# CES & MCT

*The effects of Cranial Electrotherapy Stimulation and Multisensory Cognitive Therapy on the personality and anxiety levels of substance abuse patients.*

STEPHEN J. OVERCASH, Ph.D. and ALAN SIEBENTHALL, Ed.D.

## ABSTRACT

Cranial electrotherapy stimulation (CES), biofeedback relaxation therapy, and multisensory cognitive therapy (MCT) were used to help patients withdraw from marijuana abuse by helping them learn to relax and change their attitudes and values. A sample of 32 patients was selected from referrals provided by family physicians for treatment of marijuana abuse. They were randomly assigned to two treatment groups. Psychological testing using the 16PF Personality Test was given initially and at the end of their series of ten treatment sessions. All the patients were given a psychophysiological stress profile during each session. The control group (CG) was given biofeedback EMG training, Quieting Response relaxation tapes, and psychotherapy. The experimental group (ExG) was given essentially the same treatment, with the addition of multisensory emotional therapy using the Relax and Learn system and CES using the Alpha-Stim 2000 during the last 20 minutes of their treatment sessions.

Although the nervous tension level was reduced significantly in both groups, the results of the study show significant differences between the two groups in five different areas. An ANOVA performed on the results of the patients' EMG indicated that the ExG was more significantly able to reduce their frontalis EMG than the CG ($F = 5.32$, $p < .01$). In addition, the ExG was able to reach the same level of relaxation after 8 sessions that it took the CG to reach in 10 sessions. There were four significant differences in the subtests of the 16PF Personality Test. In the self sufficiency subtest, the ExG was significantly more planful than the CG. While the ExG became significantly more assertive in the dominance subtest area, there was no significant difference in the CG. Another subtest showing a significant difference between the groups was ego strength. The ExG appeared to become more decisive in handling their interactions with others, whereas, there was no significant difference in the CG. Finally, the patients were given weekly blood tests to determine any use of marijuana. Both groups were able to reduce their use of marijuana during the 10 week trials, but the ExG reduced their use more quickly and sustained for a longer period of time. This may have occurred because the CES may have allowed the patients to become more relaxed and more open to the affirmations used with the multisensory emotional therapy. The actual affirmations used statements in regard to the patient becoming more assertive, making better decisions, and being more self sufficient. The results of the study indicate that the combination of CES and affirmative repetition during multisensory emotional therapy appear to be both a useful and cost-effective tool in assisting patients to withdraw from marijuana.

A search of the literature does not reveal any studies describing use of computer-generated flashing message "windows" superimposed on a "relaxing" videoscreen. Also, there is no study where the patient simultaneously receives the same messages auditorily by superimposing that message on a relaxing videotape which is listened to by the patient at the same time. While the literature contains some references to both visual and auditory subliminal messages, there is no study that uses "affirmation" or "vertical" messages in a manner where the patient can see, read, hear, and be aware of the messages in a conscious manner.

While there is some evidence indicating that subliminal messages may unconsciously influence patients' minds, it is obvious that a more straightforward approach, such as using the repeated flashing mes-

sages in a conscious way and reinforcing them auditorially at the same time, may have a more profound impact on a patient's behavior. Further, this approach, called multisensory emotional therapy (if one wishes to change one's emotional condition) or multisensory cognitive therapy (if one wishes to change one's values, cognitive thinking, or strategies) is consistent with and is a natural extension of the vast body of research in learning and cognitive thought processes. Thus, learning research indicates that the best, most efficacious way to influence one's unconscious mind and, therefore change one's thinking, is to use repetition, spaced learning, and positive verbal reinforcement in a repetitive and contingent manner. Although the technology was not capable of the multisensory emotional therapy approach until the advent of the Relax and Learn software, it is surprising that it has not been tried or, at least, suggested as a possible efficacious treatment in the past.

Silverman has demonstrated that verbal stimuli repeatedly received by a patient and associated with a personal wish can result in behavioral change.[1] Becker, et al, also indicate that behavioral changes can occur in individuals when the unconscious mind repeatedly perceives stimuli which the conscious mind does not.[2]

There has been much experimentation in the area of learning, tracing back to Digman who found that spaced learning was a better approach than mass learning in general.[3] Underwood discovered that mass practice was better for the acquisition of new material, but poor for retention.[4] His conclusion was that spaced learning was more effective than mass learning, since retention is considered more important than the quick learning of material. There are many other studies that indicate and support the notion that material should be presented in small units with rests in between. Koontz, in 1983, suggested that three twenty-minute learning sessions can produce more effective learning than one hour of continuous learning.[5] In addition, over-learning was used to insure very thorough learning when Fitz found that this was necessary for maintaining performance and retention during periods of emergency and stress.[6] Hagman and Rose found in their review of learning military tasks that repetition of to-be-learned material was especially effective in improving retention.[7]

It has been found that the rehearsal of information in short-term memory increases the chance that the information will be transferred to long-term memory. If it is done in a multisensory fashion, where both visual and auditory cues are used, learning occurs more quickly and is retained for longer periods of time. Any learning aid that allows the user to continue to rehearse the information improves retention also. Research also indicates that the number of eye fixations on words increases retention of those words and the information.

One of the prerequisites for learning is that the individual be relaxed in order to receive the new information in the most appropriate way. This is both an appropriate skill to learn and a prerequisite for learning. Previous research by Budzynski has indicated that the use of relaxing video representations, as well as relaxing audio cues, increase the patient's potential for relaxation and potential for learning or relearning information.[8]

Reversing the effects of substance abuse is a major problem in today's society and quite challenging for today's psychologists. Teaching patients to reverse their substance abuse in a reasonable fashion involves teaching them to learn to relax those areas of their bodies that are affected by the stress and have caused the substance abuse disorders. Finally, they must actually change the approaches or strategies used in their personality to cope with life's everyday problems. A psychologist, therefore, should be able to change or reverse the effects of substance abuse disorders if he can teach the patient to relax on cue, especially if he can relax the area of the body most affected by disease, and to generalize this response to the rest of the day. When the patient learns to keep his body in a relaxed position, as measured objectively by appropriate biofeedback devices, the substance abuse disorder symptoms should be greatly diminished or disappear entirely.

Thus, the purpose of this study is to investigate the effects of multisensory emotional therapy using the Relax and Learn software and cranial electrotherapy stimulation (CES) in the treatment of substance abuse. However, the study is also designed to investigate the proposition that CES and multisensory emotional therapy is more effective in comparison to the biofeedback/relaxation training that is currently used in the treatment of substance abuse problems.

In this study, biofeedback techniques, as well as pre and post testing using the

16PF, a widely used personality test, have been used to measure the before and after effects of the substance abuse.

## MATERIALS AND METHODS

A sample of thirty-two patients was selected for this study after being referred by family physicians in the Franklin County area of Pennsylvania to Psychological Services, Chambersburg, Pennsylvania, during the Fall of 1987 and the Spring of 1988. In addition to marijuana usage, they had various psychophysiological stress disorders such as irritable bowel syndrome, colitis, ulcers, etc. They were randomly assigned, on an alternating basis as they called for appointments, to either the experimental group (ExG) or control group (CG). A total of sixteen patients was in each group. All patients were seen weekly for one one-hour session for ten weeks.

This study used a microelectric nerve stimulator (Alpha-Stim 2000 from Electromedical Products Inc., Hawthorne, California, Figure 1); TV monitor with external synchronization; a VCR; a computer with overlay capacity; an Alpha-Chamber Chair from S.E.E., Long Beach, California; Relax and Learn software from Profiles International, Inc., Fort Worth, Texas; and Thomas Budzinski's B-1 EMG Biofeedback Instrument.

In order to obtain a pre and post indication of any personality changes, in addition to the physiological changes that occurred by using the biofeedback devices, the 16PF Personality Test from IPAT, Champaign, Ill., was given to all thirty-two patients before they began their therapy and at the conclusion of their tenth session.

In the CG procedure, the patients received Quieting Response relaxation tapes to listen to and practice during the week. During the session, the first twenty minutes were spent having the patients discuss any significant behaviors or environmental changes that occurred during the week, as well as their reaction to the relaxation tape they used during the week. Another twenty minutes were spent using basic EMG biofeedback techniques with the patients being allowed to both visually and auditorially monitor their progress. During the last twenty minutes of the session, feedback was given to them verbally by the therapist on how well they did and suggestions were made on how to improve in the coming week. A printout of the entire EMG responses during the session was kept for all patients.



FIGURE 1. The Alpha-Stim 2000 microelectric nerve stimulator (Electromedical Products).

## TABLE 1. ONE-HOUR SESSIONS BY GROUP

| CONTROL GROUP (CG) | EXPERIMENTAL GROUP (ExG) |
|---|---|
| 20 MINS.—Discussion of relaxation tape used in previous week. | same |
| 20 MINS.—EMG biofeedback with multisensory monitoring by patient. | same |
| 20 MINS.—Therapist analysis and discussion. | RELAX AND LEARN software combined with MENS. |

The ExG patients also received Quieting Response tapes and the first 40 minutes of the session were the same as the CG (Table 1). Feedback was also given by the therapist on how they did and suggestions were made on how to improve in the coming week. During the last twenty minutes, ExG patients were given multisensory emotional therapy and CES. Appropriate positive self-statements, suggested by either the patient or the therapist during the first couple of sessions, were placed on the Relax and Learn flashing list. The flashing screen of the Relax and Learn software was superimposed over a relaxation videotape as it played. The interval between the positive self-statements was four seconds and each statement stayed on the screen for approximately seven seconds. Therefore, it was done in a superliminal fashion. The Relax and Learn software rotates the individualized statements on the list, starting over when it reaches the end.
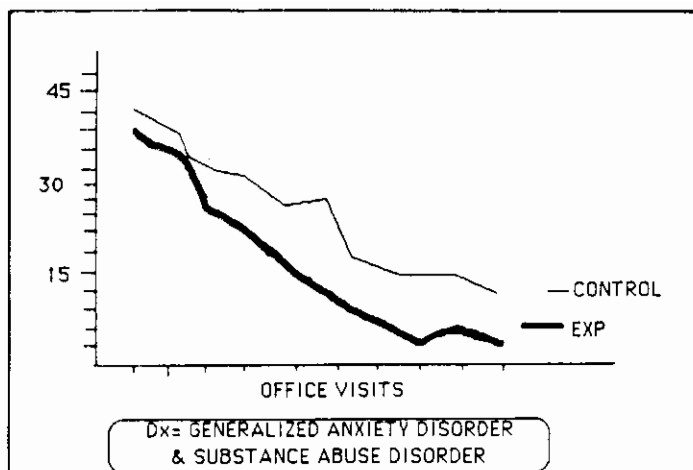
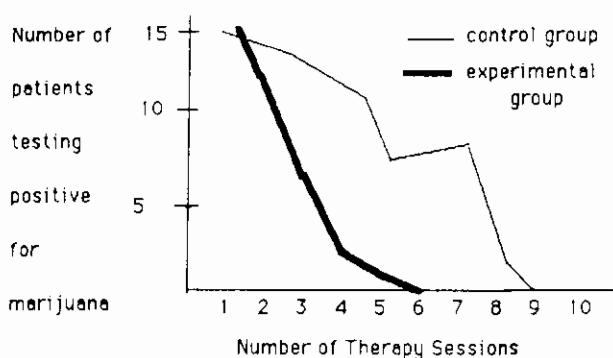FIGURE 2. Average EMG (μV), frontalis placement, vs number of office visits.



FIGURE 3. Results of weekly drug testing in both CG and ExG.

The patients were instructed to either read these if they wished to or continue watching the videotape and just allow their minds to see the statements. In order to help them become more relaxed and more open and receptive to the messages, CES was administered through electrodes placed on their earlobes at 0.5 Hertz and 100 microamperes during the multisensory emotional therapy portion of the treatment.

## RESULTS

The results of the study are shown in Figures 2 and 3 and Tables 2, 3, 4 and 5. Figure 2 indicates the average amount of EMG, measured in microvolts, on the ordinate and the number of office visits on the abscissa of the graph. One can see that the initial levels of EMG response were approximately the same, an average of 38 for the ExG and 41 for the CG. There was

very little change during the first two sessions, but a significant change occurred at approximately the fifth session in the ExG. There continued to be a very significant increase in their ability to relax, as shown by the psychophysiological stress measurement, throughout the remaining sessions.

The CG also made significant gains. However, the ExG obtained an average level of 3.2 microvolts, whereas the CG only averaged 9.6 microvolts. An Analysis of Variance (ANOVA) was performed on these results. These results (F = 5.43, p < .01) indicate a significant difference between the ExG and the CG. The ExG averaged the same amount of relaxation at the end of eight sessions, that the CG obtained after ten sessions.

A look at the various measurements using the 16PF personality test shows four significant areas of difference out of the sixteen possible areas tested. In scale D1, which measures the amount of *nervous tension* and in which a level of zero or one indicates a high degree of nervous tension and a stanine of 10 represents calmness, the ExG and the CG were quite similar. Both significantly increased their amount of relaxation to approximately the 5 level, putting them much more within the normal group of individuals in our environment who average approximately 5.0 to 5.5. However, an appropriate level and one which they should work toward is 3 to 4. Although both made significant gains (EXPERIMENTAL F = 7.42, p < .01 and CONTROL F = 5.96, p < .01), there was not a significant difference between the treatment groups when comparing the two treatment effects using ANOVA (F = .95, p > .05). Thus, this indicates that the patients were able to reduce their nervous tension not only physiologically, but also in a psychological manner as well.

In the second area, *self sufficiency*, a low score indicates disorganization while a score of ten indicates planfulness. The ExG made significantly more gains in this area. This may be expected since anxiety levels are reduced when becoming more planful and self sufficient. The CG went from 4.6 to 4.6, which indicates no significant change in the post-test area. However, the ExG, which started a little lower than the CG, obtained an even higher average of 7.2. The results of the ANOVA indicate that the ExG (F = 10.4, p < .01) made significant gains while the CG (F = .5, p > .05) did not.

In the third area of significant differences, *area of dominance,* in which a low score indicates a more passive approach and a high score indicates a more assertive (but not an aggressive approach), the ExG and the CG began at low levels of 3.2 and 4.0, respectively. The ExG reached a much higher level, with a post-test average of 7.1, whereas the CG only went to 4.3. It is quite possible that the self-statements included in the analysis of data which were used on the Relax and Learn flashing screen aided the ExG in making better gains in this area. The self-statements placed on the Relax and Learn flashing screen were in the area of assertiveness to give people "I" messages versus "you" messages in order to reduce anxiety. The results of the ANOVA indicate that the ExG made significant gains ($F = 5.9$), while the CG did not ($F = .4$, $p > .65$).

In the fourth area, the *ego strength scale* of the 16PF, a low level indicates poor decision-making skills and a high level indicates good ability and a desire to make good decisions. Both groups initially averaged between 2.8 and 3.0. The ExG significantly increased its overall level, becoming more decisive ($F = 6.95$, $p < .01$), reaching a 7.6 level in the personality test. The CG only reached the 3.0 level, an increase but not a significant difference ($F = .28$, $p > .75$).

Overall, then, it could be said that the 16PF showed significant changes in the personalities of both the ExG and the CG. However, the ExG was able to obtain higher and more significant changes in both the psychophysiological measures, as well as the personality areas measured.

Figure 3 illustrates the results of weekly drug testing that was done on the patients in both the ExG and the CG. As one can see, both groups were able to be tested completely drug free by the ninth session. The ExG, however, was able to be tested completely drug free from the 6th session. The tests were done by a local medical laboratory and included a screening for other illicit drugs in addition to marijuana. It appears that both groups benefited from outpatient therapy by being able to significantly control their use of drugs.

## DISCUSSION

A look at the results of the biofeedback studies on all the patients indicates definite physiological changes occurred over

**TABLE 2. NERVOUS TENSION, PRE- AND POSTTEST (16 PF SCALE = Q4 - NERVOUS TENSION)**

N=32

| GROUPS | PRETEST | POSTTEST |
|---|---|---|
| EXPERIMENTAL | 8.4 | 4.0 |
| CONTROL | 9.1 | 6.2 |

**TABLE 3. SELF SUFFICIENCY, PRE- AND POSTTEST (16 PF SCALE = Q2 - SELF SUFFICIENCY)**

N=32

| GROUPS | PRETEST | POSTTEST |
|---|---|---|
| EXPERIMENTAL | 4.0 | 7.2 |
| CONTROL | 4.6 | 4.6 |

**TABLE 4. DOMINANCE, PRE- AND POSTTEST (16 PF SCALE = E - DOMINANCE)**

N=32

| GROUPS | PRETEST | POSTTEST |
|---|---|---|
| EXPERIMENTAL | 3.2 | 7.1 |
| CONTROL | 4.0 | 4.3 |

**TABLE 5. EGO STRENGTH, PRE- AND POSTTEST (16 PF SCALE = C - EGO STRENGTH)**

N=32

| GROUPS | PRETEST | POSTTEST |
|---|---|---|
| EXPERIMENTAL | 3.0 | 7.6 |
| CONTROL | 2.8 | 3.0 |

the ten-week period. There was a definite downward trend in their overall measurements. This is an objective measure of their anxiety level which certainly appears to be collaborated by the results of the 16PF personality testing. I think it is important to note that this study indicates that regular biofeedback training does result in the overall lowering of arousal levels, as well as anxiety levels, with regular practice. Biofeedback was used in both parts of the experiment because the authors believe biofeedback may be a major factor in teaching individuals to lower their anxiety and nervous tension levels. It also appears that it may be useful in increasing their feelings of dominance or having control in situations and increasing their sensitivity to other people's feelings, as well as lowering their subjective feelings of disorganization.

It is important to point out that using the Relax and Learn software in a multisensory manner along with CES appears to significantly speed up these behavioral changes almost from the beginning, but particularly by the end of the fourth session. This increase continued throughout the rest of the experiment, with the ExG achieving comparable levels of relaxation at the end of the seventh session, whereas it took the CG ten sessions to reach similar levels of relaxation.

Further, the use of the 16PF personality testing appears to substantiate, from a personality and behavioral change standpoint, that what is being seen objectively through using the psychophysiological stress measurements in the biofeedback modality is actually occurring in the individual's or patient's personality as well. There was a significant difference in both the pre and post test in four different measures of the 16PF personality test. The other variables showed no significant statistical change. This would indicate that the treatment of both the ExG and the CG was effective in changing them in these four areas.

There is significant face validity in the nervous tension level indicating that both the ExG and the CG should become more relaxed or calm. This, in fact, did show up in the nervous tension measurement, with a high score indicating restlessness, a low score indicating calmness. In addition, there was a more substantial difference in the amount of change in the ExG compared to the CG.

A look at the self sufficiency area of the 16PF test again indicates substantial changes in both the ExG and the CG. A more substantial change in becoming more planful and less disorganized occurred in the ExG. This is not surprising given the fact that positive self-statements emphasizing planfulness and becoming less disorganized were used in the Relax and Learn flashing windows, as well as in the audiotapes.

In the 16PF subtest, dominance, the ExG exhibited an extraordinary amount of change, going from a 3.2 to a very normal level of 7.1, becoming more assertive and less passive. The CG also changed, however, their improvement was still substantially below the norm of 5 to 5.5.

Finally, in the ego strength subtest of the 16PF, in which a low level indicates an inability to make decisions and a high score indicates good decision-making ca-

pacity, the ExG obtained a somewhat surprisingly high score. The ExG made substantial changes in what may be considered a positive direction, becoming more decisive in dealing with others. The CG also increased, but only by two-tenths of a point, going from 2.8 to 3.0, which is not statistically significant.

Overall, the results of the experiment indicate the use of flashing windows, using the Relax and Learn software, superimposed on a relaxing videotape with CES are substantially more beneficial in reducing nervous tension, increasing planful self sufficiency, increasing assertiveness, and increasing ego strength in a variety of patients suffering from psychophysiological stress disorders. It appears that the use of multisensory emotional therapy substantially increases the overall level of relaxation in individuals who have psychophysiological stress disorders. In addition, it is able to do so faster than the normal model of biofeedback training and audio reinforcement during the intervening week.

This study appears to substantiate the idea that using positive self-statements in a reinforcing manner, via a flashing, rotating screen may be a useful adjunct in psychological treatment. It can assist individuals in learning and remembering new terms and in keeping them utmost in their mind. Multisensory emotional therapy may actually change inappropriate self-statements or eventually belief systems if used in a regular reinforcement program. It can also teach individuals new strategies in dealing with stress. It substantiates the power of positive thinking, the approach or theory that "you become what you think about" used by Norman Vincent Peale and others as a basis for one's philosophy or approach to life. Finally, the use of CES is a useful adjunctive therapy in assisting patients in relaxing and becoming more open to the positive self-talk statements.

There are also implications for education. This same method or technique can be used individually or in groups, in a school setting, to optimize learning and memory in a shorter period of time and with a longer recall period. This is one way to use television more effectively in the classroom. As a nation, the United States appears to be obsessed and prefers a combined audio-visual presentation of its news and entertainment. Given the capabilities of our mind to do multi-tasking, why not use TV for academic learning? It

could also be used to assist those who have difficulty learning by providing the optimal environment for learning—high interest, attention, a relaxed approach, repetition, and reinforcement in a multisensory manner and in an easily individualized manner.

Employing this type of program in learning disabled and mentally retarded classrooms would make it possible to teach both emotional and cognitive skills in a much more individualized, relaxing and successful fashion than with the techniques currently used with these groups. Also, the Relax and Learn software offers the possibility of using a double learning environment. This could be a substantial boon to gifted students in the classroom. Using the multi-tasking possibilities of the brain, it would allow these students to learn multiple subjects in a unique manner.[9]

Multisensory cognitive training, the same basic procedure applied to teach new information, can be used in businesses and industries to train their employees at all levels. Profiles of Fort Worth, Texas, has already keyed appropriate "trigger lists" to aid employees in improving their scores on Profiles, the most popular test used today in employment selection and promotions. For example, an employee may now take the Profiles test and receive a set of "triggers" that will be useful in increasing his productivity on the job, as well as maximize his promotional capabilities.

Perhaps the findings of this study could be used to help released inmates adjust to their life outside prison.

In looking at these results in a critical manner, replication of the study is certainly needed. The Relax and Learn program should be separated from CES to determine if one contributed more significantly than the other. Studies should be done to verify this new approach in high substance abuse populations such as schools, prisons, and existing drug and alcohol programs. Finally, studies in changing values and other such areas through this approach, could also be explored for its positive effects. ☐

## REFERENCES

1. Silverman, L.H., Frank, S., & Dachinger, P. Psychoanalytic Reinterpretation of the Effectiveness of Systematic Desensitization: Experimental Data Bearing on the Role of Merging Fantasies, *Journal of Abnormal Psychology*, 1974, 83, 313-318.
2. Becker, H.C. & Charbonnet, K.D. Applications of Subliminal Video and Audio Stimuli in Therapeutic, Educational, Industrial, and Commercial Settings, *Eighth Annual Northeast Bioengineering Conference*, Massachusetts Institute of Technology, March 28, 1980, Cambridge, Mass.
3. Digman, John. The Effect of Massed versus Spaced Learning, *Psychological Review*, May, 1959.
4. Underwood, Paul. Differential Effects of Massed versus Spaced Practice on Learning New Material, *Perceptual and Motor Skills*, 143, 1964.
5. Koontz, George. The Differential Effect of Different Types of Spaced Learning on Retention, *Perceptual and Motor Skills*, 1983, 163, 161-167.
6. Fitz, John. The Effect of Overlearning During Periods of Stress, *American Journal of Psychology*, 1965, 23, 133-136.
7. Hagman, M. & Rose, J. The Effect of Repetition on Learning New Material, *Psychonomic Monograph Supplements*, 23, 1983.
8. Budzynski, T. Effect of Relaxation on Learning, *American Psychologist*, April, 1981.
9. Budzynski, T. Tuning in on the Twilight Zone, *Psychology Today*, 1977, 11, (#3), 38-44.

## THE AUTHORS

*DR. STEPHEN J. OVERCASH is in private practice Clinical and Consulting Psychology. His interests are in the diagnosis and treatment of recurrent, non-productive pain, psychological disorders, and obsessive/compulsive disorders through brief multimodal psychotherapy. Dr. Overcash earned his Ph.D. in Counseling and Clinical Psychology from the University of VA. He may be reached at Psychological Services, 776 Lincoln Way E., Chambersburg, PA 17201, 717/263-9471.*

*DR. C. ALAN SIEBENTHALL is on the General Practice Staff at HCA Richland Hospital and Fort Worth Psychiatric Hospital, Fort Worth, TX. He is also Consultant in Learning Theory to Profiles International, Fort Worth, as well as a member of their Technical Board. Dr. Siebenthall earned his Ed.D. in Counseling and Student Services with a minor in Psychology from North Texas State University. He may be reached at P.O. Box 751, Hurst, TX 76053, 817/589-0038.*