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RESTRICTED ENVIRONMENTAL STIMULATION THERAPY IN THE TREATMENT OF ESSENTIAL HYPERTENSION

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Summary—Restricted Environmental Stimulation Therapy (REST) has been useful in treating a variety of health-related problems, including obesity and cigarette smoking. The pilot project described in this paper used 24 hr of REST (darkness and silence) with four patients suffering from essential hypertension. Long-term changes have included lower blood pressure, a reduced need for medication, and improved coping with stressful life events.

INTRODUCTION

The control of blood pressure with the use of behavioral procedures was one of the earliest concerns of health psychology, and has been the subject of much research. Blood-pressure biofeedback, for example, has shown positive effects in reducing both systolic and diastolic pressure in a number of studies (reviewed in Blanchard and Miller, 1977). Biofeedback techniques have also been used as adjuncts to relaxation training, and as indices of how effective such training is. Systematic relaxation has been shown to obtain blood-pressure reduction beyond that achieved by placebo or other control procedures (Jacob *et al.*, 1977). Although some writers (e.g. Frankel *et al.*, 1978) have argued that it should be viewed primarily as an adjunct to antihypertensive medication, there is little doubt that relaxation is one of the more promising behavioral techniques in the management of essential hypertension (Tarler-Benlolo, 1978).

The pilot study reported here used relaxation training in conjunction with a technique that has not hitherto been applied to hypertensive patients, and that may be particularly appropriate as one component of a multimodal treatment package. This technique is Restricted Environmental Stimulation Therapy (REST), in which the patient is placed for a relatively long period of time into an environment of severely-reduced stimulation. There are several ways of achieving this condition (Zubek, 1969); two of the most frequently used are lying on a bed in a dark, soundproof room and flotation in a liquid substance in a tank located within a dark and soundproof enclosure. A great deal of previous research has found that such environments facilitate therapeutic progress among both institutionalised and non-institutionalized patients with psychiatric and behavioral problems (Suedfeld, 1980).

REST has been perceived as a cost-effective method for obtaining long-range changes in behaviors related to health maintenance. In some ways, it is similar to (and may in fact be classified with) a category of refocusing and relaxation therapies. It provides a period of low distraction, removal from external demands, and opportunity to consider one's problems and their possible solutions. One of its most striking features has been the fact

that its positive effects seem to be maintained at a higher level long after the cessation of treatment than has been the case for many other behavioral techniques (Suedfeld, 1980).

There are theoretical parallels between the use of biofeedback and that of REST in the treatment of hypertension and similar stress diseases. The major function of biofeedback is to make the client more aware of internal cues. This is accomplished by the amplification of the signal emanating from bodily processes, and its conversion when necessary from one modality to another. For example, the kinesthetic stimulation that is normally the only observable feedback of muscle tension may be converted to a visual display or an audible tone. Both signal amplification and signal transformation have the effect of making the stimulus more salient, and thus more likely to be attended and reacted to.

REST approaches the same goal from a different angle. Rather than making the signal stronger, it severely reduces the bombardment of competing inputs that normally serves as 'noise' interfering with the processing of relevant signals. Many subjects report that awareness of internal sensations is heightened in REST. In fact, there are bodily processes that give rise to stimulation of which the individual had never before been aware. Since REST requires only one session, without elaborate training and equipment, it may in at least some cases serve as an economical and effective counterpart of biofeedback procedures.

In addition, REST leads to a greater awareness of whatever external stimuli are available. Participants become more receptive to new information (Myers *et al.*, 1966) and more responsive to instructional and persuasive messages (Suedfeld, 1969a, 1977). Thus, the technique may facilitate relaxation and lifestyle changes when it is combined with appropriate inputs.

PROCEDURE

The pilot study was conducted with three patients from the practice of one of the authors (C. Roy), a psychiatrist interested in biobehavioral problems and treatment approaches. All three had originally been referred by their primary physician to a cardiovascular clinic, where they had been diagnosed as suffering from essential hypertension. They were being maintained on sizeable doses of medication, in spite of which their blood pressure did not reach normal levels. They had then been referred to Dr Roy for psychotherapy and biofeedback treatment. These approaches likewise failed to obtain sufficient reduction in blood pressure, and the patients were referred by Dr Roy to the clinical research program using REST that was being conducted by the other two authors. A fourth participant was a personal acquaintance and colleague of Dr Roy.

The only criteria for inclusion in the study were that the diagnosis was one of essential hypertension, that medication and psychotherapy had not been successful in achieving normal levels of blood pressure, and that the patient was willing to undergo 24 hr of REST. This was described to the patients as a technique that had previously been used successfully in treating problems (smoking, obesity) related to cardiovascular illness, but whose use in the treatment of high blood pressure *per se* was experimental and whose effectiveness in this context was unknown. The actual procedure was described in detail. Each patient was given a session in which the stressful aspects of his or her life situati were discussed, in the general mode of Rational–Emotive Therapy (e.g. Ellis and Harper, 1976), with P. Bruce Landon, the third author of this paper.

The REST method used in all cases consisted of 24 hr of lying on a bed in a completely dark and sound-reduced chamber. Immediately after entering the chamber, *S*s were given brief relaxation training (Bernstein and Borkovec, 1973). They were also encouraged to practice the relaxation exercise while they were in the chamber. No other communications were presented during the REST session. Throughout the session, water and liquid diet food were available *ad libitum* at the bedside. A chemical toilet was located in the room. Thus, the reduced-stimulus environment was only minimally disrupted either for meals or for the use of the toilet. A monitor was always present in the next room, and listened to the patient over the intercom to ensure that no problems arose. Dr Roy and one of the other two authors were always on call in case of medical or psychological

complications. No such complications occurred; all of the patients completed the 24-hr REST session without any trouble or major sign of discomfort, anxiety or other aversive reaction.

Throughout the project, medical supervision was continued by Dr Roy. Follow-up data were collected by the staff of the REST research clinic, by Dr Roy, and by the referring cardiologists.

CASE STUDIES

Medical effects

Patient A. When referred, Patient A had been suffering from hypertension for approx. 10 yr, and had had two moderate strokes. He had also had a left-side hemiparesis 2 yr earlier, and had not worked full-time since then. Prior to his being referred, his blood pressure (BP) had been varying from 180/100 to 190/120 mmHg, and he had complained of feelings of dizziness and vertigo occurring two or three times daily. He was also suffering from tachycardia, angina pectoris and chronic allergic wheezing. He was 6 ft tall and weighed 185 lb. He was smoking approx. 10 cigarettes a day.

When first seen by Dr Roy, he complained of severe dizziness and chronic tension and anxiety. He had been taking substantial medication, prescribed by the referring cardiologist. The dose included propranolol (80 mg per day), HydroDiuril (50 mg), Isordil (5 mg when needed for angina) and Valium. In spite of this regimen, his resting BP was still 160/100.

One month after REST treatment, Patient A's progress was such that he was taken off all medication by his physician. His unmedicated BP was steady at 140/80. Six months afterward, his wife was killed in an automobile accident, which in addition involved Patient A in a complicated and stressful court case. At that time, medication including Valium was reinstituted.

Approximately 3 yr after the REST treatment, his BP was 150/90. He was taking 20 mg of propranolol per day, and was not receiving any other form of medical treatment or psychotherapy. He was abstinent from cigarettes, and had lost approx. 22 lb.

Patient B. When first seen, Patient B was a 33-yr-old married housewife and mother of two children. She was referred to Dr Roy with a history of hypertension and generalized anxiety. She had been taking various antihypertensive drugs for approx. 4 yr at that time (reducing her BP from 210/130 to 150/115), and was undergoing psychotherapy for marital stress. When tested immediately upon referral to Dr Roy, her resting BP was 140/95. Psychotherapy was ineffective in dealing with either her medical or her psychological problems, and she was therefore referred to the REST program. After the session, her BP dropped to 110/70; 6 months later, it was still at that level and her only medication was an anti-depressant at nighttime to help her sleep (Surmontil, 25 mg).

One year later she sold her house and returned to her native England, so that further follow-ups were not feasible. At the time of her departure, she had reduced her smoking from over two packs of cigarettes per day to less than one. No direct information is available about her BP or related problems.

Patient C. When first seen, Patient C was 43-yr old. He was somewhat overweight (5'9", 170 lb) and suffered from occasional headaches and transient dizzy spells, usually at times of stress. He had been hypertensive for approx. 5 yr, and at the time of the first referral was taking Aldomet (500 mg per day) and was maintaining a BP of 140/90. His family history revealed a repeated occurrence of cardiovascular problems.

After REST, his dosage of Aldomet was reduced by half. In spite of this decrease, his BP remained down (138/88). Approximately 18 months later, his BP was 120/80, and he was taking 300 mg of Lopresor per day. At the time of the 3-yr follow-up, he had lost some of his excess weight, and had a BP of 120/80. He was taking only 100 mg of Lopresor daily.

Patient D. This patient is a 46-yr-old male physician with a family history of cardiovascular illness. He has suffered from chronic insomnia for approx. 20 yr, depending upon a

variety of hypnotics for falling asleep. He was diagnosed as hypertensive in 1969 (BP of 150/105), and was then put on Chlorthiazide and a weight-reducing diet. After a few months of relief, he again showed hypertensive symptoms, and consulted a prominent cardiologist. With his BP at 150/110, he was put on 250 mg of Aldomet per day, a prescription that was continued until 1973. At that time he was put on Diazide, and in 1978 on a regimen of 40 mg of Inderal twice a day in addition to Aldomet and Diazide. About 2 yr ago, he took a course and began to practice transcendental meditation; however, this had no appreciable effect on his health.

He became acquainted with the REST program during the course of a conversation with Dr Roy. Eventually, he took a leave of absence from his work to participate in the program. Upon arrival, his BP was 160/110, in spite of the medication he was taking.

During the REST session, he found that he was able to sleep without any medication for the first time in many years. He stated that he thought he had slept 16–18 hr, and also had practiced the meditation exercises that he had learned previously. During the week following the session, he was monitored by Dr Roy. His blood pressure at the end of that week was 120/90, although he had taken no medication (with the agreement of his cardiologist) since he entered the chamber. His pulse remained below 74, and he was sleeping normally without drugs.

The recency of his participation in the REST program precludes any further follow-up data on Patient D.

Life changes

Many *Ss* in previous REST studies have reported that the session gave them an opportunity to engage in considerable introspection and self-searching (Lilly, 1977; Suedfeld, 1977; Zubek, 1969). Those who enter the environment with specific personal problems frequently use the time to think about these difficulties and to generate and evaluate possible solutions. Since in one of our previous studies on smoking cessation we had found that major lifestyle changes sometimes followed and were attributed to the REST experience (Suedfeld and Best, 1977), the first three hypertensive patients described above were also queried about general life aspects during psychiatric interviews on follow-up. Naturally, there is no evidence that would justify the assumption of a causal relationship between REST and the changes that were found in lifestyle and stress management; however, it is interesting that all three of the patients referred to us for the treatment of essential hypertension did evidence significant improvements in adjustment.

Patient A. At the time of the automobile accident in which his wife was killed, both his primary physician and the patient himself indicated that the REST treatment seemed to have been instrumental in enabling him to survive the traumatic events of her death and the subsequent court case without suffering another stroke or major health setback. Three years later, Patient A reported that he had adjusted well to the death of his wife. He no longer had sleep problems nor depression. He felt fit and active, and was waiting to hear the outcome of his lawsuit. He was engaged, and was planning to marry once the suit was settled. He seemed to have solved his previous problem of tension and anxiety, and was judged to be well-adjusted, assertive and cheerful. Aside from his successful adaptation to traumatic life events, he continued to maintain effective behavioral self-management of health-related conditions (smoking and weight control).

Patient B. Shortly and up to 6 months after the REST treatment, Patient B reported that she had changed her approach to her life problems. She had accepted the bad situation with her husband realistically, instead of continuing to deny the difficulties, and had separated from her husband. She had also given up her previous habit of visiting the psychiatrist at least once a week without a previous appointment to talk about her problems. She was making plans to renew her occupational skills and to find a job. Again, her departure for England made it impossible to obtain further follow-up data.

Patient C. When first seen by Dr Roy, Patient C showed signs of depression and anxiety, most of them related to marital problems. His wife was a successful community leader and business woman, who was the primary manager of their jointly-owned enter-

prise. Patient C felt that she was more successful than he, and he also feared that she was becoming involved with another, more prominent man, whom she had met in the course of her business dealings. In the most direct relationship between REST and lifestyle change, he reported soon after the session that he had become much more assertive and more open about his resentment of his wife's activities. For the first time, he had discussed his objections and unhappiness with her. They had both entered couple and individual counseling with Dr Landon. At the time of the 18-month follow-up, the patient had separated from his wife and had moved into his own apartment. He was also successfully running his business. At the 3-yr follow-up, the picture was of a bright, cheerful and self-confident individual. He had moved to a different city in order to live near a woman whom he later married and then had moved back, had reestablished his business, and was doing well.

DISCUSSION

All four of these patients showed improvement both in the primary complaint of hypertension and in associated stress-management and health-related behaviors after having gone through relaxation training and REST. The improvement in sleep reported by Patient D is compatible with subjects in other REST studies, including a chronic insomniac who took part in a study dealing with weight reduction (Suedfeld and Clarke, 1982), who also stated that her sleep disturbance had disappeared during the session and had not recurred during the 1-month follow-up. It should be noted that these patients represented the entire group referred to the REST clinic by the examining cardiovascular specialists and the referring psychiatrist.

Obviously, on the basis of this pilot project it was not possible to ascertain the exact role of this particular treatment. However, health changes were compatible with those found previously in larger-scale, controlled studies with systematic follow-up on the effects of REST on smoking and weight reduction (Suedfeld, 1980). The positive life changes were also similar to those evidenced by previous REST subjects.

The use of REST with clinical patients has frequently included other therapeutic components as well. In the cases reported in this paper, those other components were relaxation training and Rational–Emotive Therapy. Although the relative contributions of the three techniques remain to be clarified, there is good evidence that—unlike some therapeutic methodologies (see, e.g. Friedman and Taub, 1977)—REST has the effect of increasing the potency of at least some other behavioral self-management interventions. Such reactions, coupled with the low cost of REST in time and money, support the view that stimulus reduction may be a widely applicable addition to the repertoire of behavioral medicine.

Why is the technique so effective, particularly given its brevity compared to other intervention techniques? And what are the mechanisms that underlie its wide range of apparent applicability? There is certainly no shortage of theoretical propositions that attempt to explain the impact of REST (see Suedfeld, 1980). Some are neurophysiological: removal or distortion of normal stimulus inputs results in alterations of the functioning of the brain stem; REST produces changes in arousal that lead to a twilight state characterized by relaxation, pronounced theta waves and the reduced dominance of the left hemisphere. Others are cognitive: reductions in external stimulation ('noise') lead to increased focussing of attention on internal thought and emotional processes ('signal'); existing habitual patterns of attitudes and behavioral readiness become destabilized and more open to change. There are also purely social hypotheses: it would be cognitively dissonant for individuals who have gone through such a dramatic experience not to change; the primary mechanism is that of expectancy and non-specific effects.

The three theories most relevant to the health applications of REST appear to be those based on changes in signal-to-noise ratio, an explanation relating the technique to such procedures as meditation and biofeedback; relaxation effects related to changes in arousal and in the functioning of both the central and autonomic nervous systems; and the

increased ability to self-regulate biobehavioral systems both cognitively and physiologically (Suedfeld and Kristeller, 1982). All of these theoretical approaches are compatible with the wide impact of REST, viewing it as a category of interventions analogous to, for example, operant conditioning, in the sense of being applicable with appropriate modifications to a variety of problems.

The topic of non-specific effects and expectancy has been brought up repeatedly in relation to REST, in the context of both basic research and applications (Jackson and Pollard, 1962; Orne and Scheibe, 1964; Reed, 1962; Suedfeld, 1969b, 1980). The technique is dramatic, and the unique nature of the experience may potentiate whatever other therapeutic effectiveness it possesses. Clinical researchers using REST have incorporated various kinds of placebo control groups in their designs (see Suedfeld and Kristeller, 1982), without obtaining equivalent results in those groups; but one could argue that none of the placebos had the psychological impact of REST itself. In fact, it is difficult to think of a very dramatic procedure that is actually inert. However, current research in our laboratory does include one procedure that appears to have this characteristic, and another in which we try to eliminate any positive expectancy as to the treatment effectiveness of the REST condition. Perhaps the most relevant point to make at this stage is that if there is nothing to REST except the placebo effect, it is an extremely powerful one whose long-term impact compares favorably not only with other placebos but even with active treatments, both physiological and pharmacological.

This is one issue that needs to be further investigated. Others include the comparison of chamber and flotation REST; parametric manipulations of such factors as REST duration, message content, number, length and timing of presentations; and cost-benefit comparisons with other techniques. Research is also needed to find the optimal combination of REST and other interventions, as well as to test the usefulness of the procedure in regard to a greater range of biobehavioral problems. Perhaps most important are the needs for replication, for better controlled studies with larger numbers of subjects, and in general for moving from pilot and case studies to develop a reliable data base on relatively large-scale clinical trials. There are problems of funding and facilities involved in this; but the most important problem is that of gaining sufficient acceptance and objectivity by the psychotherapeutic and medical communities for the attempt to be made.

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