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AN EXPLORATORY INVESTIGATION OF CES AS AN EMPLOYEE STRESS MANAGEMENT PROCEDURE

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INTRODUCTION

In recent years work-related stress has been the object of increasing interest on the part of organizational researchers, health practitioners and providers, and managers. (Matteson and Ivancevich, 1982) While stress researchers, years after the pioneering work of Selye (1946), are still having difficulty describing, explaining, and classifying stress and stress reactions (Cooper and Payne, 1980; Holt, 1982; Shuler, 1980), there is little question that stress and its prevention and management are important organizational concerns.

Sethi and Schuler (1985) identify four major reasons why dealing with work-related stress has received the attention it has. The first of these is the well-established link between stress and health. Major health problems associated with stress in organizations include a variety of mental and physical dysfunctions, not the least of which is coronary heart disease, a major killer and disabler. The second reason—and one closely related to the first—is the financial impact of stress. The cost of stress-related illnesses and healthcare alone is significant, perhaps as much as \$100 billion a year. (Ivancevich and Matteson, 1980) Albrecht (1979) estimated the annual cost to be close to \$1,800 per employee.

The third reason identified by Sethi and Schuler (1984) relates to expanded definitions of organizational effectiveness and the view that, in addition to productivity, profitability, and return on

investment, there is a need to evaluate organizations on the basis of employee health, satisfaction, absenteeism, and turnover, all of which may be related to work-related stress. Finally, there are legal reasons why organizations are interested in stress and stress management. The growing number of lawsuits filed by employees against their employers for stress-related injuries and the increasing levels of stress-related worker compensation claims are testaments to this concern. (Ivancevich, Matteson, and Richards, 1985)

Despite the awareness that stress is a growing, costly, and legal problem, frequently associated with declining productivity and significant health consequences, reviews of the literature note a paucity of scientific studies evaluating stress reduction and management procedures. In one such review, Newman and Beehr (1979:35) note:

Perhaps the most glaring impression we received from the review was the lack of evaluative research in this domain. Most of the strategies reviewed were based on professional opinions and related research. Very few have been evaluated directly with any sort of scientific rigor. In spite of this weak empirical base, many personal and organizational strategies for handling stress have been espoused. Although some of these strategies seem to glow with an aura of face validity, there remains the extremely difficult task of empirically validating their effectiveness.

Although the status of evaluative research has not changed significantly since this review, the lack of an empirical base has not dampened the enthusiasm of a growing number of organizations who have embarked on some type of stress management program. For some companies, this has meant a one-time stress "lecture" wherein interested employees are informed of the dangers of stress and provided with a list of preventive and/or management techniques; for other companies, stress management is a part of the administration of an overall health enhancement program which may include exercise facilities, nutrition counseling, smoking cessation, medical screening, and a host of

other life style-related programs, in addition to stress management. The vast majority of organizations with activity in this area fall somewhere in between these two extremes. (Pelletier, 1984)

The corporate healthcare umbrella under which a growing number of worksite stress management programs are being placed is the Employee Assistance Program (EAP). When the first EAPs were developed 40 years ago, they were exclusively alcoholism treatment programs. As companies began to realize that problems other than alcohol abuse affected job performance, these programs broadened their scope of involvement to include, among other activities, stress management. (Numerof, 1983)

Because there is no universally established model, the range of activities and services available through EAPs is diverse. While almost all offer short-term counseling and employee education (Numerof, 1983), specific techniques vary greatly and range from self-learning of specific relaxation techniques to intense counseling sessions with a trained therapist leading to individually-tailored coping strategies. (Lettieri, 1984) In between may be found meditation lessons, biofeedback training, cognitive restructuring, behavioral skills training, and combinations of these and other methods. While only a small percentage of those experiencing difficulties participate in EAPs (Rosen, 1984), the diversity of program offerings and treatment modalities available for these employees is well-established.

One reason for the plethora of different approaches is the aforementioned lack of evaluative research, which in turn may be partially accounted for by the fact that stress itself is a highly individualized phenomenon which has been conceptualized in a variety of ways and lacks a universally accepted definition. Similarly, the term **stress management** has a multitude of meanings which include activities designed to eliminate stressors, prevent stress responses, inhibit stress reactions, mask stress symptoms, and/or facilitate a general state of relaxation. For purposes of this investigation, stress is seen as an adaptive response that is a consequence of any external action, situation or event that places special demands upon a

person. (Ivercevich and Matteson, 1980)

The consequences of this adaptive response may manifest themselves in different ways, including physiological, psychological, and behavioral effects. Stress management may thus be viewed as any activity designed either to minimize the likelihood of an adaptive response occurring or decrease the frequency or intensity of undesirable physical, psychological, and behavioral consequences. The purpose of this article is to report on an exploratory investigation of the efficacy of a relatively new biomedically-based approach to managing stress: cranial electrotherapy stimulation (CES).

BACKGROUND OF CES

Cranial electrotherapy stimulation is a procedure used in the treatment of severe stress-related disorders such as extreme anxiety and depression, particularly when associated with alcoholism and various other chemical dependencies. In general CES involves the induction of a relaxed state by the transcranial application of a low intensity electrical current provided by a specially-designed electronic apparatus. (Henderson, Church, and Lee, 1973) It should not, however, be compared to electroshock treatment which involves significantly higher current levels and is associated with convulsions and unconsciousness. CES as a method of clinical treatment was originally developed in the Soviet Union in 1949, although it was not until the 1960s that its use began to be investigated in the United States. (Rosenthal and Wulfsohn, 1970)

With very few exceptions, the use of CES in this country has been associated with psychiatrically disturbed patients in the treatment of severe anxiety and depression. It has been most extensively used and investigated in connection with alcohol and other substance abuse programs where the anxiety, depression, and frequent insomnia accompanying withdrawal of alcohol and other drugs in abusers are significantly reduced when patients receive CES as a post-withdrawal treatment. (Smith, 1982; Gomez and Mikhail, 1979) Numerous well-designed and controlled studies have demonstrated its effectiveness as part of detoxification programs. (Smith, 1982)

In clinical settings, CES treatment is typically administered once a day for approximately 30-60 minutes for a period of 2-3 weeks. The individual receiving treatment may or may not detect a very mild electrical stimulation which, if sensed, is for most people not at all uncomfortable. In order to maintain longer lasting benefits of CES, treatment may be continued at irregular intervals following the initial 2-3 weeks.

As is true with a number of medications (e.g., aspirin), the mechanism of action of CES is not fully understood. Research has established that current from CES treatment does enter the brain area (Dymond, Coger, and Serofetinides, 1975) and is of sufficient physiological significance to alter brain wave activity, specifically increased alpha waves (Cox and Heath, 1975). Kotter et. al. (1975) found that CES significantly reduced gastric secretion of hydrochloric acid during actual treatment and that this effect was maintained even when the acid system was challenged with the oral administration of benodryl. On the basis of these results, it has been hypothesized that CES treatment alters hypothalamic activity, although additional research is needed to confirm this hypothesis.

In summary, CES has demonstrated effectiveness in producing significant changes in a variety of applications with "disturbed" and/or chemical-dependent persons. What has not yet been investigated is how useful the treatment might be as a stress management strategy for normal (non-psychiatrically disturbed) individuals. If, for example, CES is useful in mitigating negative stress reactions in chemical users, might it not also be useful for employees in work organizations experiencing stress which, while perhaps less severe, is nonetheless dysfunctional? Would these users of CES indicate reductions in self-reported stress, tension, anxiety, and somatic complaints, including sleep problems? If so, because of a unique characteristic of CES (which will be discussed in detail later), its addition to the array of options available to EAPs and other organizational stress management programs is potentially quite significant. This present study was designed as a preliminary investigations of the above questions.

METHOD AND PROCEDURE

Sample

Participants were volunteers from three separate classes of an Executive MBA program at a large urban university. Volunteers from two of the classes were used as a CES treatment group while participating individuals from the third class were used as a non-equivalent control group. Participants in both treatment and control groups ranged in age from 28-48 and were employed in middle management positions (or the equivalent) in a variety of small, medium, and large corporations. A total of 40 individuals agreed to participate in the group receiving CES treatment. Eight were unable to complete the treatment, resulting in a usable N of 32. Twenty-two individuals participated in the class used as a non-equivalent control.

CES Apparatus

Prior to 1983, use of CES required the using individual to travel to a physician's office, medical clinic or hospital for treatment. In 1983 the first truly portable CES unit was developed and distributed under the trade name RelaxPak. It was this portable unit that was used in the current study. The unit is only slightly larger than a typical package of cigarettes, measuring $4\frac{1}{2} \times 2\frac{3}{4} \times 1$ inch and weighing 8 ounces with a nine volt battery power supply. The unit may be used with either standard electrodes or, as was the case in this research, a stethoscope-shaped electrode which is placed behind each ear just below the mastoid. This makes the unit truly portable in that it may be slipped into a shirt or coat pocket and worn while performing a variety of routine activities. The unit itself produces a modified sine wave, the amplitude of which is adjustable from 0 to 1.0 milliamperes. Pulse duration is 2 milliseconds and frequency is 100 hertz. The RelaxPak is approved by the Federal Drug Administration for stress-related disorders and currently requires a physician's prescription.

Measures

To evaluate the potential effectiveness of CES as a stress management procedure, the authors focused primarily on measures of the consequences or effects of stress to determine if CES usage was associated with a diminution of their occurrence. Specifically, measures used consist of a questionnaire from a previous stress research study conducted by the authors (Matteson, Ivancevich, and Smith, 1984) and two standardized psychological tests measuring various affective states, changes in which are frequently associated with the experience of stress. The questionnaire included a listing of health complaints frequently associated with stress (e.g., headaches, insomnia, inability to relax, poor appetite) which yielded three scores: total number of problems experienced during the last week, the intensity of the problem (using a five-point scale) summed over all problems experienced, and the intensity of sleep problems (a combination of three sleep-related items).

Additionally, the questionnaire included the Reeder stress scale, a frequently used measure of daily stress levels (Reeder, Schrama, and Dirkson, 1973) and a tension discharge rate (TDR) measure developed by Rose, Jenkins, and Hurst (1978) for use in the stress and health change study of air traffic controllers. The Reeder scale is a four-item measure of self-reported stress (example item: My daily activities are extremely trying and stressful) to which the respondent indicates degrees of agreement or disagreement, using a four-point response scale. TDR is a six-item measure (example item: I stay in "high gear" and have trouble relaxing once I leave work) to which agreement or disagreement is indicated using a seven-point scale. TDS measures the rate at which an individual dissipates the tension effects of job-related stress.

The two standardized psychological measures used were the Profile of Mood States (POMS) (McNair, Lorr, and Droppleman, 1981) and the State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, and Lushene, 1970). The POMS is a 65-item measure of six identifiable affective states: tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia, and confusion-bewilderment. Psychological effects are

perhaps the most common consequences of stress (Selye, 1974; Cox, 1978) and the affective states assessed by the POMS may all be associated with stress, although not every stress experience will result in changes in all (or necessarily, any) of these states. The 40-item STAI is comprised of separate scales for measuring two distinct anxiety concepts: state anxiety (reflecting how an individual feels at a particular moment in time) and trait anxiety (reflecting how a person generally feels). Once again, anxiety may be viewed as a stress effect and the STAI is a widely-accepted measure of this construct.

Procedure

Participants in the treatment group were told that the purpose of the study was to evaluate the effectiveness of a stress management procedure. The importance of adhering to a schedule which required daily use of the RelaxPak during the study was emphasized by the researchers. Participants completed the previously described questionnaire, POMS, and STAI and were then issued CES units. They were instructed and provided with a demonstration in the use of the unit and given instructions to use the unit daily for thirty to forty minutes for a period of 14 days. No attempt was made to prescribe when during the day the unit should be used, nor was any suggestion given that they would or would not find the unit helpful in dealing with perceived stress.

At the completion of the two-week treatment period, participants again completed the questionnaire, POMS, and STAI. Two weeks later (four weeks after the initial administration), the measures were again completed. Thus for the treatment group, three administrations of the materials occurred to provide a pre-treatment, post-treatment, and later post-treatment view of participants. The non-equivalent control group of 22 volunteers from a third Executive MBA class, which did not receive treatment, were administered the same materials on two occasions, with a two-week interval between administrations.

RESULTS

Eight of the original 40 treatment participants did not complete the two weeks of CES treatment. In four of the cases, the reasons for discontinuation were unrelated to the study. In the remaining four, the participants indicated that the use of the apparatus caused headaches. The manufacturer reports that fewer than five percent of supervised users complain of headaches initially but that with continued use the number of complaints diminishes. In the present case, the participants who reported headaches discontinued the use of the CES unit during the study. Subsequent data analysis was based on the 32 participants who reported uninterrupted thirty to forty minute daily use of the device for the entire two-week period. It was not possible directly to monitor participant use of the CES unit and consequently it was necessary to rely on the veracity of their self-reports.

Table 1 displays mean differences for the treatment group for all the study variables. Significant differences in the appropriate direction (i.e., indicating "improvement" on a particular dimension) were found between pre-treatment and first post-treatment for all thirteen study variables. Significance was maintained for eleven of the variables between the pre-treatment and second post-treatment. Only the Reeder stress measure and the vigor-activity scale of the POMS failed to maintain significant differences two weeks after the use of the CES apparatus was discontinued.

Essentially, the picture that emerges is that immediately following treatment and two weeks after, CES users reported fewer health complaints which manifested themselves with less intensity, a lower degree of sleep problems, less strain, faster discharge of tension, lower levels of tension, depression, anger, fatigue, and confusion, a greater degree of vigor, and lower levels of both state and trait anxiety. In the latter case, it is interesting to note that state anxiety, a less stable characteristic, showed greater movement between each of the three administrations than did trait anxiety, a more stable characteristic.

In comparison, the group of 22 who did not receive treatment showed no meaningful change (positive or negative) on any of

TABLE 1
PRE- AND POST-TREATMENT MEAN DIFFERENCES

VARIABLES	Pre-Treat	1st Post-Treat-Mean	2nd Post-Treat-Mean	% Pre & 1st Post)	% Pre & 2nd Post)
1. Health Complaints-Frequency	8.03	6.84	6.66	3.27**	3.05**
2. Health Complaints-Intensity	15.69	11.84	11.41	4.79***	3.77***
3. Sleep Complaints-Intensity	4.50	3.63	3.25	2.48**	2.74**
4. Reader Stress	10.16	8.81	9.34	3.56***	1.97
5. Tension Discharge Rate	21.62	24.41	24.88	-2.26*	-3.26**

TABLE 1 (cont.)

Profile and Mood States							
6.	Tension-Anxiety	16.22	10.72	10.59	5.43***	4.82***	
7.	Depression-Dejection	12.22	8.47	8.06	4.08***	3.34**	
8.	Anger-Hostility	16.59	12.22	11.41	3.29**	4.18***	
9.	Vigor-Activity	15.66	17.50	16.84	-2.15*	-1.12	
10.	Fatigue-Inertia	12.69	9.25	9.34	3.54***	4.07***	
11.	Confusion-Bewilderment	8.84	6.97	6.63	3.24**	3.14**	

TABLE 1 (cont.)

State-Trait Anxiety Inventory						
12. State Anxiety	42.84	36.47	39.28	4.63***	2.17*	
13. Trait Anxiety	42.41	40.06	40.38	3.37**	2.40*	
N = 32						
* p < .05 (two-tailed test)						
** p < .01 (two-tailed test)						
*** p < .001 (two-tailed test)						

the variables. None of the differences in mean values between the two administrations for this group approached significance.

DISCUSSION

There is no question but that organizational stress management programs, of whatever type, have expanded in recent years at a far more rapid pace than has the research directed at providing information regarding the efficacy of the various techniques and procedures used in these programs. While these programs are, like other organizational healthcare offerings, frequently viewed as a cost of doing business or as an additional employee benefit, this should not mean that their effectiveness need not be addressed. Stress management is still in a very early stage of development; it is virtually impossible at this point to speak in terms of absolutely effective and ineffective approaches. Consequently, it is of interest to evaluate as wide an array of procedures as possible. CES is one of these procedures.

The differences obtained on the measures used in this study were highly significant. These findings are especially interesting since they were obtained after the treatment volunteers used the CES for only 14 days. Nonetheless, this is the first reported investigation using normal adults and the results should be viewed very cautiously.

Some potentially significant limitations should be noted. First, random assignment of participants was not feasible and consequently rigid adherence to the establishment of randomly-matched, equivalent treatment and control groups was not possible. This design limitation, while not fatal, requires that the results should be interpreted circumspectly.

A second limitation is that the study design cannot rule out the possibility that the obtained differences were partially or even wholly a function of a "placebo effect" rather than a result of direct action of the CES treatment itself. Great care was taken in the instructions given to participants not to create expectations that the use of CES would have positive, or even any, effects. This, of course, by itself does not rule out a possible placebo effect. The only certain way to accomplish that would be

to include a sham treatment group which thought it was receiving CES but was not. This was not possible in the present study but previous research with alcohol and drug abusers have included sham CES treatment (see, for example, Gomez and Mikhail, 1979; Smith, 1982; Ryan and Souheaver, 1976). Virtually without exception in these studies, sham treatment groups showed little change on the study variables, more nearly resembling control groups than treatment groups in their responses.

To what extent, if any, the results obtained here are accountable for by a placebo effect is an important question which these data cannot answer. On the other hand, it should be noted that the possibility that such an effect is operating cannot be interpreted as meaning that CES has no contribution to make in the administration of organizational stress management programs. At one time placebos were defined narrowly as inactive medications given solely to satisfy patients that something was being done for them. More recently, as Pelletier (1979) has pointed out, it has become clear that virtually any medical or psychological procedure has a placebo effect. For example, fifty percent of patients with minor emotional difficulties display a positive response to a placebo in drug studies compared to an active drug response of approximately seventy-five percent. (Wheatley, 1977) Thus, in one sense at least, what is of primary importance is that an individual shows a positive response to a procedure, regardless of whether that response is a result of attributes of the procedure, attributes of the person or, as is most likely, a combination of both.

Questions of possible placebo effects notwithstanding, perhaps the most fundamental question which needs to be asked is to what extent does any stress management approach offer a sufficient advantage over existing procedures and methodologies already available? In the event that subsequent investigation substantiates the positive effect in this preliminary study, CES possesses a characteristic which would seem to make it an attractive addition to stress management treatments currently in use. This characteristic is the relative passive, non-obtrusive nature of the procedure.

How successful any organization is in administering their

stress management efforts will depend in large measure on the extent to which individual employees utilize the treatment modalities offered. Many approaches to stress management offered by organizations fail to accomplish their objectives not because they are inherently faulty, but because the regimen required is not followed by employees. Meditation and other relaxation approaches, for example, require the continued, active participation of the individual, as well as an active learning process on his or her part. Time must be taken to provide initial instruction and time must be set aside to practice the procedures; during these periods, the employee may not be engaged in other activities, job-related or not. If meditation sessions are to take place at work, the company is subsidizing them; if they are to take place off the job, a myriad of other activities are competing for the individual's time.

Similarly, biofeedback depends on the active cooperation of the employee and a considerable investment of his or her time during the training period. Additionally, a biofeedback approach requires setting aside organizational space which cannot be used for other purposes and which may be at a premium. It will generally also necessitate the presence of trained staff members, adding to its cost from the organization's perspective.

CES, on the other hand, is considerably more passive in its demands on both individual and organizational time. The participants in this study required less than five minutes of instruction to learn how to operate the CES apparatus. Of far greater potential value, however, is that, during a treatment procedure, the individual is virtually unrestricted in terms of other activities. He or she is not required to be in a specific location. Indeed, one may move about freely between a number of locations and may engage in a virtually unrestricted range of activities. Consequently, from both a time and a physical and mental energy perspective, use of CES makes few demands on the individual. To the extent that this characteristic translates into higher compliance rates, a significant advantage is gained relative to many other stress management approaches.

CONCLUSION

The need for effective administration of EAPS and other stress management programs in organizations grows as the number of organizations and the amount of resources they devote to these kinds of activities grow. The evaluation of the effectiveness of these offerings is, or at least should be, an ongoing concern. Likewise, research addressing the efficacy of specific approaches and procedures is similarly important to organizational stress management.

The findings of the present study, while very tentative, nonetheless suggest that CES may have considerable potential. Additional research, which provides for randomization, includes sham treatment groups and provides for direct comparison between CES and other approaches, such as various forms of meditation and relaxation techniques, are a few examples of further work which is required before a more complete picture of the potential value of CES can be obtained.

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