Relaxation strategies and enhancement of hypnotic susceptibility: EEG neurofeedback, progressive muscle relaxation and self-hypnosis

Martin J. Batty, Samantha Bonnington, Bo-Kim Tang, Malcolm B. Hawken, John H. Gruzelier

Imperial College, London W6 8RP, UK

Received 18 February 2006; received in revised form 31 July 2006; accepted 1 August 2006
Available online 1 September 2006

Abstract

Hypnosis has been shown to be efficacious in a range of clinical conditions, including the management of chronic pain. However, not all individuals are able to enter a hypnotic state, thereby limiting the clinical utility of this technique. We sought to determine whether hypnotic susceptibility could be increased using three methods thought to facilitate relaxation, with particular interest in an EEG neurofeedback protocol which elevated the theta to alpha ratio. This was compared with progressive muscle relaxation and self-hypnosis. Ten subjects with moderate levels of susceptibility (2–7/12) were randomly assigned to each condition and assessed for hypnotic susceptibility prior to and upon completion of 10 sessions of training. Hypnotic susceptibility increased post-training in all groups, providing further evidence that operant control over the theta/alpha ratio is possible, but contrary to our predictions, elevation of the theta/alpha ratio proved no more successful than the other interventions. Nonetheless, all three techniques successfully enhanced hypnotic susceptibility in over half of the participants (17/30), a similar incidence to that reported using other methods. As previously reported, the majority who were not susceptible to modification were at the lower levels of susceptibility, and the greater increases tended to occur in the more susceptible subjects. However, here enhancement was disclosed in some at low levels, and capability was found of reaching high levels, both features not typically reported. Further research is warranted.

Keywords: EEG; Neurofeedback; Hypnosis; Relaxation

1. Introduction

Neurophysiologically, the dynamic alterations of awareness that accompany hypnosis are underpinned by a slowing of EEG oscillations, with a predominance of alpha and theta activity [9]. Attempts to increase hypnotic susceptibility through alpha training were among the first applications of neurofeedback, following the early discovery that operant control of the electroencephalogram is possible, particularly control of alpha activity [33]. Initial controlled studies [e.g. 36,37] reported that hypnotic susceptibility increased following alpha training, but not following mock EEG biofeedback (neurofeedback), and these findings have subsequently been replicated [e.g. 19]. These reports appear to have been largely forgotten, as there is no mention of them in a recent book on hypnotisability [31], and there had been a loss of interest in EEG-biofeedback in general. However, more recently there has been a renaissance in research on the operant control of CNS activity in such diverse fields as EEG brain computer interface [3], peak performance [15,43], therapy [18,38,44], and now there is the possibility of fMRI-based neurofeedback [12,53].

Since the initial attempts to modify hypnotisability using neurofeedback, neurocognitive studies have informed the process of hypnotic induction, and in the case of a three stage neurophysiological model of the induction of hypnotic relaxation have provided a neuropsychological translation of the hypnotic induction process [26,28]. Two factors are theorised to be prerequisites for hypnosis. In order to initiate the process of induction, the participant must first focus their attention. Secondly, once attention has been focused, the participant must ‘let go’ in order that an alteration/uncoupling of frontal functions may take place, thus, enabling the instructions of hypnosis...
to orchestrate behaviour. In other words, hypnotisability is modifiable for it is a dynamic process whereby the abilities both to focus attention and to ‘let go’ may be enhanced in order to yield a state more conducive to hypnosis. The process of relaxation, though not essential, will facilitate both the processes of focusing attention and of ‘letting go’, especially the latter, particularly in those unpractised in hypnosis. Furthermore relaxation, though not essential, is nonetheless a part of the majority of hypnotic inductions in clinical and experimental contexts. This includes the active-alert induction [1], which while physically active, is also mentally relaxing, and in keeping with mental relaxation has produced the shift in activity to the right hemisphere [5] observed following deeply relaxing floatation training [42]. Relaxation facilitates both parasympathetic activity, which is augmented with hypnosis, and alpha and theta activity [2,6,17,52]. In addition, relaxation also facilitates the focusing of attention and the vividness of imagery [50,51]. This corresponds with earlier findings [45] that the repeated induction of hypnosis using relaxation techniques such as breathing training increases hypnotisability. Accordingly, in this study, the hypothesis that it is possible to modify hypnotic susceptibility with relaxation techniques is revisited to include EEG neurofeedback.

Here, for exploratory purposes, a different EEG protocol to the one used by earlier researchers was examined. This involved the differential reinforcement of theta (4–7 Hz) and alpha activity (8–12 Hz) to increase the theta/alpha ratio. This neurofeedback protocol was originally devised to produce a state of hypnogogia [25], given that theta activity is a primary characteristic of the border between waking and sleeping [48]. Our choice of theta training also followed the fact that while both theta and alpha frequencies have been implicated in the state underpinning hypnosis, the majority of interest has focused on theta activity [9]. On re-examining this issue with narrow band EEG analysis, increases in theta were found in all subjects in a hypnotic induction that was effective in relaxing participants with both low and high hypnotisability [56]. Furthermore, these increases in theta were longer lasting in the highly hypnotisable, surviving into their post-hypnosis state. We interpreted the elevation in theta as an accompaniment of the induction of relaxation that was produced by the instructions of hypnosis. Accordingly, training participants to elevate theta may facilitate the relaxation component that forms a part of the conventional instruction of hypnosis.

Furthermore, increasing the theta/alpha ratio by producing an hypnagogic state may be more effective than instructions of relaxation per se in modifying susceptibility, due to associations between theta and memory retrieval, facilitating the evocation of hypnotic imagery. In order to test this, a comparison group was given instructions of progressive muscle relaxation, which is often incorporated in hypnotic induction procedures. We hypothesised that relaxation alone may also be effective to some extent in enhancing hypnotic susceptibility. Indeed, earlier evidence had supported this by showing that muscle relaxation training was effective in enhancing hypnotisability [34].

Training in modifying hypnotic susceptibility has usually been characteristic of investigators with a purely socio-cognitive perspective on hypnosis. Operant-based training programmes [47] have been developed, involving the practice of suggestions, discussion of subjective experience, and strengthening of appropriate responses. Other approaches, such as the Carleton skills training package (CSTP) [22,23], set out to remove misconceptions about hypnosis, giving advice on interpretation of suggestions and encouragement to subjects to experience involuntary actions with mental imagery. These procedures have been found to be effective [4,21] with a strong expectancy component demonstrated with the CSTP [20]. Thus, increases in hypnotisability may arise simply from psychological factors such as practice, familiarisation, and from loss of the insecurity which may inhibit the hypnotic response in some subjects. Therefore, in order to try to ensure that subjects reached a plateau in the level of hypnotic susceptibility prior to training [7,14,40], we administered the Harvard Group Scale of Hypnotic Susceptibility [49] to all subjects as an initial step before performing a pre-training assessment with the Stanford Scale of Hypnotic Susceptibility, Form C [54]. It may nevertheless be the case that two administrations may not be sufficient for all subjects to reach a plateau, therefore, a self-hypnosis group was included as a third group acting as controls. These subjects practised hypnosis at home in a safe context, going well beyond the three to four sessions thought necessary to ensure a plateau has been reached [40].

In summary, three different training procedures for modifying hypnotic susceptibility were evaluated, all using a standardised scale of hypnotic susceptibility to measure changes. These intervention procedures comprised an EEG-neurofeedback protocol designed to increase the theta/alpha ratio, a programme of progressive muscle relaxation, and practice with self-hypnosis. From a theoretical and clinical perspective it was hypothesised that hypnotic susceptibility could be raised by all three techniques. However, it was anticipated that the elevation of the theta/alpha ratio would be more effective. In order to achieve as homogeneous a sample as possible, participants were chosen who were broadly categorised in the mid-range of levels of susceptibility. Furthermore, there is general agreement that susceptibility may be better enhanced in those with medium levels of hypnotisability than participants with low levels, in whom evidence is less consistent [40], while at the opposite end of the spectrum, ceiling effects may inhibit improvement in those with high susceptibility.

2. Materials and methods

2.1. Subjects

Thirty subjects (11 male, 19 female), aged between 19 and 50 years (mean = 24.0, S.D. = 5.74) were recruited through posters placed around Imperial College and Charing Cross Hospital. There were no significant differences in age between groups. All volunteers were either students or hospital staff members. Participants were reimbursed at a rate of £ 5 per hour for their time. The study received ethical approval from the Riverside Ethics Committee.

2.2. Susceptibility

The Harvard Group Scale of Hypnotic Susceptibility [49] was used as an initial screening measure for all participants. To standardise the procedure, the
Harvard Scale was administered using a pre-recorded CD. Subjects who scored more than seven or less than two out of a possible score of 12 were excluded.

The measure of hypnotisability used to assess modifiability was the Stanford Hypnotic Susceptibility Scale, Form C [54]. Subjects who met the criterion for inclusion during preliminary screening with the Harvard Scale were assessed subsequently in a one-to-one session using the Stanford C Scale. As with the Harvard Scale, subjects scoring below two or above seven on the Stanford C Scale were excluded from the study. Subjects who met this second criterion for inclusion were allocated at random to one of the three intervention groups: theta/alpha neurofeedback training; relaxation training; self-hypnosis training. Each intervention group contained 10 subjects. At the end of the study, following completion of the intervention, subjects were assessed again using the Stanford C Scale.

2.3. Theta alpha neurofeedback training

Subjects completed 10 sessions of neurofeedback training over a period of 3 weeks, each session lasting 20 min. During the sessions, participants listened with their eyes closed to sounds contingent on theta and alpha activity. Before starting, each subject was given instructions to close their eyes and relax. While listening to the sounds, subjects were told they should allow themselves to feel empowered and imagine the person that they most wanted to be. Relative increases in alpha activity were represented by a sound resembling a babbling brook, with increases in theta represented by waves crashing peacefully on the seashore. Additionally, high bursts of alpha elicited the sound of a high-pitched Thai gong, and of theta, a low-pitched gong. At no point were the subjects informed that it might be possible for them to control the sounds. Withholding this information was intended to facilitate unconscious learning, and to minimise the development of an analytical attitude, which impedes the production of slow wave activity.

A single channel of EEG was recorded with Ag/AgCl electrodes from area PZ (parietal midline), located using the ‘International 10–20 System’ [32]. Reference and ground electrodes were attached to the left and right earlobes, respectively. EEG signals were amplified initially by an EEG-Z Pre-amplifier, and then by a ProComp+ main amplifier (both Thought Technology, Montreal). EEG data was sampled at 160 Hz, and bandpass filtered to extract theta (5–8 Hz), and alpha (8–11 Hz) by the neurofeedback software (EEG Biofeedback System, Version 3.12k. Neurocybernetics Inc., Canoga Park, California), which used the relative amplitudes in the different bands to control the feedback sounds as described above. Each session consisted of seven consecutive recording periods of 177 s, although subjects were not aware of the separate recording periods and experienced a single session lasting a little over 20 min. Mean amplitudes of alpha and theta were calculated for each of the seven periods.

Although in training the theta/alpha ratio both alpha and theta are reinforced, theta activity is typically reinforced at a greater rate than alpha due to the soporific/relaxing nature of the training.

2.4. Relaxation training

Subjects undergoing relaxation training completed one live session with the experimenter in a group setting prior to home training. For the remainder of the sessions, subjects listened to a 20 min pre-recorded CD nine times over a period of 3 weeks. The CD provided instructions for progressive muscle relaxation, using a commercially available relaxation protocol ‘Undoing Stress With Dan Johnston’, modified to suit the requirements of the study.

2.5. Self-hypnosis training

Subjects undergoing self-hypnosis training completed one live session of training with the experimenter in a group setting prior to home training. For the remainder of the sessions, subjects listened to a 20 min pre-recorded CD nine times over a period of 3 weeks. The CD contained a short section of hypnotic induction, followed by a series of visualisation exercises. For example, one of the exercises required subjects to experience the sensation of sunlight and warmth travelling through their body. Subjects were asked to avoid listening to the CD immediately before retiring in the evening.

2.6. Statistics

All statistical analyses were carried out using SPSS Version 12 (SPSS Inc., Chicago). As scores on the Stanford C Scale are ordinal rather than conforming to an interval or ratio scale it was necessary to use non-parametric tests for analysis. However, as there is no non-parametric equivalent of the two-way factorial analysis of variance (ANOVA) that would be required for a GROUP by TRAINING analysis of parametric data, separate tests of simpler effects were carried out. Between groups comparisons were carried out separately on pre-training scores and change (post–pre) scores using the Kruskal–Wallis test for independent groups. Pre- and post-training scores were compared over all 30 subjects using the Wilcoxon signed ranks test for paired samples. As EEG amplitude data conforms to a ratio scale, EEG data from the neurofeedback subjects was analysed using a repeated measures ANOVA (SPSS GLM) with two within subjects factors, SESSION [1–10] and PERIOD [1–7]. If the data violated the assumption of sphericity a corrected p-value was used (Greenhouse–Geisser correction, reported as p[GG]).

3. Results

3.1. Hypnotisability

The changes in susceptibility scores on the Stanford C Scale from pre-training to post-training for individual subjects in the three different groups are shown in Fig. 1. Group medians are shown in Table 1. Just over half the subjects showed an increase in susceptibility, just under half showed no change, while no subject showed a reduction in susceptibility after training.

In fact, hypnotic susceptibility increased significantly following training (pre- versus post-training score for all groups combined, Wilcoxon-signed ranks: Z = −3.671; n = 30; p = 0.001), and the increase in score (change, post–pre) did not differ between groups (Kruskal–Wallis: χ² = 0.60; n = 3; p = 0.970). To ensure all the groups were comparable before training, the pre-training scores for the groups were compared. This demonstrated no significant difference between the groups (Kruskal–Wallis: χ² = 0.091; n = 3; p = 0.955).

When the subjects were examined individually, 13/30 showed no change in hypnotic susceptibility, an incidence close to the 50% generally reported. Importantly, of the 13, the majority (10/13) had low scores of 2 or 3 pre-intervention. This was in keeping with reports that low susceptibility subjects are less likely to increase susceptibility.

![Fig. 1. Pre- and post-training scores for each participant as a function of group (NF: neurofeedback group; SH: self-hypnosis group; RL: relaxation group).](image-url)
Table 1
Hypnotisability scores (Stanford Scale of Hypnotic Susceptibility, Form C) preceding and following intervention, and change (post–pre), by training (n = 30)

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Pre</th>
<th>Post</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
<td>Range</td>
<td>Median</td>
</tr>
<tr>
<td>Neurofeedback</td>
<td>3</td>
<td>2–7</td>
<td>4</td>
</tr>
<tr>
<td>Self-hypnosis</td>
<td>3</td>
<td>2–7</td>
<td>4</td>
</tr>
<tr>
<td>Relaxation</td>
<td>3</td>
<td>2–7</td>
<td>4.5</td>
</tr>
<tr>
<td>Overall</td>
<td>3(^b)</td>
<td>2–7</td>
<td>5(^b)</td>
</tr>
</tbody>
</table>

\(^a\) No group difference in change in hypnotisability p = 0.97 (NS), see text.
\(^b\) Hypnotisability increased, post vs. pre, p = 0.001, see text.

Table 2
Hypnotisability scores (Stanford Scale of Hypnotic Susceptibility, Form C) preceding and following intervention, and change (post–pre), by training for subjects where change > 0

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Pre</th>
<th>Post</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
<td>Range</td>
<td>Median</td>
</tr>
<tr>
<td>Neurofeedback</td>
<td>3</td>
<td>2–6</td>
<td>5</td>
</tr>
<tr>
<td>Self-hypnosis</td>
<td>4</td>
<td>2–5</td>
<td>6</td>
</tr>
<tr>
<td>Relaxation</td>
<td>4</td>
<td>3–7</td>
<td>5.5</td>
</tr>
<tr>
<td>Overall</td>
<td>4</td>
<td>2–7</td>
<td>6</td>
</tr>
</tbody>
</table>

Group medians for subjects whose susceptibility increased are shown in Table 2. A correlation was found between the hypnotic susceptibility score pre-intervention and the associated change in susceptibility, i.e. a higher pre-training score corresponded to a greater increase in susceptibility (Spearman’s ρ = 0.363, p = 0.048, n = 30).

Regarding the order of magnitude of the changes that occurred in more than half the subjects, the distribution is shown in Fig. 2. Four increased by 1 point on the Stanford Scale (three of whom had scores of 2 or 3 at the start), eight increased by 2 points, two by 3 points (one of whom from the neurofeedback group began with 2), two by 4 points and one by 5 points. Most remained within the moderate hypnotisability category, but two rose to the cusp between medium and operationally defined high susceptibility, reaching scores of 8. A further two individuals clearly became highly hypnotisable—one reaching a score of 10 increasing from 5, and the other reaching a score of 11 increasing from 7.

3.2. Theta alpha ratio training

In order to determine whether participants had achieved operant control of their EEG, the theta/alpha ratio was calculated. A repeated measures ANOVA, with the within subjects factors SESSION [1–10] and PERIOD [1–7], showed a significant main effect of PERIOD (SPSS GLM: F(6,54) = 6.56, p_{GG} = 0.014). Fig. 3 confirms that the mean theta/alpha ratio increased monotonically within sessions. The figure shows the theta/alpha ratio collapsed across subjects and sessions, and plot.

![Fig. 3. Overall mean (of all 10 sessions) within session theta/alpha ratio for the neurofeedback subjects. The ratio rises steadily throughout the session, with each period demonstrating a within-session learning effect. Error bars denote standard errors.](image-url)
ted against period. The relationship between theta/alpha ratio and period was examined further by means of a polynomial contrast for PERIOD, which revealed a significant linear effect for theta/alpha ratio versus period ($F_{(1,9)} = 8.43$, $p = 0.017$). None of the higher order contrast effects were significant (all $F$'s $< 1.1$).

3.3. Theta, alpha and beta

Theta, alpha and beta bands were examined using the same statistical model. There were highly significant, or marginally significant in the case of theta, main effects of PERIOD: theta ($F_{(6,54)} = 3.43$, $p_{GG} = 0.054$); alpha ($F_{(6,54)} = 24.08$, $p_{GG} = 0.001$); beta ($F_{(6,54)} = 13.076$, $p_{GG} < 0.001$) in that mean amplitudes decreased within sessions. The polynomial contrasts produced highly significant linear effects, or effects approaching significance with theta: theta ($F_{(1,9)} = 4.74$, $p = 0.057$); alpha ($F_{(1,9)} = 32.36$, $p = 0.001$); beta ($F_{(1,9)} = 20.21$, $p = 0.001$) indicating a monotonic decrease in amplitudes within sessions, as examined previously for theta and alpha [16].

The rate of decrease in alpha for periods 5–6–7 was slower than that for 1–2–3–4 (quadratic effect for PERIOD $F_{(1,9)} = 15.57$, $p = 0.003$). Importantly, this within-session decrease in alpha amplitude was greater than the corresponding decrease in theta, giving rise to the increase in the theta/alpha ratio, as found previously [16]. No other main effects, interactions or contrasts approached significance (all $F$’s $< 1$).

3.4. EEG learning

In order to gain insights into the nature of changes in hypnotic susceptibility, neurofeedback subjects whose hypnotic susceptibility increased following neurofeedback were compared with subjects who showed no change in susceptibility on the three measures of EEG (alpha, theta, theta/alpha). The statistical model was a repeated measures ANOVA, GROUP (no change, change) by SESSION [1–10] by PERIOD [1–7]. None of the main effects or interactions were significant. The analysis was repeated to compare low scorers at pre-test (scores 2–4) and high scorers at pre-test (5–7) on the same variables. Again, none of the interactions, GROUP × PERIOD, GROUP × SESSION, GROUP × SESSION × PERIOD, were significant (all $F$’s $< 1$). Repeating the procedure to compare no/low change scorers (change 0 or 1) with moderate/high change scorers (change $> 2$) again produced no significant interactions (all $F$’s $< 1$).

An alternative analysis, breaking down the within-session changes in theta/alpha score by subject and session using regression, showed no significant differences between the regression slopes in the several groups. In other words, differences in modifiability did not relate to differences in the ability to achieve operant control.

4. Discussion

4.1. Empirical results

All three procedures were successful in increasing hypnotic susceptibility in moderately susceptible participants, and contrary to our predictions, all were broadly equally effective. Relaxation was a common feature of all three approaches, and, together with the fact that the relaxation procedure was as effective as neurofeedback and self-hypnosis, may indicate the importance of the relaxation dynamic and associated factors, such as reassurance, in enhancing susceptibility. The latter features are also implicit in intensive cognitive approaches to enhancing hypnotisability, such as the Sachs and Anderson [47] and CSTP [23] procedures. Interpretations that theta activity in hypnosis is a concomitant of relaxation [56] support this supposition. Indeed, increased theta is a hallmark of hypnagogia, the border between waking and sleeping, and also characterises many meditative states, including relaxation [48].

This is not the first occasion on which slower EEG rhythms have been associated with hypnotic susceptibility and its modifiability. That baseline levels of theta are correlated with hypnotic susceptibility has been previously documented [24,46]. Positive correlations have sometimes been found between alpha at baseline and hypnotic susceptibility [10,19,39], although this finding is by no means unequivocal [8,46]. Increased hypnotic susceptibility following alpha training has been reported [19,37]. These relations did not extend to shedding light on modifiability for comparisons between those whose susceptibility increased with those who remained unchanged, for differences in theta and alpha activity were uninformative.

The incidence of about half of the subjects (13/30) being resistant to change is in keeping with other reports [40]. Importantly 10/13 non-responders had pre-training scores of two or three, in keeping with our a priori hypothesis that subjects with low susceptibility are more resistant to raising their scores of hypnotisability in the setting of a standardised inventory. No subject showed a decrease in susceptibility, which would have been predicted in some were order effects operative. Certainly there is no cause for invoking as a confound the law of initial value, which here would mean the lower the level of susceptibility, the higher the potential for enhancement.

In modifiable participants (17/30) there was a weak but significant positive association between pre-training susceptibility level and magnitude of change. The modal peak was a two-point change which is typical of previous attempts, but 7/17 showed changes greater than this; up to five points in one subject. Two clearly became highly hypnotisable—one with a score of 10 increasing from 5, and one with a score of 11 increasing from 7. In fact, increases in susceptibility could occur at any level of hypnotisability, with one participant in the neurofeedback group showing a three-point increase from an initial score of 2. Most participants remained within the moderate hypnotisability category, but two rose to the cusp of high susceptibility, reaching scores of 8.

Both the lack of susceptibility to change in many with low levels, and the weak positive correlation whereby those with higher initial levels of susceptibility showed the greatest improvements, are in accord with evidence of the trait-like nature of formally assessed hypnotisability. This has been
shown through twin-study and test-retest methodologies [39,41]. The fact that hypnotisability is highly heritable does not mean that it is fixed, but it is better understood along the lines of inherent susceptibility. In other words, there is an inherent susceptibility to the potential level of hypnotisability that one can reach, without which all subjects would be able to enhance their hypnotisability equally. Accordingly the demonstration of the ability to enhance susceptibility has disclosed abilities that lay hidden prior to training in some, with the potential seen to be greater in those with the higher initial hypnotisability scores.

Even so, intervention procedures may override this inherent susceptibility to some extent, as shown here by the range of modifiability seen throughout the distribution. This is implied too by reports that positive correlations between pre- and post-training measures have been higher in non-intervention control groups than in the intervention groups themselves, suggesting that modification can be independent of pre-training [13,36,55]. Inspection of Fig. 2 shows that only in the neurofeedback group did a participant with the lowest hypnotisability score of 2 show a sizeable (three point) increase in susceptibility. This may simply be a chance finding, but in view of the work of others above it is worthy of investigation in a larger study.

4.2. Cognitive and clinical implications

Clinicians rarely see the need to assess patients formally for hypnotic susceptibility. The skilled clinician will induce hypnosis successfully in the majority of patients and will increase as a matter of course the level of hypnosis reached over sessions. Nevertheless, strategies for enhancing hypnotisability are not without clinical interest. At a practical level, self-hypnosis training has advantages. We reasoned that practice with self-hypnosis would also increase hypnotisability, encouraged by familiarity, reassurance and the comfort of practising it privately at home. This, we had hypothesised, lay behind psychoneuroimmunological studies of the efficacy of self-hypnosis training, where participants categorised prior to training as low or high in hypnotisability on the basis of standardised scales, disclosed similar benefits [29,30]. Here we have put this to the test, and self-hypnosis proved to be effective in some.

Similarly progressive muscle relaxation, often incorporated in hypnotic inductions, proved to be as effective as the other approaches. Thus, self-hypnosis and progressive muscle relaxation (both practised via CD), were found to be practical ways of facilitating hypnotisability in approximately half of all subjects. These methods are more cost effective than EEG-neurofeedback. Whether more elaborate procedures such as the CSTP would be effective in the same way and/or effective in the remainder who were non-responsive is an empirical question which remains to be answered.

Alpha/theta training afforded no advantage, and, on the face of it, it is not recommended, though with some provisos. Here, the session length of 20 min, though effective in our hands in enhancing music and dance performance and elevating mood in socially anxious students, may not be long enough to benefit states having affinities with hypnogogia, where sessions having double the length have been scheduled in earlier studies [25]. In addition, neither of our experimenters (BKT and SB) had any previous experience in administering alpha/theta training. The success in raising susceptibility by three points in a subject with the lowest level included in the study, if replicated, raises the possibility of its usefulness with low and typically resistant levels of hypnotisability.

4.3. Conclusion

In the field of hypnosis, while there are many conflicting theoretical viewpoints, there is universal agreement that individual differences in hypnotisability exist. Whatever the viewpoint on the validity of standardised scales for disclosing this individual variation, the results with these scales themselves disclose a range of variation, which has been seen to be fairly reliable over years [39,41]. Considering the many positive effects of hypnosis, such as enhanced immune functioning [27] and relief of pain from chronic conditions [11,35], the ability to enhance hypnotisability has considerable clinical utility.

Here operant conditioning of the theta rhythm, relaxation training, and self-hypnosis training with a strong relaxation component all resulted in increased hypnotic susceptibility in more than half our participants. Improvements were seen throughout the range of susceptibility, although there was a weak positive correlation whereby those with higher initial levels of susceptibility showed the greatest improvements. Thus, hypnotic susceptibility represents an important difference in individual aptitudes and in many participants, is capable of modification. Outstanding issues requiring clarification include which characteristics differentiate those with high versus low levels of hypnotic susceptibility and the extent to which they vary across different interventions. The present study intimates that while some interventions may be more efficacious than others, the degree to which change is possible, and the magnitude of this effect remains unclear. In addition, whether participants can be trained to achieve a virtuoso level of responsiveness or whether a limitation exists [40] has important practical and financial applications, particularly in clinical settings such as pain clinics.

Acknowledgements

We thank Ann Frick, Akira Naito and Tony Steffert for their insightful suggestions and practical comments.

References


