Clinical and Experimental Restricted Environmental Stimulation

New Developments and Perspectives

With an Introduction by Ernest R. Hilgard

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A Model of the Common "Active Ingredient" in Stress Reduction Techniques

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Psychophysiological Stress, Short Term Memory and Negative Affect

Psychological stress (Lazarus, 1966; Appley & Trumball, 1967) has been implicated in the exacerbation or etiology of several medical symptoms (e.g., headaches, peptic ulcers, essential hypertension) and behavioral symptoms (alcohol, drug and tobacco abuse). Analyses of psychological stress emphasize the critical role of cognition (e.g., threat appraisal and labelling) in the sequence of events that comprise psychological stress (Lazarus & Folkman, 1984) and suggest that it is unlikely that physiological arousal alone, without aversive cognitive labelling of the arousal, is a sufficient condition for the acquisition and maintenance of chronic stress related clinical symptoms.

The stressors that impinge on these patients seldom involve tissue damage or the threat of tissue damage. Frequently, they present in intermittent ambiguous forms of threat to well-being or conflicts that elicit cumulative physiological arousal and/or intense ambivalent emotions in these people. These "psycho-social" conscious or
unconscious perceptions of threat and conflict may include an unhappy marriage, a problem child, the care of a sick or aging parent, a hypercritical boss, an unrealistic performance standard, rejection, or loneliness. These complex psycho-social problems elicit sympathetic activation that cannot be adequately remediated by primitive "fight or flight" methods of coping, or alternatively by modern drugs and surgery, as the somatizing patient (Wickramasekera, 1989) attempts to do.

The importance of conscious or unconscious (Kihlstrom, 1987) cognitive activity lies in the simple fact that most psychological stress is initiated and maintained not by tissue damage, but by rigid and developmentally primitive cognitive appraisals of threat to well-being, and the fixed emotional meanings we assign to psycho-social and environmental events over which we have little or no direct control. Rigid and irrational habits of cognitive appraisal (Ellis, 1962; Beck, 1976) can generate catastrophizing verbalizations which can transduce into "stressors," the inevitable psycho-social events (failure, delays, loss, uncertainty, rejection, etc.) of life. When cognitively appraised rigidly and simplistically as "threatening" or "intolerable," these events can lead to excessive and chronic psychophysiological arousal through the hypothalamic-pituitary-adrenal axis (H.P.A.A.) and other physiological mechanisms. Causing immunosuppression (Ader, 1981; Geiser, 1989), muscular or vascular pain, negative cognitive ruminations (e.g., anxiety, depression), neurotic avoidance (phobias) or self-medication (e.g., substance abuse).

The ability to transcend irrational cognitive constrictions and to see fresh solutions to perceived "threats" is the essence of creativity and insight. High negative (Watson & Clark, 1984; Watson & Tellegen, 1985) affect (fear, anger) and high levels of cognitive catastrophizing (Ellis, 1962; Wickramasekera, 1979, 1983, 1986, 1988) can keep the hypothalamic-pituitary-adrenal axis (H.P.A.A.) on "red alert," constricting cognitive resources. Consciousness or short term memory has a maximum attentional capacity limited to seven items, plus or minus two (Miller, 1956). If high chronic sympathetic activation (e.g., tachycardia) is cognitively appraised as a "threat" to well-being, then the bulk of limited conscious cognitive resources can be seized and dedicated reliably and exclusively to internal cognitive monitoring and
cognitive coping with the cognitive system's own inner subjective processes of threat perception and threat management. Cognitive resources may be chronically devoted to security operations like maladaptive cognitive scanning (repetitious scanning of internal cognitive threat perceptions) and maladaptive behavioral coping (avoidance). This may leave little or no conscious cognitive resources available for objective scanning and appraisal of the external environment or for creative cognitive coping with the problematic situation. Thus, the present perceptual representation of a "stressor" can be dominated by internally generated cognitive fantasies and memories and relatively devoid of externally generated sensory and environmental informational input. So that the perception of a given threat may be largely a constructed cognitive fantasy rather than a perceived sensory event. It is likely that the bulk of the cognitive resources of both the 1) conscious cognitive system and perhaps also the 2) unconscious cognitive system (Kihlstrom, 1987; Wickramasekera, 1991) are preempted whenever a threat is perceived, sympathetic activation occurs, and strong negative affect (e.g., fear or anger) is evoked. Hence, no cognitive resources may be available to appraise objectively and to cope creatively with the actual external problem. Threatening cognitive labels sustain sympathetic activation which can 1) inhibit objective perception of the "sensory" world and 2) block creative cognitive coping with real environmental threats. All the above factors increase the probability that the everyday perceptions, the emotions and the coping methods of the present and future will be similar to those of the past.

Creativity, the Perception of Threat, and Hypnotic Ability

Alterations in the perception of everyday events have been psychologically described by Kris (1951), Schachtel (1959), and others. Perception is altered in a way that increases the probability that events and problems in living (Szasz, 1960) will be looked at freshly. Schactel (1959) called this the "allocentric mode of perception" and described it thus. "This openness means that the sensibilities of the person, his
mind, and his senses, are more freely receptive, less tied to fixed anticipations and sets, and that the object is approached in different ways, from different angles, and not with any fixed purpose to use it for the satisfaction of a particular need, or the testing of a particular expectation or possibility. Reducing sympathetic activation, as in sleep, may indirectly reduce threat perception and disinhibit cognitive creativity. This disengagement of limited cognitive resources from chronic threat appraisal and coping and their availability for fresh or objective cognitive appraisal of the environment and creative coping can liberate present and future perceptions from the domination of the past maladaptive emotions and coping methods. Stressors may be recognized as the fantasies of a mind preoccupied with scanning its own inner workings and insulated from the objective environment by this cognitive preoccupation. Stressors can be perceived as stepping stones rather than as obstacles to well-being.

There is empirical evidence of a modest (r = .55) relationship between hypnotic ability and creativity (Bowers & Bowers, 1979). Hypnotic ability is an empirically well established construct and tools to measure its magnitude have high and known reliability and validity (Hilgard, 1965). There is evidence that two common procedural components in stress reduction techniques can at least temporarily increase hypnotic ability. The common procedural components that potentiate hypnotic ability are sensory restriction and muscular relaxation.

**Stress Reduction Techniques**

Five techniques have been proposed to combat psychophysiological stress. The best known of these methods are 1) Transcendental Meditation (TM), 2) Autogenic Training, 3) Progressive Relaxation, 4) Symbolic Desensitization, and 5) Frontal EMG and Thermal Biofeedback. There is some evidence for the clinical utility of these techniques with some patients with certain stress related problems (Blanchard et al., 1986, 1988; Wolpe, 1973; Schultz & Luthe, 1959;
Jacobson, 1970; Wallace & Benson, 1972). Where data is available, careful study demonstrates that: 1) there are individual differences in response to these stress reduction methods, 2) the "active ingredients" are not clear in these superficially very different procedures, and 3) the mechanism of change in clinical status and psycho-physiological response is not clear in these studies.

Similarities Among Stress Reduction Techniques

In spite of many historical, cultural, and philosophical differences between these stress reduction methods, it appears that they share at least three similarities at a procedural level. 1) All five techniques require the trainee to explicitly or implicitly restrict sensory stimulation during the exercises. For example, subjects are asked to close their eyes, lay or sit still, and concentrate attention on a repetitive stimulus or phrase. Hence, at least in this respect they are like Restricted Environmental Stimulation Therapy (REST). 2) All five procedures instruct the patient to relax, let go, and to reduce his level of psychophysiological arousal. Hence, all five techniques try to reduce sympathetic activation and threat perception. 3) All five techniques explicitly or implicitly seek to impact the patient's belief systems and structure positive therapeutic expectations. Their credibility is boosted by their association with systems (e.g., science, medicine, etc.) that already have high credibility (Wickramasekera, 1977b, 1985). For example, TM training is introduced with a display of charts and graphs and a lecture on the scientific basis of TM. Progressive relaxation (Jacobson, 1970) stresses its roots in the muscle physiology laboratory and EMG measurement. Desensitization (Wolpe, 1973) is introduced to a patient in clinical practice with reference to its roots in the conditioning laboratory and its presumed origins in scientific psychology. Clinical biofeedback uses impressive scientific-medical instruments and in fact, appears to have such high face validity that it requires no explicit statement of credentials. Autogenic training is preceded by a serious ritualistic measurement of vital functions (pulse,
blood pressure, etc.), which can create the impression that grave and healing events are at hand. The scientific and medical packaging of these five procedures may inhibit critical analytic skeptical brain functions. Their claims of clinical effectiveness are supported by empirical data and at least plausible and logical rationales. Hence, there is a deliberate structuring of positive therapeutic expectations.

1. Sensory Restriction and Potentiated Hypnotizability

Sensory restriction (REST) is one common procedural component of the five stress reduction techniques. It appears that sensory restriction procedures can be used to increase human secondary suggestibility (persuasibility) and to potentiate therapeutic expectations (Azima et al., 1961; Adams et al., 1963; Suedfeld, 1969a; Lilly, 1956; Hebb, 1966; Zukerman & Cohen, 1964; Orne & Scheibe, 1964; Lindsley, 1957). These reports have been critically and exhaustively reviewed in at least two authoritative texts (Zubek, 1969b; Rasmussen, 1973) and will not be elaborated on further. The studies to be reviewed here, however, constitute the first controlled empirical demonstrations that sensory restriction procedures also reliably increase primary suggestibility (Eysenck & Furseaux, 1945; Evans, 1967) or hypnotizability. Previous studies focused on secondary suggestibility and did not incorporate pre-post measures of secondary suggestibility of known reliability and validity.

Increased patient sensitivity to cognitive expectational manipulations can also be indexed by changes in primary suggestibility. Primary suggestibility or hypnotizability can be operationally defined by standardized pre-post scales, such as the Stanford Hypnotic Susceptibility Scales (1959) or the Barber Suggestibility Scale (1969) which have been designed to measure these behaviors. Hypnotizability is a variable whose parameters have been well established through careful laboratory studies (Hilgard, 1965; Barber, 1969).

In the last 25 years, several independently replicated studies with progressively tighter controls demonstrate that sensory restriction procedures increase hypnotizability (Pena, 1963; Wickramasekera, 1969,
1970, 1977; Sanders & Rehyer, 1969; Barabasz, 1982; Barabasz & Barabasz, 1989). Superior hypnotic ability appears to be associated with potentiated cognitive control of physiological functions (Barabasz & Lonsdale, 1983; Speigel & Barabasz, 1989; Spiegel et al., 1985; Spiegel et al., 1988; Ewer & Stewart, 1986; Murphy et al., 1989; Klein & Spiegel, 1989; DeBenedittis et al., 1989; DePascalis et al., 1988). Hence, the REST component common to all five stress reduction techniques may potentiate through hypnotic mechanisms the cognitive reduction of 1) sympathetic activation, 2) negative affect (N.A.), and 3) threat perception at least temporarily. Reduced threat perception (indexed indirectly by reduced sympathetic activation) may liberate cognitive resources for more 4) objective cognitive appraisal of the environment, and 5) creative cognitive coping with challenges in living.

An early study (Wickramasekera, 1969) supported the hypothesis that 30 minutes of sensory restriction enhanced hypnotizability as measured by Forms A & B of the Stanford Hypnotic Susceptibility Scale (SHSS). Experimental subjects were subjected to REST Experimental subjects wore padded earphones providing white noise, light attenuating goggles and wore cotton gloves. They were instructed to be silent and motionless for 30 minutes while seated in a recliner. Control subjects were simply told to come back after 30 minutes for post-testing. This study showed a significant increase ($p < .007$) in hypnotizability in the sensory restriction group and no change in the control group.

The second study (Wickramasekera, 1970) was a replication and extension of the previous study using 45 white male prisoners randomly assigned to one of three groups of 15 subjects each. Subjects in both experimental groups (one and two), received 60 minutes of sensory restriction (auditory-visual-tactile) delivered by a procedure identical to that described above. But subjects in experimental one were additionally read before exposure to REST, a set of verbal instructions intended to arouse anxiety about the effects of REST. Controls simply sat on the same chair in which experimental subjects had sat and listened to music and read magazines for sixty minutes. The results of this study confirmed the observations of the first study. Subjects in the two experimental groups (REST) increased significantly ($p < .005$) in
hypnotizability, but controls did not. Analysis revealed that the three groups were equated on initial susceptibility. When this second study was being prepared for publication, Professor Ernest Hilgard brought to my attention an unpublished dissertation by Pena (1963), which also used male prisoners. Pena used a control group plus two experimental groups receiving, respectively, one and one-half and three hours of sensory restriction. He found that the enhancement scores of the three groups were ordered in a direction that was consistent with the enhancement hypothesis. The group receiving three hours of sensory restriction obtained the greatest enhancement of hypnotic ability, and the control group the least.

![Graph](image)

Figure 7-1. Hypnotic ability and sensory restriction (REST).

Wickramasekera, 1969
Figure 7-2. Hypnotic ability and sensory restriction (REST).
Wickramasekera, 1970

A study by Sanders and Rehyer (1969) which used previously "resistant" subjects, also found that four to six hours of sensory restriction significantly increased hypnotizability at least temporarily. There is only one study (Levitt et al., 1962) involving hypnotizability that failed to replicate the above observations. The Levitt study involved three "resistant" student nurses. It appears that sensory restriction in a laboratory situation may enhance hypnotizability or primary suggestibility at least temporarily.

More recently, a series of very tightly controlled studies (Barabasz, 1982; Barabasz & Barabasz, 1989) used the most stringent measure of hypnotic ability, the Stanford Form C. Clever and careful controls for
generalization, follow-up testing, plateau hypnotizability, experimental demand characteristics, and motivational instructions were used. The Barabasz studies clearly show that chamber REST (six hours) enhances hypnotic ability. Reviews (Adams, 1964; Suedfeld, 1977) support the hypothesis that in a clinical situation, subjects show a positive therapeutic response to even a single session of mild to moderate sensory restriction. But these studies did not illuminate the mechanism of change elucidated by Barabasz (1982). The therapeutic regimens of autogenic training, progressive muscular relaxation, transcendental meditation, clinical biofeedback, and systematic desensitization increase the probability of numerous brief consecutive periods of sensory restriction which may have cumulative therapeutic effects through potentiated hypnotic ability. Potentiated hypnotic ability may be used through cognitive procedures to reduce sympathetic activation, reduce negative affect, indirectly reduce threat perception, and increase the cognitive resources available to access the "allocentric mode of perception".

2. Muscle Relaxation and Potentiated Hypnotizability

Relaxation instructions are a second common procedural component of the five stress reduction techniques. Relaxation instructions are one of the independent variables that increase suggestibility (Barber, 1969). It would seem that increasing the precision of relaxation training, and reducing sympathetic activation with EMG feedback may increase suggestibility even more significantly. In a preliminary study (Wickramasekera, 1971), contingent EMG feedback training temporarily but significantly increased hypnotic ability ($p < .001$). In the control group there was no change in hypnotic ability. Encouraged by these preliminary observations, we attempted replication. The only differences were that in the present (Wickramasekera, 1973) study, 1) there were 10, 30-minute feedback training sessions; 2) the post-testing for hypnotic susceptibility was done by a research assistant who was blind to the nature (contingent or non-contingent) of the feedback training the subjects received. We
again found that response contingent (true) feedback training increased hypnotic susceptibility significantly ($p = .001$) if only temporarily. There was no change in the control group which got false or non-contingent EMG feedback. Radtke et al., (1983), using procedures unlike mine, has reported a failure to replicate the above results.

But within the constraints of both our experimental situation and our clinical procedures with tension headache patients, we have often observed that those who succeed in learning to voluntarily and reliably drop frontal (to approximately 2 uV.p-p) EMG levels, appear more responsive to hypnosis on post-testing on the SHSS:B (Wickramasekera, 1976, 1977a). These observations are also consistent with the systematic EEG studies of Engstrom (1976) and the clinical EEG study of Melzack and Perry (1975) who used EEG feedback to potentiate relaxation induction.

The muscle relaxation training component common to these five stress reduction techniques may be another mechanism (in addition to REST) through which hypnotic ability is temporarily increased. Relaxation potentiated hypnotic ability may be a mechanism through which 1) sympathetic activation is reduced, 2) cognitive threat perception is indirectly reduced, 3) the probability of access to the "allocentric mode of perception" is increased.

3. Potentiated Placebo Effects and Positive Therapeutic Expectations

Structuring positive therapeutic expectations is another common component in the five stress reduction techniques under review. There is good consensus in both the psychotherapy and the medical literatures, that patient expectations can powerfully influence clinical outcome with both psychological and biological disorders (Frank, 1965; Shapiro, 1971; Beecher, 1959; Kaxdin & Wilcoxin, 1976; Strupp & Bergin, 1972; Goldstein, 1962). The medical literature shows that the effects of an active drug can be attenuated, potentiated, or reversed by expectational manipulations. The literature on the placebo effect (Shapiro, 1971) has shown that placebos can be more powerful than potent active drugs for placebo responders and that they can reverse
the action of such drugs. Placebos can have therapeutic effects on organic illness and malignancies. Studies have shown the dose-response, time-effect curves and the side effects of an active drug and a placebo to be similar (Evans, 1974). Beecher (1959) and Evans (1974) reviewed 36 double blind studies and found that a placebo reduced surgical pain by half its original intensity in 36 percent of patients.

There are currently at least three explanatory models of the placebo effect. The suggestion hypothesis (Shapiro, 1971; Barber, 1969) and the anxiety reduction hypothesis (Evans, 1974a,b) are the best known. Recently, I have proposed (Wickramasekera, 1977b, 1980, 1985) a conditioned response model of the placebo effect that operates through acquired expectations and Pavlovian conditioning. This third model (Wickramasekera, 1977b, 1980, 1985) explains and predicts the observed clinical outcomes of the present five stress reduction procedures.

It appears that people of high hypnotic ability condition more rapidly in both operant and respondent learning situations (Edmonston, 1979; Wickramasekera, 1980, 1985). The REST and relaxation training procedures in the five stress reduction techniques appear to potentiate hypnotic ability. Hence, people with increased hypnotic ability should condition more reliably and powerfully and will therefore be better placebo responders than people of low hypnotic ability. The five stress reduction techniques may also potentiate the conditioned response mechanism of the placebo effect.

Hypnotizability as a Factor in Risk, and Therapy of Stress Reactions

High and low hypnotic ability people are especially at risk for stress related disorders, because they are respectively hyper- and hyposensitive (Wickramasekera 1979, 1983, 1986, 1988). Therefore, enhanced hypnotic ability may be both a liability (hyper- and hyposensitivity) and an asset (because it can be used to reduce sympathetic activation, reduce threat perception and to increase creativity) in the management of stress related disorders.
The enhanced hypnotizability associated with REST and/or muscular relaxation (e.g., low frontal EMG) potentiates the verbal-cognitive control of behavior and physiology (Wickramasekera, 1976, 1977a) bringing even temporarily, psychological and physiological systems closer together in a functional sense.

![Diagram](image)

Figure 7-3. Degrees of proximity between psychological and physiological functions.
Hence, verbal relaxation instructions (a psychological function) can be used to induce a state of low physiological arousal (inhibition of the H.P.A.A.) which is very often an indirect index of reduced threat perception in the cognitive system. Limited cognitive resources (seven, plus or minus two) may be liberated from chronic dedication to security operations. This cognitive state (inhibition of chronic preoccupation with the perception of threat) will be indexed in the cognitive system by 1) reduced conscious catastrophizing, 2) reduced conscious negative affect (neuroticism), and 3) reduced unconscious negative affect (reduced sympathetic reactivity) (Wickramasekera, 1979, 1983, 1986, 1988, 1991). In this low threat perception mode ("allocentric" mode of perception), larger portions of the cognitive system are available to freshly appraise old problems and for creative coping and problem solving as described by Kris (1951) and Schactel (1959). The "allocentric mode of perception" increases the probability of creatively approaching old problems in living, finding "meaning" in what seemed meaningless, looking freshly at everyday events, and noticing alternatives where none seemed to exist before. These cognitive and perceptual changes can generate more adaptive behavioral and biological coping methods, and the positive personal or environmental consequences can further reinforce these perceptual shifts. The patient may become more willing to take risks, acquire new skills, explore his environment, and persist in adaptive coping behavior in the face of temporary uncertainty or non-reinforcement. The absence of such an adaptive cognitive and perceptual attitude can be at least as crippling to self actualization as the absence of an arm or leg.

The increased cognitive control of autonomic functions that a patient often experiences, with repeated practice of the five stress reduction techniques (all of which may unintentionally increase hypnotic ability) can add considerably to the patients conviction of "self efficacy" (Bandura, 1977), apart from actually reducing the frequency or intensity of a specific symptom (e.g., tension or migraine headache pain). "An efficacy expectation is the conviction that one can successfully execute the behavior required to produce an outcome" (Bandura, 1977). Self efficacy is postulated by Bandura (1977) to be the primary determinant
of the intensity and duration of coping behaviors, assuming the patient has the relevant skills and incentives.

Conclusion

Sensory restriction and muscular relaxation potentiate hypnotic ability and the placebo effect. Potentiated hypnotic ability can cognitively reduce sympathetic activation and enhance creativity (Bowers & Bowers, 1979). It is a major hypothesis of this paper that an alteration in physiology alone is not a sufficient condition to induce durable positive clinical outcomes, particularly if there is little or no long term change in the aversive features of the patient's environment. Low physiological arousal may indirectly index temporarily reduced cognitive threat perception, and increased availability of cognitive resources for objective appraisal of the situation and creative cognitive coping. But an additional essential condition, for durable positive clinical outcome is a stable change in the way the patient cognitively appraises, and creatively copes with, "threatening" information, so that new coping skills are learned and social support systems acquired to elevate the patient's general level of positive affect (Watson & Tellegen, 1985).

The disengagement of constrained cognitive resources from preoccupation with threat perception and their availability for engagement in fresh and creative cognitive coping may enable obstacles to be seen as stepping stones. Reducing negative affect (threat perception) enables the patient in stress reduction therapy to risk experimenting with new cognitive and behavioral coping skills that are essential for dealing adaptively with the inevitable major and minor changes in life. It is predicted that: 1) Pre-post tests of hypnotic ability, before and after systematic and extended training in the five stress reduction techniques will show significant increases in hypnotic ability; 2) The delivery of a) pure forms of REST and b) generalized muscle relaxation will be more effective in increasing hypnotic ability than either condition alone.