EFFECTS OF ELECTROMYOGRAPHIC FEEDBACK ON HYPNOTIC SUSCEPTIBILITY:
MORE PRELIMINARY DATA

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The purpose of this double-blind study was to determine if taped verbal relaxation instructions and response-contingent electromyographic feedback training would increase suggestibility or hypnotic susceptibility over that obtained with instructions and false or noncontingent feedback. The present data appear to confirm the hypothesis.

Relaxation instructions seem to be one of the independent variables that increase suggestibility (Barber, 1969). There is a growing recognition (Bandura, 1969) that verbal instructions and cognitive factors can significantly add to the power of reinforcement variables. It seems likely that a combination of verbal instructions and response-contingent feedback will be more effective in deepening muscular relaxation than verbal instructions alone.

Electromyographic (EMG) feedback seems useful in the induction of muscular relaxation (Budzynski & Stoyva, 1969; Green, Walter, Green, & Murphy, 1969). Further, EMG feedback-induced muscle relaxation appears to increase suggestibility (Wickramasekera, 1972).

The purpose of this double-blind study was to determine if taped verbal relaxation instructions and response-contingent EMG feedback training would increase suggestibility or hypnotic susceptibility over that obtained with instructions and false or noncontingent feedback. The specific hypothesis tested was that 10 sessions of relaxation practice with response-contingent EMG feedback would result in a greater increase in hypnotic susceptibility as measured by the Stanford Hypnotic Susceptibility Scale, Forms A and B (SHSS:A, SHSS:B), of Weitzenhoffer and Hilgard (1959) than would relaxation instructions and noncontingent feedback.

Method

Subjects

The subjects were 12 white undergraduate males between the ages of 18 and 22 who volunteered for a study of “relaxation training and hypnosis.” Those who admitted to a history of psychiatric problems were excluded.

Design and Procedure

Subjects were pretested by a research assistant with Form A of the SHSS. After pretesting, subjects were assigned to either a control (false feedback) or an experimental (accurate feedback) group. After the intervening EMG feedback treatment was administered by the author, the subjects were posttested by the previous research assistant who was blind as to which treatment group (control or experimental) the subject had been in. Hence, both subjects and hypnotist were blind as to feedback conditions.

After assignment to treatment groups, all subjects listened to the same set of taped instructions, which stated that they would be trained to relax deeply and that the EMG auditory feedback would facilitate this training process. The taped instructions followed closely those in the manual that accompany the portable EMG feedback apparatus. It included a simple explanation of the feedback system as basically an information system. The sequence of EMG feedback training and practice of tension-releasing cycling started with both auditory and visual feedback at the lowest sensitivity threshold, with electrodes placed on the forearm. After an initial 10-minute orientation period, all subjects received only auditory feedback. As the subject demonstrated progress by keeping the feedback at a low level (< 4 microvolts), the sensitivity was raised successively to the medium and high ranges and held there until the subject could reach the previous criteria at these sensitivity levels. A final plateau was reached in forearm training, and the subject could maintain a low level (< 4 microvolts) of feedback on high sensitivity. The electrodes were then attached to the area of the frontalis muscle of the forehead, and the previous training sequence (e.g., low to high sensitivity) was

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run. Both experimental and control subjects were reminded by the same taped instructions at the start of each training session to watch for and become familiar with the response-produced proprioceptive cue (heaviness, tingling, and numbness) of deep relaxation.

Procedures with control subjects differed from those with experimental subjects only with respect to the following conditions: (a) control subjects received false or noncontingent EMG feedback; (b) no changes in the sensitivity levels were made for control subjects (controls had no knowledge of this); and (c) the electrodes were moved from forearm to forehead for all control subjects at the start of the fourth session of training.

Feedback training consisted of 10 30 minute sessions. The subjects were seated on a large padded recliner during all procedures. After terminating his tenth training session, each subject was immediately retested with SHSS:B. All procedures were conducted individually. Posttesting with SHSS:B was done by the research assistant who was blind as to which subjects received the contingent EMG feedback. The entire study was done in the experimenter’s office at a mental health clinic, and experimenters attempted to restrict their verbal contact with subjects to the taped instructions for feedback training and standardized hypnotic procedures. During the orientation period (first 10 minutes of first session), all subjects (control and experimental) were given both visual and auditory “true” or response-contingent EMG feedback. After the orientation, the EMG console and visual feedback were placed on a table behind the subject’s chair. The earphones of control subjects were disconnected without their knowledge from the EMG console and connected to a recorder that delivered taped auditory EMG feedback from the actual first 10 relaxation training sessions of a psychiatric patient hearing “true” or response-contingent auditory EMG feedback. Hence, controls did not receive random feedback which would be frustrative but a pattern of feedback which had the appearance of progress because the feedback tone declined over time. But the decline or pattern of improvement was unrelated to anything the control subject actually did. Informal postexperimental inquiry indicated that the controls believed they were receiving accurate feedback and that they had improved substantially in their relaxation skills.

**RESULTS**

Not all experimental subjects reach the preestablished criterion of relaxation training, but all approximated it at the end of the tenth session of training. None of the control subjects even approximated the criterion for forehead muscle relaxation. This is surprising since all control subjects stated verbally that they felt they had learned to relax deeply, and none of them stated that they suspected the feedback was inaccurate.

Pretest and posttest scores for each experimental and control subject appear in Table 1. A Mann-Whitney test of the difference between the posttest scores of the experimental and control groups yielded a significant difference in the hypothesized direction \( (p = .001) \). A similar analysis yielded a nonsignificant difference between pretest scores. Hence, the experimental subjects who practiced relaxation with both the benefits of instructions and contingent feedback appeared to increase in suggestibility more than the control subjects who received only the benefits of verbal instructions with their relaxation practice.

**DISCUSSION**

The very small size and select nature of the sample necessitates caution in drawing conclusions and generalizing from these data. However, this study replicates previous findings (Wickramasekera, 1972) on identical subjects. EMG feedback-induced relaxation training appears at least to increase hypnotic susceptibility of young college males. It is important to determine next what aspects of the training procedure contribute to this enhancement.
Since relaxation instructions have been found to contribute to suggestibility (Barber, 1969), it is probable that delivering these instructions more effectively will enhance suggestibility. It may be hypothesized that relaxation increases suggestibility or response to verbal instructions through the mechanism of improved attention to verbal stimuli. The training procedure may teach the subject to reduce the “noise” within his body. About 80% of body mass is skeletal muscle, and restricting the “noise” from this source may enhance suggestibility by improving the subject’s capacity to attend to verbal instructions. To test this hypothesis, it is necessary to demonstrate that subjects in the contingent feedback group were in fact more muscullarly relaxed than subjects in the false feedback group. It has previously been shown that external sensory restriction increases hypnotic susceptibility (Wickramasekera, 1969, 1970a), and it is at least possible that internal sensory restriction (reducing the internal “noise”) may also increase the impact of verbal instructions (hypnotic test suggestions).

It may be argued that the critical variable in the study was subject expectancies rather than relaxation, that is, control subjects did not perceive the experiment like experimental subjects. Identical instructions, procedures, and instrumentation were used with both controls and experimentals. Covertly, inaccurate feedback was substituted for accurate feedback in the control treatment. But the inaccurate feedback was designed in such a way that over time it appeared to parallel the subjective experience of the control subjects. The decline of the feedback tone in the control group appears to be generally correlated over time with subjects' relaxation efforts, but the correlation was not perfect. Hence, by positively but noncontingently reinforcing the relaxation efforts, we appeared to create the illusion of improvement in relaxation skills, whereas, in fact, we may have only strengthened some subjective unknown responses of a “superstitious” (Skinner, 1953) nature. That this attempt to manipulate the subjective experience of the controls was generally effective was evidenced clinically by the spirited manner and sense of participation with which the control subjects approached the feedback training sessions and the feelings of gratitude they appeared to express for training in deep relaxation. None of the control subjects spontaneously questioned the veracity of the feedback tone. Other research in verbal conditioning indicates it is useless to infer “awareness” of response-reinforcement contingency or the lack of it—from subjects' verbal responses to progressively more suggestive interview questions (Bandura, 1969) with at best unreliable procedures (Weinstein & Lawson, 1963). It may be speculated further that it was some other variable which was the critical one. However, we are left with the fact that significant changes in a relatively stable dependent variable, hypnotizability (Hilgard, 1965), appear to have been demonstrated with standardized measure of the variable. This was done first in the context of a single-blind study (Wickramasekera, 1972) and has been reported now in a double-blind study. Furthermore, these changes appear to be a function of a relatively objective and simple training procedure.

The foregoing results lead to some clinically relevant speculations. It has been hypothesized (Wickramasekera, 1970b) that the primary value of hypnotic susceptibility scales in psychotherapy and behavior modification is that they indicate the extent to which the behavior of an individual may be controlled by verbal stimuli. Intuitively, it seems that verbal instructions provide the most economic, precise, and elegant means available today for controlling complex human behavior. Empirically, however, it seems that verbal methods of control are effective with only a relatively small proportion of the total population subjected to a verbal influence procedure like psychotherapy. Investigations with hypnotic susceptibility scales seem to reveal that there are significant individual differences in that particular type of susceptibility to control by verbal instructions which is called suggestibility.

The clinician even more than the research scientist is concerned in his everyday work with the prediction and verbal control of the behavior of specific individuals. Hypnotic research seems to reveal that for certain individuals, under certain conditions, the verbal control of behavior can be extended
beyond “base-line” levels (Barber, 1969), and that for many people control may be extended even further with the use of certain prehypnotic procedures (Pena, 1963; Sanders & Reyher, 1969; Wickramasekera, 1969, 1970a).

Clinicians are concerned with altering complex human behavior, and their effectiveness may be increased if methods can be found to increase the efficacy, reliability, and generality with which verbal control can be exerted on behavior. Sensory restriction (Pena, 1963; Sanders & Reyher, 1969; Wickramasekera, 1969, 1970a) and apparently “relaxation” training (which seems more complex than was previously thought) are procedures which, for reasons that are still unclear, appear to facilitate the verbal control of behavior.

If the establishment of a voluntarily induced relaxed state is found to increase susceptibility to control by verbal stimuli or hypnotizability, then EMG training may become a useful adjunct to a wide variety of psychological treatment techniques. Clinically, it seems that a major subgoal in relaxation training is to induce in the patient the subjective feeling of “letting go,” which when it occurs seems to increase the malleability of behavior. Subjectively, the experience of “trust” and “letting go” appear very similar, even though these subjective responses may be shaped up or elicited by procedures, for example, “core conditions” (Truax & Carkhuff, 1965) versus EMG feedback, which are objectively dissimilar. The development of reliable and effective procedures for altering or shaping subjective responses (private events) will contribute saliently to a reliable and powerful technology of behavior control. The importance of this subjective feeling of “letting go” has previously been recognized in more esoteric fields (e.g., Yoga, Zen, and religious conversion) and is currently coming into increasing recognition in the investigation of altered “states of consciousness” induced by a variety of agents (e.g., alpha and theta feedback training, LSD, and EMG feedback training).

REFERENCES


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(Received December 7, 1972)