but 15 minutes into the journey, the subjects' suggestibility was measured by giving them the test suggestions of the Stanford Hypnotic Susceptibility Scale form "B" (SHSS/B, 59). The length of time the subjects made their journey into the underworld from the beginning until the first suggestion was 15 minutes, in accordance with the SHSS procedure, where there is a 15 minutes long hypnosis induction before the first test suggestion is given. This instruction was identical with the corresponding phrases of the SHSS instruction. This was followed by the 3–10 test suggestions of the SHSS/B version [59]. The suggestions were: hand lowering, arm immobilization, finger lock, arm rigidity, moving hands apart, verbal inhibition, hallucination, eye catalepsy. Subjects were instructed as with hypnotic susceptibility measurements, for example to imagine that they are holding a heavy weight and their arm is lowering, etc.

After the amnesia and post-hypnotic suggestion they were told to start back to the entrance of the underworld.

Measurement of the subjects' hypnotic susceptibility was made one week later in another room with the Stanford Hypnotic Susceptibility Scale "A" version [59].

(b) Participation in this experiment was limited to students with no previous experience of hypnosis. The final sample was composed of 47 subjects (18 males and 29 females) who volunteered to take part in the laboratory experiment (mean age 22.4 ± 4.3 years, median 22 years). Subjects were paid for their participation.

Hypnotic susceptibility was measured by the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A) [54] which is a group measure of hypnotic responsiveness. The scale involves a structured hypnotic induction and an assessment of the subject's response to 12 hypnotic suggestions. It is a self-score scale; in the standard scoring system the participants indicate for each suggestion whether they passed or failed to do it. The total scale scores range from 0 to 12. The psychometric properties of the HGSHS:A were found to be good, internal consistency was 0.83 and the test-retest reliability was 0.55 [19]. Subjects were classified as high

(n = 15), medium (n = 16) and low susceptibles (n = 16) on the basis of their scores on HGSHS:A. Highly susceptible subjects scored in the range of 9–12 (mean 9.8, SD 0.94), medium susceptibles scored in the range of 5–8 (mean 6.94, SD 0.68) and low susceptibles scored in the range of 0–4 (mean 2.81, SD 1.22).

Relaxation experiences were measured by a technique constructed by one of the authors [9]. The technique is based on the Relaxation Experiences Questionnaire (REQ), a self-report instrument to assess the occurrence of altered state experiences. First, the subject briefly describes the experiences he/she had while relaxing and listening to music. Then the subject indicates on 7-point scales how he/she experienced the following: relaxation, imagination/hallucination, alterations in attention, Altered State Experiences, and deepness. The Altered State Experiences scale was calculated form seven "altered state experience" such as the feeling of being high or the out-of-body experience; each was rated as pass or fail. It is relevant to mention that hypnotized subjects sometimes spontaneously report body distortions or fluctuations in body experience [46, 47]. The imagination/hallucination factor was calculated from five "hallucination" scales of five modalities (visual, auditory, smell, taste and movement) in which subjects indicated their experiences of seeing images, hearing sounds, smelling or tasting something or feeling any movement. The last section of the REQ includes three items. The first two questions are aimed at comparing the "listening to music" experience with the hypnotic experience ("How similar were your experiences during relaxation to the ones you felt during hypnosis?" and "Which was more pleasant for you?").

The present experiment was part of a larger study examining the connections between hypnotic susceptibility and coping with examination stress. Before the experiments began, all participants were informed that purpose of the study was to examine how listening to music can enhance performance on mental tasks. They were told that after listening to music they have to work on some mental tasks and that payment will depend on their performance.

All subjects were tested alone in a laboratory, the investigator was in another room and the subject and the investigator communicated through an audio-video system. The instructions were presented to the subjects by audiotape. The subjects were instructed as follows: "Now you will listen to music for a while. You don't have to do anything just make yourself comfortable in the armchair. If you wish you may abandon yourself to relaxation." Then the subjects were listening to relaxation music for 10 min. Following that, they heard a speech containing suggestions to stay calm during the examination and to perform well on mental tasks. Later on another 10 min music followed. At the end of the resting period the investigator asked the subjects to fill out the Relaxation Experiences Questionnaire.

(c) Volunteer university students participated in this part of the experiment. They were stringently controlled for hypnotic susceptibility on the HGSHS:A [54], and Stanford Hypnotic Susceptibility Scale, Form C, (SHSS/C) [60]. Thirty-one subjects participated in the experiment: 15 highly susceptibles, scoring 10–12 on the SHSS/C and 16 low susceptibles, scoring 0–2. All subjects were strongly right handed, and had no medical problems.

Each experiment consisted of two parts: waking and hypnosis in counterbalanced conditions [42]. During the waking condition subjects had to listen to a tape recorded magazine passage, while in the hypnotic part the SHSS/C induction was administered from magnetic tape. In both conditions a 5 minutes baseline period of EEG was recorded for the analysis of brain electrical activity. In this part the subjects were told to remain relaxed with eyes closed and let their thoughts come and go. In five experiments on low susceptibles the induction of hypnosis was carried out by indirect Ericksonian [15] method. After this procedure the hypnotically altered state of consciousness characterizing hypnosis on mental and behavioral level could be recorded in low susceptible subjects as well.

Silver-silver chloride electrodes fixed by collodium according to 10–20 system were used for recording the EEG. Bipolar or monopolar (reference on the linked earlobes) derivation was used. Resistance of electrodes were below 5 kΩ and kept as equal as possible across symmetric electrodes. As bioamplifier a 16 canal Medicor EEG was used with 0.3 Hz time constant and 70 Hz filter. The data were A/D converted with 200 samples per second and stored on PC. Off-line analysis of different parts of experiment consisted of Fast Fourier Analysis (FFT) of different frequency bands as β, α, τ and δ. On the basis of the power of a frequency band a laterality quotient (Q) was calculated between the symmetric electrodes using the formula: $Q=(Lx-Rx)/[(Lx+Rx)/2]$ where Lx is the group averaged power of the left side electrode and Rx is that of the right electrode. According to that if the Q is a positive value the left electrode is more active, the negative number shows the preponderance of the right hemispheric electrode location.

RESULTS

The comparison of susceptibility to suggestions in hypnosis versus "shamanic journey" showed no significant difference between the scores (suggestibility in shaman journey: mean = 5.86, sd = 2.58 in hypnosis: mean = 5.71, sd = 2.52, $t = 0.64$, $df = 27$). Results show that subjects while listening to the drumming become as susceptible for suggestion as they get after the induction of hypnosis (Fig. 1). Suggestibility scores during shaman journey and hypnosis correlated significantly ($r = 0.89$, $p < 0.001$).

In a context, which is called "listening to music", subjects have similar experiences regardless of their hypnotic susceptibility; measures of hypnotic performance and relaxation experiences were compared. The continuous variables of REQ (relaxation, imagination/hallucination, focused attention, altered state experiences, deepness) were analyzed by one-way-ANOVA. The results showed that there were no differences between subjects with low, medium and high hypnotic susceptibility regarding the following factors: relaxation, focused attention, altered state experiences and deepness. On the other hand, significant differences ($p < 0.05$) were found between the three groups in the hallucination/imagination factor, $F = 3.67$, $p = 0.034$. Thus, the hypothesis was not fully supported as in four factors (relaxation, focused attention,

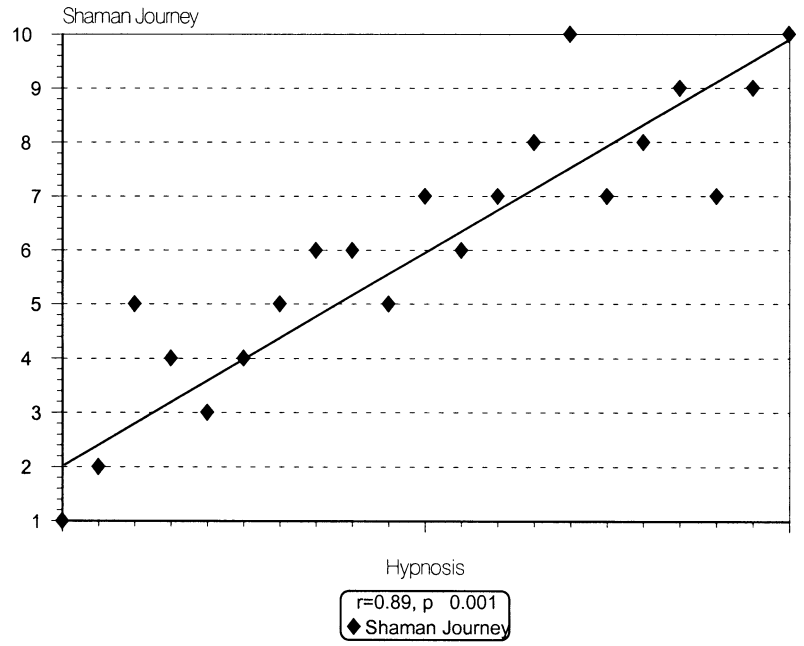

Fig. 1. Scores of suggestibility according to the Susceptibility to Hypnosis (SHSS/A) versus performed suggestions under "Shamar Journey". Rise of linear regression: r = 0.89

altered state experiences, deepness) low, medium and high susceptibles did have similar experiences but in the hallucination/imagination factor significant difference have been found between the three groups. *Post hoc* tests were performed to determine if all three groups differ significantly or not. The results showed that this difference is due to the discrepancy between mediums and highs (mean difference 1.88, $p = 0.018$) and between mediums and lows (mean difference 1.68, $p = 0.034$), in other words the difference between lows and highs was not considerable. The calculated Altered State Index was also analyzed with one-way-ANOVA but there were no differences between the three groups. Nevertheless, *post hoc* test showed that there was a statistically significant difference between the high and medium susceptibles (mean difference 1.07, $p = 0.02$).

To test the hypothesis that low susceptible subjects prefer relaxation to hypnosis, planned comparisons were performed on measures of hypnotic susceptibility and the preference item ("Which was more pleasant for you?" hypnosis, relaxation or the same) of REQ. Since this variable was formulated in a nominal way, data were analyzed by Kruskal-Wallis test. The results showed no statistically significant differences between the preferences of low, medium and high susceptible subjects. However, the frequency values of the three groups (Fig. 2) suggested that there is a tendency that subjects with different hypnotic susceptibility prefer different contextual settings. To test for this assumption, the hypnotic susceptibility and preference

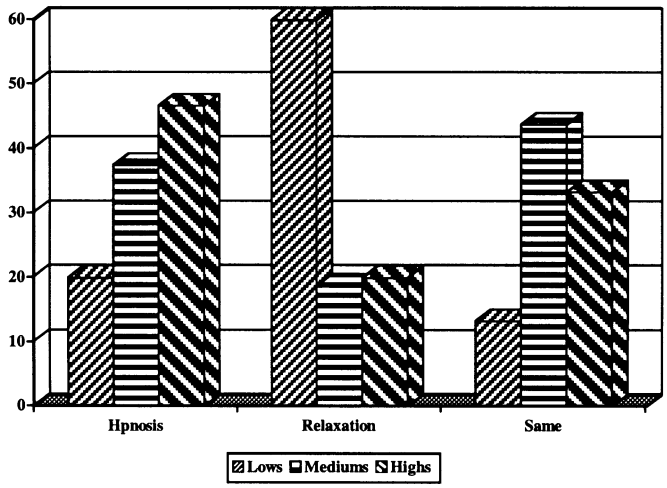

Fig. 2. Effect of low, medium or high susceptibility to hypnosis on preferences (or absence of advantage) of hypnotic induction versus relaxation called "listening to music". Percents of subjective preference

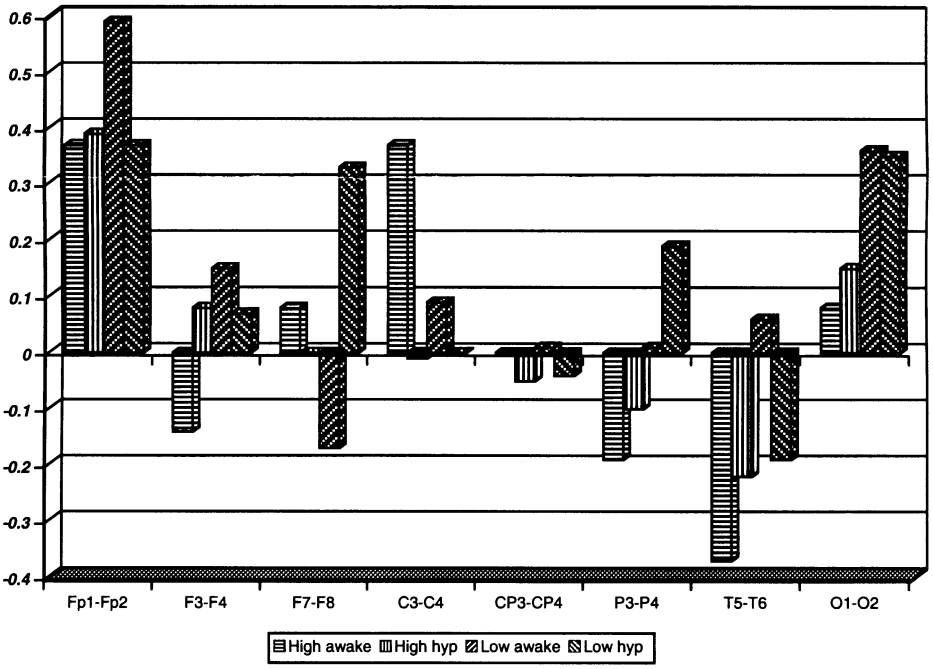

Fig. 3. Group averaged laterality quotients of EEG β power. Subjects with high and low susceptibility to hypnosis in waking state and after a direct permissive induction procedure. Laterality quotient (ordinate): $Q = (Lx - Rx)/\{(Lx + Rx)/2\}$. Lx: FFT power of left derivation, Rx: FFT power of (symmetric) right derivation. Q+: left hemispheric dominance, Q–: right hemispheric dominance. High awake: high susceptible group in waking state. High hyp.: high susceptible group after hypnotic induction. Low awake: low susceptible group in waking state. Low hyp.: low susceptible group after a direct (formal, ineffective) hypnotic induction Symmetric bipolar derivations according to 10–20 system

ratings were analyzed with chi-square test. The outcomes have failed to render the expected results, since the difference was not statistically significant ($p = 0.054$) when all three groups were included. However, when high susceptibles were excluded from the population, the difference between low and medium susceptibles was statistically significant ($p = 0.036$).

According to our earlier findings [40, 42] a marked asymmetry can be recorded between the power of the two hemispheres. In the α and β frequency band a characteristic difference could be observed as a function of hypnotic susceptibility. Using the traditional direct permissive technique of hypnotic induction (SHSS/C) the hypnotic state could be evoked in high hypnotizables but not in lows. In both frequency bands the frontal derivations showed left hemisphere predominance independently of susceptibility or hypnotic state, while in the parieto-temporal region in high susceptibles the right hemisphere was more active in waking and in hypnotic state as well (Fig. 3). The analysis of power side by side demonstrated an augmentation of the right parieto-temporal activity in high hypnotizables. On the group-averaged data other derivations were more or less equilibrated between the two hemispheres (bipolar recording).

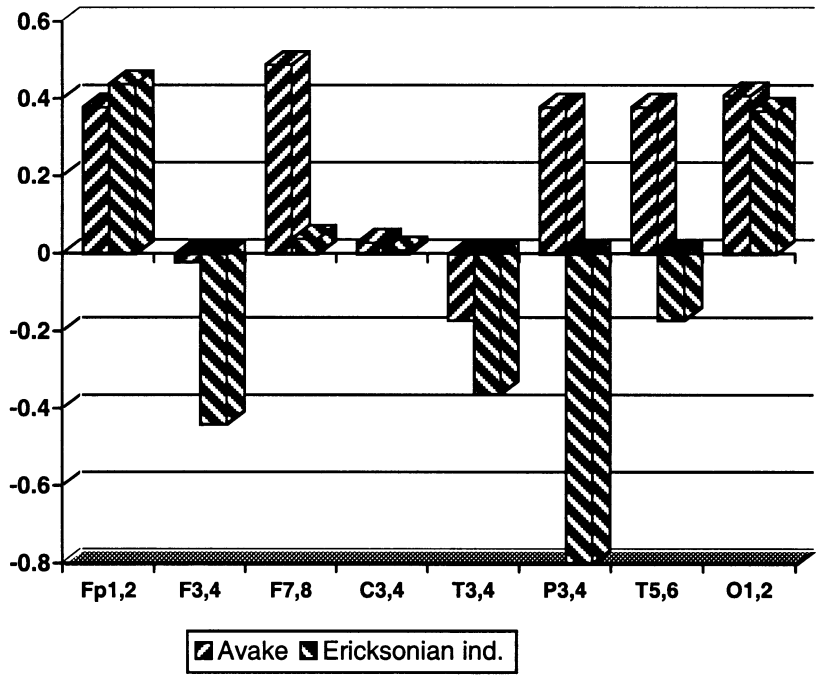

Fig. 4. Group averaged laterality quotients of EEG β power of low susceptible subjects after Ericksonian indirect hypnotic induction. Low susceptible group's FFT power in waking state and in hypnosis after an indirect hypnotic induction. For other codes see Fig. 3

In 5 low susceptible subjects indirect Ericksonian hypnotic induction technique was administered. The subjective reports and the observed behavior of the subjects both supported the hypnotic alteration of consciousness. The EEG data obtained in monopolar derivation showed similar results as in high susceptibles: left side preponderance in fronto-polar electrodes independently of hypnotic state but right hemispheric predominance in parietal and temporal region after Ericksonian hypnotic induction (Fig. 4). In waking state all derivations showed left side predominance (except the non significant F4 electrode), or they were equilibrated.

The α activity showed similar right parieto-temporal predominance in high susceptible subjects but in lows only after indirect hypnotic induction [42].

DISCUSSION

It was demonstrated that during a "journey" subjects became susceptible to suggestions to the same extent as if they were in hypnosis. An important characteristic of this experiment was that the situation was not called "hypnosis", and changes of suggestibility were effected without induction of hypnosis.

The altered state reached during shaman journey was induced by the monotonous drumming and imaginary involvement. The journey in the underworld can be similar to a self-hypnosis or an indirect hypnosis, when everyone might find their entrance to their "underworld", and follow their "own ways".

In a relaxation situation called "listening to music", subjects have almost similar altered-state experiences regardless of their hypnotic susceptibility. There were no differences between the three study groups (low, medium and high hypnotizables) in four factors (i.e. relaxation, focused attention, altered state experiences, and deepness) and in the calculated Altered State Index. However, there was a statistically significant difference in the imagination/hallucination factor. Further analysis showed that medium susceptible subjects differ in this factor from both high and low susceptibles, although the difference between high and low susceptibles was comparatively small. This suggests that hearing sounds or seeing images in an altered state could not be connected directly to the ability of responding behaviorally to suggestions in a hypnotic setting. The results of the contextual preferences underlined that low susceptible subjects prefer relaxation to hypnosis but for medium and high susceptibles the contextual setting is not that important.

Our results are in accordance with the observations of Lynn et al. [36] that low but not high hypnotizable subjects are reactive to the test context. They are also consistent with the results of another study [57] that low and medium hypnotizable individuals experience greater depth during indirect hypnosis compared with traditional direct hypnosis. Thus subjects with low hypnotic susceptibility calling the situation "listening to music" may have greater subjective involvement and more altered state experience. Another explanation might be that low susceptibles have similar altered state experiences during a standard susceptibility measure, but, as the items are scored behaviorally, they do not affect the total scores. However, the second expla-

nation is inconsistent with those studies in which the correlation between two scoring systems (i.e. behavioral and subjective) for standard hypnotic measures was remarkably high [30, 32].

The present electrophysiological data confirmed our earlier finding that there is a difference between the EEG activity of two hemispheres as a function of hypnotic susceptibility. While in low susceptibles the signal processing is more left hemispheric (the approach is more cognitive, rational) characterized by higher left side electric power, the highs showed a more right hemispheric (holistic, emotional, spatial) mode of thinking with predominant activity in the right parieto-temporal associative cortical region. If we use Ericksonian induction to evoke hypnotic state, similarly to the highs the low susceptibles also showed higher right parieto-temporal EEG activity. This fact underlines the importance of this associative cortical area in hypnotic alteration of consciousness.

CONCLUSION

In summary, our results concerning the altered state experiences evoked either, as a shaman journey or listening to music, indicated that low and medium susceptibles are able to have similar experiences as those with high hypnotic susceptibiliy which suggests that they may not differ from high susceptibles in the ability to have alterations of consciousness. Similar ratings were obtained from the subjects to control that there was likeness between "listening to music" and hypnotic experience. The mean of these ratings fell in the middle of the scale, indicating that the subjects rated the two contexts similar but not identical. Nevertheless, there were several important differences between the two situations, such as in the relaxation context, there was no formal induction, and that its duration was much shorter than that of the formal hypnosis measure.

The results of our research group underline the role of hemispheric activation, and stress the importance of the experimental context in the subjective experience of different altered states of consciousness. It can be concluded that the phenomena of hypnotic susceptibility – as a stabile personality trait – is more complex than it was supposed earlier.

We suggest that the accentuated emotionality, the holistic way of thinking and the partially inhibited rational signal processing might be the result of the augmented activity of the right parieto-temporal associative cortex. These findings may explain why the mainly emotion-focused hypnotherapy, as a psychotherapeutic approach, is one of the most effective ways to treat different kind of diseases, especially those in which emotional problems are involved. These results also highlight the importance of conducting further research in this area of science.

ACKNOWLEDGMENT

This work was supported by the Hungarian Scientific Research Fund (OTKA), grant No. T 023153.

REFERENCES

1. Bányai, É., Hilgard, E. (1976) A comparison of active-alert hypnotic induction with traditional relaxation induction. *J. Abnorm. Psychol. 85,* 218–224.
2. Bányai, É. I. (1985) A social psychophysiological approach to the understanding of hypnosis: The interaction between hypnotist and subject. *Hypnos: Swedish J. Hypnosis Psychother. Psychosom. Med. 12,* 186–210.
3. Bányai, É. I. (1991) Toward a social-psychobiological model of hypnosis. In: Lynn, S. J., Rhue, J. W. (eds), *Theories of Hypnosis, Current Models and Perspectives*. Guilford, New York, pp. 564–598.
4. Bányai, É. (1998) The interactive nature of hypnosis: Research evidence for a social-psychobiological model. *Contemporary Hypnosis 15*, 52–63.
5. Barber, T. X. (1963) The effects of "hypnosis" on pain: A critical review of experimental and clinical findings. *J. Psychosom. Med. 25,* 303–333.
6. Barber, T. X., Carverley, D. S. (1964) The definition of the situation as a variable affecting "hypnotic-like" suggestibility. *J. Clin. Psychol. 20,* 438–440.
7. Crawford, J. C., Allen, S. N. (1983) Enhanced visual memory during hypnosis as mediated by hypnotic responsiveness and cognitive strategies. *J. Exp. Psychol. Gen. 112,* 662–685.
8. Crawford, H. J., Clarke, S. W., Kitner-Triolo, M. (1996) Self-generated happy and sad emotions in low and highly hypnotizable persons during waking and hypnosis: laterality and regional EEG activity differences. *Int. J. Psychophysiol. 24,* 239–266.
9. Csákó, R., Mészáros, I. (2002) Altered-state experiences during relaxation: Do they depend on hypnotic susceptibility? *Hypnosis International Monographs,* München. (In press)
10. Dement, W., Kleitman, N. (1957) The relation of eye movements during sleep to dream activity: an objective method for study of dreaming. *J. Exptl. Psychol. 53,* 339–346.
11. De Benedettis, G., Carli, G. (1990) Psineurobiologia del'ipnosi, in Seminari sul dolore. In: Tiengo, M. (ed.) *Centro Studi sull'Analgesia Universitá degli Studi di Milano.* Milano, pp. 59–116.
12. De Pascalis, V., Marucci, F. S., Penna, P. M. (1989) 40 Hz EEG asymmetry during recal of emotional events in waking and hypnosis: Differences between low and high hypnotizables. *Int. J. Psychophysiol. 7,* 85–96.
13. Diószegi, V. (1962) *Sámánizmus.* Gondolat, Budapest.
14. Diószegi, V. (1967) *A pogány magyarok hitvilága.* Akadémiai Kiadó, Budapest.
15. Erickson, M. H., Rossi, E. L., Rossi, S. I. (1976) *Hypnotic Realities.* New York, Irvington.
16. Gorassini, D. R., Spanos, N. P. (1986) A social-cognitive skills approach to the successful modification of hypnotic susceptibility. *J. Personality Soc. Psychol. 50,* 1004–1012.
17. Gorassini, D., Sowerby, D., Creighton, A., Fry, G. (1991) Hypnotic suggestibility enhancement trough brief cognitive skill training. *J. Personality Soc. Psychol. 61,* 289–297.
18. Gorassini, D. R., Spanos, N. P. (1999) The Carleton Skill Training Program for modifying hypnotic susceptibility. In: Kirsc, K. I., Capafons, A. (eds), *Clinical Hypnosis and Self-regulation: Cognitive-behavioral Perspectives.* Dissociation, trauma, memory, and hypnosis book series, USA. American Psychol. Assoc., Washington D. C., pp. 141–177.
19. Gruzelier, J. H. (1988) The neuropsychology of hypnosis. In: Heap, M. (ed.), *Hypnosis: Current Clinical, Experimental and Forensic Practices.* Croom Helm, London, pp. 68–76.
20. Gwynn, M. I., Spanos, N. P., Gabara, N. J., Jarrett, L. E. (1988) Long term and short term follow-up on a Harvard Group Scale of Hypnotic Susceptibility: Form A. *Brit. J. Exp. Clin. Hypnosis 5,* 117–124.
21. Harner, M. (1980) *The Way of the Shaman*. Harper & Row, New York.
22. Harner, M. (1997) *A sámán útja*. Édesvíz, Budapest
23. Hilgard, E. R. (1973) The domain of hypnosis: With some comments on alternative paradigms. *Am. Psychologist 28,* 972–982.
24. Hilgard, E. R. (1974) Toward a neo-dissociation theory: Multiple cognitive controls in Human functioning. *Perspectives in Biology and Medicine 17,* 301–216.

25. Hilgard, E. R. (1991) A neodissociation interpretation of hypnosis. In: Lynn, S. J., Rhue, J. W. (eds), *Theories of Hypnosis, Current Models and Perspectives*. Guilford, New York, pp. 83–104.
26. Hilgard, E. R. (1977) *Divided Consciousness. Multiple Controls in Human Thought and Action.* Wiley, New York.
27. Hilgard, E. R. (1992) Dissociation and theories of hypnosis. In: Fromm, E., Nash, M. R. (eds), *Contemporary Hypnosis Research.* Guilford, New York, pp. 69–100.
28. Hoppál, M. (1994) *Sámánok. Lelkek és jelképek,* Helikon, Budapest.
29. Jouvet, M., Michel, F., Courjon, J. (1959) Sur un stade d'activité electrique cérébrale rapide au cours du sommeil physiologique*. Compt. Rend. Soc. Biol. 153,* 1024–1028.
30. Kirsch, I., Council, J. R., Wickless, C. (1990) Subjective scoring for the Harvard Group Scale of Hypnotic Susceptibility, Form A. *Internat. J. Clin. Exp. Hypnosis 38,* 112–124.
31. Kirsch, I., Council, J. R. (1992) Situational and Personality Correlates of Hypnotic Responsiveness. In: Fromm, E., Nash, M. R. (1992) *Contemporary Hypnosis Res.,* Guilford, New York.
32. Kirsch, I., Milling, L. S., Burgess, C. (1998) Experiential scoring for the Waterloo-Stanford Group C Scale. *Internat. J. Clin. Exp. Hypnosis 46,* 269–279.
33. Laurence, J.-R., Nadon, R. (1986) Reports of hypnotic depth: Are they more than mere words? *Internat. J. Clin. Exp. Hypnosis 34,* 215–233.
34. Loomis, A. L., Harvey, E. N., Hobart, G. (1936) Brain potentials during hypnosis*. Science 83,* 239–241.
35. Lynn, S. J., Rhue, J. W., Weekes, J. R. (1990) Hypnotic involuntariness: A social cognitive analysis. *Psychological Rev. 97,* 169–184.
36. Lynn, S. J., Weekes, J. R., Neufeld, V., Zivney, O., Brentar, J., Weiss, F. (1991) Interpersonal climate and hypnotizability level: Effects on hypnotic performance, rapport, and archaic involvement. *J. Personality, Soc. Psychol. 60,* 739–743.
37. Maurer, R. L. Sr., Kumar, V. K., Woodside, L., Pekala, R. J. (1997) Phenomenological experience in response to monotonous drumming and hypnotizability. *Am. J. Clin. Hypnosis. 40,* 130–145.
38. McConkey, K. M. (1991) The construction and resolution of experience and behavior in hypnosis. In: Lynn, S. J., Rhue, J. W. (eds), *Theories of Hypnosis: Current Models and Perspectives*. Guilford, New York, pp. 542–563.
39. McConkey, K. M., Wende, V., Barnier, A. J. (1999) Measuring change in the subjective experience of hypnosis. *Int. J. Clin. Exp. Hypnosis 47,* 23–39.
40. Mészáros, I. (1984) *Hipnózis.* Medicina, Budapest.
41. Mészáros, I. (2002) Can psychophysiological research help hypnotherapy? *Hypnosis International Monographs,* München. (In press)
42. Mészáros, I., Szabó, Cs. (1999) Correlation of EEG asymmetry and hypnotic susceptibility*. Acta Physiol. Hung. 86,* 259–263.
43. Mitchell, G. P., Lundy, R. M. (1986) The effects of relaxation and imagery inductions on response to suggestions. *Int. J. Clin. Exp. Hypnosis 34,* 98–109.
44. Morgan, A. H., Johnson, D. L., Hilgard, E. R. (1974) The stability of hypnotic susceptibility: A longitudinal study. *Int. J. Clin. Exp. Hypnosis 22,* 249–257.
45. Moruzzi, G., Magoun, H. W. (1949) Brain stem reticular formation and activation of the EEG. *J. Electroenceph. Clin. Neurophysiol. 1,* 445–473.
46. Nash, M. R. (1991) Hypnosis as a special case of psychological regression. In: Lynn, S. J., Rhue, J. W. (eds), *Theories of Hypnosis, Current Models and Perspectives*. Guilford, New York, pp. 171–193.
47. Nash, M. R. (1992) Hypnosis, psychopathology, and psychological regression. In: Fromm, E., Nash, M. R. (eds), *Contemporary Hypnosis Research.* Guilford, New York, pp. 149–169.
48. Piccione, C., Hilgard, E. R., Zimbardo, P. G. (1989) On the stability of measured hypnotizability over a 25-year period. *J. Personality Soc. Psychol. 56,* 289–295.
49. Radtke, H. L., Spanos, N. P. (1982) The effect of rating scale descriptors on hypnotic depth reports. *J. Psychol. 3,* 235–245.
50. Sabourin, M. E. (1980) Hypnosis and EEG activity: historical and methodological considerations. In: Pajntar, M., Roskar, E., Lavric, M. (eds), *Hypnosis in Psychotherapy and Psychosomatic Medicine*, Univ. Press, Ljubjana, pp. 88–92.

51. Sabourin, M. E., Cutcomb, S. D., Crawford, H. J., Pribram, K. (1990) EEG correlates of hypnotic susceptibility and hypnotic trance: Spectral analysis and coherence. *Int. J. Psychophysiol. 10,* 125–142.
52. Sheehan, P. W. (1992) The phenomenology of hypnosis and the experiential analysis technique. In: Fromm, E., Nash, M. R. (eds), *Contemporary Hypnosis Research*. Guilford, New York, pp. 364–389.
53. Shor, R. E. (1979) A phenomenological method for the measurement of variables important to an understanding of the nature of hypnosis. In: Fromm, E., Shor, R. E. (eds) *Hypnosis: Developments in Research and New Perspectives*. Aldine, New York, pp. 105–135.
54. Shor, R. E., Orne, E. C. (1962) *Harvard Group Scale of Hypnotic Susceptibility, Form: A*. Consulting Psychologists Press, Palo Alto, CA.
55. Spanos, N. P., Coe, W. C. (1992) A Social-Psychological approach to hypnosis. In: Fromm, E., Nash, M. R. (eds), *Contemporary Hypnosis Research.* Guilford Press, NY, London, pp. 102–130.
56. Spiegel, D., Maldonado, J. R. (1999) Hypnosis. In: Hales, R. E., Yudofsky, S. C., Talbott, J. A. (eds) *Textbook of Psychiatry*. American Psychiatric Press, Washington DC, pp. 1243–1273.
57. Szabó, Cs. (1993) The phenomenology of the experiences and the depth of hypnosis: Comparison of direct and indirect induction techniques. *Int. J. Clin. Exp. Hypnosis 41,* 225–233.
58. Szabó, Cs., Mészáros, I., Takács, A. (2002) Suggestibility in Ericksonian Hypnosis and Shamanic Trance. I. *Hypnosis International Monographs* (In press)
59. Weitzenhoffer, A. M., Hilgard, E. R. (1959) *Stanford Hypnotic Susceptibility Scale, Forms A and B.* Consulting Psychology Press, Inc., Palo Alto.
60. Weitzenhoffer, A. M., Hilgard, E. R. (1962) *Stanford Hypnotic Susceptibility Scale, Form C.* Consulting Psychology Press, Inc., Palo Alto.
61. Wickless, C., Kirsch, I. (1989) The effects of verbal and experiential expectancy manipulation on hypnotic susceptibility. *J. Personality Soc. Psychol. 57,* 762–768.
62. Woody, E. Z., Bowers, K. S., Oakman, M. (1992) A conceptual analysis of hypnotic responsiveness: Experience, individual differences, and context. In: Fromm, E., Nash, M. R. (eds) *Contemporary Hypnosis Research.* Guilford, New York, pp. 3–33.
63. Zeig, J. K. (1985) *Ericksonian Psychotherapy*. Brunner/Mazel, New York.