

The Clinical Guide to Sound and Light

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SECTION ONE: SELECTED RESEARCH ON SOUND/LIGHT

Is there a substantial body of research supporting the phenomenon of light/sound (L/S)? Certainly the field is growing rapidly and, as a result of the proliferation of the newer commercial devices, a rash of anecdotal reporting has found its way into the popular press. Hutchison (1990) devoted almost the entire issue of volume 1, number 2 of his exciting journal, *MEGABRAIN REPORT*, to a discussion of L/S, including very early reports. With all due respect we will borrow some of this material although we urge you to subscribe to this extremely informative newsletter/journal.

THE EEG (ELECTROENCEPHALOGRAM)

Since we will be discussing characteristics of brainwaves (EEG) it might be a good time to examine briefly the basic frequency bands of interest. Brainwaves, as measured on the surface of the scalp, tend to fall into certain frequency and amplitude categories which are associated with states of excitation or cortical arousal. Thus, a highly alert, focused individual will usually show a primarily beta EEG pattern. The amplitude will be relatively small (less than 10 uV) and the frequencies will range from 14 - 30 Hz. As cortical arousal lowers to a relaxed, alert state, there will appear bursts of alpha (8 - 13 Hz) frequencies which can range in amplitude up to 150 uV or more. If you transition into a, slightly drowsy state, it will be heralded by the appearance of theta waves. These are smaller in amplitude (5 - 20 uV) than alpha and lower in frequency (4 - 7 Hz).

Some sleep researchers consider the theta state as Stage 1 sleep. As one shifts even deeper into Stage 2 sleep the theta pattern is interrupted by sleep spindles or short bursts of higher frequency, larger amplitude waves. Stages 3 and 4 are characterized by delta waves (0.5 to 3 Hz) which are slow in frequency and can vary in amplitude up to 200 uV or so.

It is important to note that these various bands do not necessarily appear one at a time although they can do just that. In most instances however, there will be a dominant frequency mixed in with some other frequency energy. Thus, some individuals will show an alpha pattern mixed with occasional theta and beta. Additionally, a drowsy theta pattern can be interrupted by an alpha burst, if the individual becomes a bit more alert, or even delta if the individual becomes sleepier. For most people the transition into a theta state (if alpha or beta are not mixed in) signals a state of unconsciousness. If the EEG shows primarily theta energy, yet is mixed with some alpha and/or beta, the individual may report feeling drowsy yet conscious

EARLY OBSERVATIONS

As noted by Hutchison, ancient scientists were fascinated by the phenomenon of flickering lights. Apuleius experimented in 125 A.D. with the flickering light produced by the rotation of a potter's wheel, finding that it could reveal a type of epilepsy. Ptolemy studied in 200 A.D. the phenomenon of the flickering generated by sunlight through the spokes of a spinning wheel. He noted that patterns and colors appeared in the eyes of the observer and that a feeling of euphoria could be experienced. French psychologist Pierre Janet, one of the first who reported a "rescripting" procedure (see section on Clinical Considerations), noticed that the patients at Salpêtrière Hospital in Paris experienced reductions in hysteria and increased relaxation when exposed to flickering lights.

If flickering lights captured the interest of people hundreds of years ago, then the intrigue of rhythmic sounds predates that by at least a hundredfold. As noted by Hutchison, anthropologist and shamanism authority Michael Hamer stated that, "Basic tools for entering the SSC (Shamanic State of Consciousness) are the drum and rattle." Hamer also observed that drum beat frequencies in the theta EEG frequency range predominated during initiation procedures. Moreover, combinations of rhythmic sound and flickering light were used by the ancients to induce trance.

In the 1930s and 40s scientists such as W. Gray Walter and others used powerful electronic strobe lights and the new EEG equipment to alter brainwave activity producing trance-like states of profound relaxation and vivid imagery. Hutchison notes that Walter's research aroused the attention of a number of artists including the novelist William Burroughs. They developed a flicker device which they called the Dreammachine with which subjects reported dazzling lights of unearthly brilliance and color. From beautiful geometric images that resembled mandalas the display might dissolve into individual images and dramatic scenes like brightly colored dreams.

During the turbulent 60s and 70s interest in ways of producing altered states without drugs proliferated alongside drug experimentation. Alpha EEG feedback by Dr. Joe Kamiya at Langley-Porter Neuropsychiatric Institute in San Francisco helped initiate the age of biofeedback. Others found greater psychedelic-like effects in rhythmic light/sound combinations and numerous nightclubs began using strobes to dramatize the effects of the compelling music for dancing. Scientists continued their investigation of light/sound, examining the phenomena of hemispheric synchronization and EEG entrainment. Jack Schwarz, best known for his demonstrations of conscious mind control over autonomic responses, developed the ISIS, a device which used rhythmic sounds and variable frequency lights in goggles to produce certain mental states. Other contemporary explorers of the L/S phenomenon included Richard Townsend, who in 1973 published a description of a device with goggle-mounted lights for photo entrainment. Seymour Charas, a scientist at City College of New York, in 1974 obtained the first patent on a L/S device, but according to Hutchison (1990), it was never put into production. Breakthroughs in microelectronics in the 1980s enabled a number of inventors to develop various programs of L/S frequency changes and light intensity modulation.

CLINICAL RESEARCH OBSERVATIONS

In 1980, at my clinic in Denver, we studied one of the early commercial L/S units, and, as mentioned in Michael Hutchison's book **MEGABRAIN** (1986), we found that use of the unit appeared to enhance hypnotic induction, produced drowsy, hypnagogic-like states (at theta frequencies) and, at times, vivid holographic images. It also served as a facilitator of "unconscious retrieval" during rescripting procedures. Frequencies in the low theta range (3 - 6 Hz) seemed to help elicit childhood memories. These images were used in the next therapeutic session to aid in the uncovering and rescripting of traumatic material.

One procedure that seemed to be useful was to present the client with audiotape suggestions during a L/S session. The audiotape began with subliminal level messaging which gradually increased in volume becoming supraliminal after 10 minutes. Thereafter the messaging continued to increase in volume slowly until reaching a comfortable listening level. Moreover, the L/S device was useful in the facilitation of theta EEG during Twilight Learning sessions (see Clinical Considerations section).

NOTE: At this time (about 1980) I did warn about the general use of this technology because of the possibility of uncovering unusually frightening repressed material. This potential still exists, and the user should be aware that in the event such a disturbing revelation surfaces, he/she should seek the help of a competent mental health practitioner in order to help integrate it.

Michael Hutchison reported in Megabrain that another clinician who found the L/S devices useful at this time were Dr. Roman Chrucky, Medical Director of the North New Jersey Development Center in Totowa, New Jersey. He found, as we did also, that the machine had a strong tranquilizing effect that lasted 2 or 3 days. He noted as well that the device enhanced hypnotic induction and suggestibility in general. Dr. Chrucky particularly noticed that use of L/S facilitated creative thought.

Dr. Gene Brockopp (1984), a Buffalo, New York medical researcher, found that the L/S device produced dramatic effects in some subjects. He reviewed the related research at that time (the early 80s) which included photic and auditory stimulation of the brain, consciousness and hemispheric differentiation, on EEG patterns and personality variables, and on the behavioral effect of induced stimuli patterns. One of his findings was that coherence of the high frequency EEG pattern is apparently related to increased intellectual functioning. This leads to the conclusion that if the L/S device creates or facilitates coherence it could lead to increased intellectual functioning. Dr. Brockopp also found that when a brainwave state is experienced, learned, and practiced over a period of time, it is resistant to habituation at least in the short term. Hutchison (1986) notes that this may explain why the L/S device seems to have an accumulative effect, so that after a series of experiences with the L/S users seem to find it easier to self-produce the desired brainwave state at will.

As reported by Hutchison (1990), Bruce Harrah-Conforth, Ph.D. of Indiana University completed a controlled study of the MindsEye Plus L/S unit and reported that compared

to a control group which listened to pink noise, the L/S group showed dramatic alterations in their EEG patterns responding to the frequency of the L/S device. Participants also showed evidence of hemispheric synchronization.

Dr. Harrah-Conforth, in a letter to Megabrain Report (Volume 1, No. 2), writes: "I have little doubt that brain entrainment technology is a highly effective means of inducing changes in consciousness. Brain entrainment, at least within my own research, has shown itself to be virtually foolproof and does indeed facilitate whole brain experiences." Concluding, Harrah-Conforth stated, ". . . the early indications are strong that this nowdeveloping technology will profoundly revolutionize both our concepts of, and interaction with, our consciousness . . . The evolution of human consciousness is a tangibly manipulable process. We can control our destiny - . It would appear as though brain entrainment will be among the technologies leading the way."

PRELIMINARY ADDH (Attention Deficit Disorder Hyperactive) RESEARCH

At the 1991 AAPB (Association of Applied Psychophysiology and Biofeedback) Annual Meeting in Dallas, Texas, Harold Russell, Ph.D. reported on new research that showed that L/S at beta frequencies (18 -21 Hz) appeared to improve the cognitive functioning of ADDH (Attention Deficit Disorder -Hyperactive) children. These children show greater than normal amounts of theta energy and less than normal beta frequency energy in the EEG. Moreover, Dr. Russell had noted the research of Dr. Marion Diamond who, in her book "Enhancing Heredity," (1988) showed that sensory stimulation of the brain of rats increased dendritic growth. These changes can occur in all ages of animals from embryonic to very old.

Russell and his associate John Carter found that training of the lower performing cortical hemisphere of students showing greater than 10 point differences in Verbal and performance scores of the WAIS I.Q. test improved performance significantly. Thus, if a student showed a lower Verbal score and was given stimulation with primarily beta frequencies over the left hemisphere, he would improve significantly on this subscale after 40, 30 minute training sessions. In contrast, a child with a lower score on the Performance score would, when trained with L/S into the right hemisphere, improve on this scale. Training on the higher performing hemisphere did not result in any increase in performance on that scale. The children also used a relaxation audiotape at home each night.

Russell concluded that perhaps the L/S stimulation could be combined with actual EEG biofeedback training to teach ADDH children to selfregulate appropriate brainwave states.

EEG BIOFEEDBACK AND SUBSTANCE ABUSE

The report of Russell above is indicative of a general renewal of interest in control of EEG rhythms. In the areas of biofeedback, brain mapping and L/S there are applications

to epilepsy, learning disorders and substance abuse, to name a few. The study of Peniston and Kulkowski (1989) is illustrative of one of these. The researchers compared a group of alcoholics who received alpha/theta brainwave biofeedback training and verbal and visual self-programming to nonalcoholic and traditionally treated controls. The biofeedback group received 8 - 30 minute sessions of peripheral temperature biofeedback prior the BWT (brainwave feedback training) which consisted of 15 - 30 minute EEG alpha/theta sessions. It was believed that the skill of hand (and foot) warming would facilitate the appearance of theta in the EEG. Participants in this group were also instructed in autogenic training. After this the BWT began and was presented 5 days a week for 3 weeks. Finally, participants were instructed in the to be visualized abstinence/alcohol rejection scenes. According to Peniston and Kulkowski, they were also instructed in "imageries of increased alpha rhythm amplitude and scenes of the normalization of their personalities." Having acquired the skill of entering the theta state the participants could now "sink down" into it, taking the imaged scenes with them.

The BWT group showed significant increases in percentages of EEG record in alpha and theta rhythms, and increased alpha amplitude. Participants from this group showed sharp reductions in self-assessed depression compared to the control groups. A 13 month follow-up indicated sustained prevention of relapse in alcoholics that completed the alpha/theta and reprogramming training.

Several groups of researchers have studied the phenomenon of decreased alpha energy in alcoholics and even the sons of alcoholics. After an alcohol challenge they are likely to show an increase in the amount of alpha waves. Peniston and Kulkowski note that these findings suggest that at least some persons with a predisposition to the development of alcoholism are characterized by deficient alpha activity. Furthermore, these individuals may be especially vulnerable to alcohol's effects if drinking enables them to attain a reinforcing psychological state associated with increased alpha activity. In other words, alcoholics and even sons of alcoholics, would appear to have cortical overarousal in, the sober state. Apparently, this arousal level of the brain is lowered toward a more normal state by the ingestion of alcohol. The appearance of increased amounts of alpha signals this decrease in cortical arousal from the usual beta state. In other words, beta is decreased, alpha increased.

If cortical hyperarousal is the core physiological reason why some alcoholics tend to drink, then perhaps *L/S* training at alpha frequency might be of assistance in relapse prevention with these individuals.

PHOTIC STIMULATION AND IMAGERY

Richardson and McAndrew (1990) investigated the relative effects of photic stimulation on induced imagery. Frequencies of 6, 10, and 18 Hz were applied to 40 female undergraduates, half of whom were selected because they had a habitual interest in their own internal states, and half because they had no such interest, as defined by the Private Self-Conscious Scale (PSC). The study showed that more complex images were reported under the 6 and 10 Hz conditions rather than the 18 Hz. However, the greatest amount of

imagery was generated at 6 Hz. Moreover, the high PSC group produced more imagery than the low PSC people.

Somewhat earlier, Glickson (1986-87) exposed 4 male subjects to photic stimulation at frequencies of 18, 10, and 6 Hz. Two of the subjects experienced an ASC (altered states of consciousness) which was defined by Glickson as a state in which the subject notes a qualitative shift in the normal pattern of mental functioning. During the ASC these two subjects reported visual imagery induced by the photic stimulation and exhibited a driving response to the 10 Hz; signal. Glickson also reported some interesting and tentative conclusions:

1. Alpha persistence is Incompatible with visual imagery, and
2. It is the *change* in alpha activity (eg., by driving) and not the alpha activity itself that is conducive to an ASC.
3. The appearance of visual imagery is neither necessary nor sufficient to indicate the experience of an ASC; and
4. If a driving response is not elicited, the subject will not experience an ASC.
5. If a driving response is elicited to photic stimulation at 10 Hz, an alpha experience may be induced; and
6. The change in alpha activity is conducive both to visual imagery and to the induction of an ASC.
7. Only a partial success was obtained in attempting to drive the EEG at 6 Hz, causing Glickson to conclude that induced ASC is specific to the 10 Hz; driving stimulus.
8. One subject reported tactile effects when stimulated at 6 Hz even though a driving response was not elicited. Walter and Walter (1949) reported cutaneous sensations (tinglin& pricking) and emotional ex periences at 6 Hz.

HEMISPHERIC COHERENCE AND PHOTIC STIMULATION

A question often asked is whether or not the use of photic or *L/S* stimulation affects hemispheric coherence. This term refers to the degree to which the left cortical hemisphere dominant EEG frequency is in-phase with the right cortical hemisphere dominant EEG. A number of researchers have noted that in normal individuals during attentive behavior the coherence of the EEG does increase. Donker, Van Leeuwen and Wienke (1978) showed that with photic stimulation coherence of the alpha rhythm at 10 Hz was higher in normals than in patients with a diagnosis of epilepsy. This data also indicated that the highest coherence was found in occipital locations, whereas the parietal and temporal regions showed a nonsignificant degree of coherence.

Earlier, Hoovey, Heinemann and Creutzfeldt (1972) had found a considerable variation of phase coherence in the alpha rhythm. They also found that the degree of phase coherence was closely related to the interhemispheric amplitude coherence of single alpha waves, and both values showed a considerable inter-individual variability. From these results one would conclude that the brain does not ordinarily exhibit a high degree of coherence. The Donker, et al research noted above however does suggest that photic stimulation may increase the coherence, at least in the occipital region.

The Alpha Generators

Hoovey, et al devoted a portion of their discussion section to a discourse on whether or not the brain contained two separate and independent alpha generators. Apparently, Adrian and Yamagiwa (1935) had assumed two independent generators in the two hemispheres. Bremer (1958 ab) proposed that the alpha rhythms were not only coupled subcortically but also through the corpus callosum. Later animal studies, however, showed that the synchronization of the two hemispheres was not significantly affected by section of the corpus callosum. In humans, the agenesis of the corpus callosum did not reveal a larger right-left desynchronization than in normals. It was concluded that the corpus callosum has little to do with interhemispheric synchronization. Hoovey and Creutzfeldt (1972) felt that their results indicated that indeed the **alpha** generators were not independent and that the degree of interhemispheric coupling showed individual differences. They stated that, "It seems as if the subcortical alpha generators have a sensor which prevents alpha waves in the hemispheres from being desynchronized by more than 20 msec. If such inter-hemispheric differences are reached, a mechanism is activated which "pulls" the two generators back into phase."

One might conclude from these studies that cerebral coherence of both the phase and amplitude of the EEG varies with location and band. Occurring primarily in the EEG within the alpha band and in the occipital region, it can be increased through photic driving.

BINAURAL AUDIO STIMULATION

Is it really the case that EEG entrainment can be obtained with sound alone? In fact, there are some very good data and references in a recent Doctoral dissertation by Foster (1990).

Foster makes a distinction between the techniques of biofeedback and binaural beats in the manipulation of alpha EEG. He states that, "Alpha brain wave biofeedback is considered a consciousness self-regulation technique while alpha frequency binaural beats stimulation is considered a consciousness management technique." He also notes that, "... both techniques could be considered to contain components of both self-regulation and management of consciousness."

The existence of research on the phenomenon of binaural beats is well documented (see Oster, 1973), Foster notes that the application of binaural beat stimulation as a

consciousness management technique has received little attention except for a small number of researchers (Atwater, 1988).

The Origin of the Experience of Binaural Beats

We know that the experience of putting a given frequency tone in one ear and a slightly different tone in the other is that of hearing a third tone which is the difference in frequency of the two tones. Thus, putting a 200 Hz tone in one ear and a 210 Hz tone in the other would cause one to perceive a 10 Hz "beat" tone. Foster states that this is due to, "...an auditory brainstem response which originates in the superior olivary nucleus of each hemisphere. The beat results from the interaction of **two afferent auditory** impulses, originating in opposite ears, below 1000 Hz; and which differ in frequency between one and 30 Hz." The difference tone is experienced as the two waveforms flow in and out of phase within the superior olivary nuclei.

The first reported use of the auditory effects of binaural beats, as detailed by Oster (1973), occurred in 1839. The originator was H. W. Dove, a German researcher. Today, the binaural beat phenomenon is employed by a number of audiotape manufactures as a way of producing certain relaxed states in the listener. Foster examined, as part of his dissertation study, the degree to which these binaural beats at alpha frequency could result in an increase in alpha. He found that the binaural beats did indeed produce an increase in the occurrence of alpha however, **another group which heard artificially** produced surf sounds also showed a comparable increase in alpha. These two groups did not differ significantly. Subjects did find that they seemed to be able to increase alpha more by concentrating on the binaural beat.

BRAIN ASYMMETRY

In recent years there has been a resurgence of interest in brain asymmetry. This research may have important implications for the L/S field. This parameter, as used in these studies, refers to differences in EEG energy within certain bands between the left and right hemispheres. One of the principal investigators in this area of interest is Richard Davidson. We will take a quick look at some of his exciting studies.

Frontal Brain Asymmetry Predicts Infants' Response to Maternal Separation: The EEG as recorded from the left and right frontal and parietal scalp regions of 13 normal 10 month-old infants showed greater activation of the right frontal area in infants that cried during a brief period of maternal separation. Infants that did not cry showed significantly less activation over this region (Davidson & Fox, 1989). ***Conclusion: Frontal EEG activation asymmetry may be a state-independent marker for individual differences in threshold of reactivity to stressful events and vulnerability to particular emotions.***

Approach-Withdrawal and Cerebral Asymmetry: Scalp EEG measures of activation were found to be associated with the facial expressions of approach-avoidance. Disgust was found to be associated with right-sided activation in the frontal and anterior temporal regions compared with the happy condition. In contrast, happiness was accompanied by left-sided activation in the anterior temporal region compared with the disgust condition (Davidson, Ekman, Saron, Senulis & Friesen, 1990).

Can Brain Asymmetry Predict Emotional Response to Films? The answer to this question is YES. Resting alpha power asymmetry in the left/right frontal areas significantly predicted self-reported global negative affect in response to film clips eliciting positive and negative affect (Tomarken, Davidson & Henriques, 1990).

Conclusion: *Resting anterior asymmetry may be a state-independent index of the individual's predisposition to respond affectively.*

Can Brain EEG Asymmetry Discriminate Previously Depressed and Healthy Control Subjects? This study showed that previously depressed (normothymic) individuals had less left-sided anterior and less right-sided posterior activation (i.e., more alpha activity) than did never depressed subjects. The previously depressed subjects had no history of pharmacological treatment and did not differ from the controls in emotional state at the time of testing (Henriques & Davidson, 1990).

Conclusion: The pattern of anterior and posterior asymmetry in the previously depressed subjects is similar to that found in acutely depressed subjects and suggests that this may be a state-independent marker for depression.

AN OVERALL COMMENT: New technology such as the EEG "brainmappers" (Neurosearch 24, BEAM, etc.) that precisely quantify and convert surface EEG signals into topographic, Fourier and other pictorial displays will help detail exactly what effects are occurring in the brain during L/S stimulation. The important question that still needs a more definitive answer is what effect L/S really has on the brain in terms of entrainment and coherence enhancement.

SECTION TWO: CLINICAL CONSIDERATIONS OF LIGHT/SOUND

GENERAL

What can L/S do for the clinician in the behavioral medicine, psychological or psychiatric setting? One can look at this question from at least three models of therapy. The behavioral model would say that L/S can be used to calm or relax the client and thus reduce stress. The cognitive model would say it helps optimize cognitive functioning. A more psychodynamic model would predict that L/S can open a window to the

unconscious. Perhaps one could also consider the transpersonal model which would see the L/S device as a means for producing unusual states of consciousness.

In the clinical setting the L/S device is used to:

1. Relax clients who may be so agitated that they have difficulty concentrating on a task like biofeedback. The biofeedback can still serve as a physiological monitor.
2. Shape the EEG toward a more optimal pattern for imagery.
3. Entrain the EEG in preparation for Twilight Learning.
4. Produce a positive experience (and possible endorphin increase) in depressed clients (Try the Kaleidoscope program).
5. Provide an optimal brain/body state for hypnosis.
6. Provide an optimal mind/body state for the presentation of preconscious (subliminal) process audiotapes.
7. Provide an optimal state for creativity.
8. Decrease EEG dominant frequency for the purpose of regressing to and the recalling of childhood traumatic memories.
9. Explore different experiential or meditative states with those clients who may be seeking such a transcending experience.
10. Increase EEG frequency in certain types of hyperactivity and Attention Deficit Disorders.

RELAXATION WITH L/S

How do you get a tense client to relax in the clinical setting, without drugs? Obvious answers are that you use biofeedback, various relaxation training procedures such as Autogenic Training or Progressive Relaxation, meditation, or stretching. However, a good number of very tense clients can be calmed simply through the intrigue of the L/S presentation. The unique quality of the brilliant visual display and the compelling sound often rivet the attention of the client when first exposed to the US. Because of the excitement usually engendered upon first exposure to L/S the client should be forewarned that there will be a first stage of fascination with the display before a second stage of deep relaxation develops.

Please note that a small percent of people may find the first exposure to L/S to be slightly aversive. This usually manifests as a feeling of being overwhelmed by the display and may be accompanied by dizziness and possibly nausea. Obviously the L/S technology is not recommended in these cases.

Caution: all clients must be carefully prepared for exposure to S/L in the clinical setting. This is especially important if a high trust level between therapist and client has not yet been established. Each client brings to the clinical setting his or her own (usually unstated) expectations about the therapy or training that will occur. It is the therapist's job to elicit these expectations and to bring them in alignment with the focus of his/her clinic, or at least, in this instance, with the L/S procedure. The success of a technique such as L/S is extremely sensitive to the polarity and degree of the user's expectations. Perhaps a good rule of thumb is to give the client a truthful yet very positive "set" for the most unusual experience that is about to unfold. (See Ian Wickramasekera's excellent text, *CLINICAL BEHAVIORAL MEDICINE* (1988) for the best discussion of this issue).

What L/S Parameters?

A good general rule of thumb for the choice of an L/S program for producing deep relaxation from a starting state of high cortical arousal, would be one which would present a starting frequency of beta (say 13 or 14 Hz) which would ramp down (gradually changing frequency in a decreasing direction) to "slow alpha" (8 Hz), stay there for the main duration of the session, and then ramp up to a moderate, relaxed alpha (10 Hz) A program that would ramp down into the theta range (4 -7 Hz) could also be used, but theta states are used primarily for reaching unconscious process.

NOTE: The special states created by the L/S are ideal for the absorption of positive suggestions as presented through audiocassette format. Hypnotic, preconscious process, relaxation, soothing music of nature sounds, or combinations of the above have superior impact during L/S stimulation.

WILL CHANGING BRAINWAVE FREQUENCY PRODUCE CHANGES IN MUSCLE AND AUTONOMIC RESPONSES?

The answer is a qualified *yes*. Qualified by virtue of the fact that there are great individual differences in the degree of correlation between the EEG and the muscle and autonomic responses during waking states. At high arousal and at low arousal the degree of correlation increases. However, in general, decreasing the EEG frequency does produce a relaxation response. Moreover, driving the EEG toward the low alpha and then theta does seem to produce a change in consciousness. Specifically, most individuals will experience a quieting or slowing of conscious thought process as their dominant alpha frequency decreases.

Certain individuals may exhibit what is called a "guardian" response. This refers to the maintenance of one or more of the physiological responses at a high level of arousal while other responses decrease toward a deepening relaxation state or low arousal. Thus, the client maintains a full measure of consciousness as certain of the physiology relaxes. The guardian response(s) appear most often in those individuals who, on some level, fear the loss of critical screening as arousal lowers. For these individuals a deepening of the relaxed state means an increased vulnerability and possible harm. **NOTE: Such individuals can offer resistance in a number of ways:**

1. Showing a guardian response.
2. Sudden twitches or myoclonic jerks.
3. Sudden feelings of panic ("I felt closed-in.")
4. Laughter
5. Maintenance of primarily beta EEG frequencies even as the L/S frequency ramps downward; or, on a slightly deeper level, maintaining dominant alpha frequency as the L/S changes to theta.
6. Feeling a sudden nausea or other aversive physical symptoms.
7. Intermittent verbal comments.
8. Complaints about some aspect of the L/S, the chair, or some other aspect of the immediate environment.
9. Making derisive comments about the procedure.
10. Unusual itching or painful sensations.
11. Experiencing frightening imagery from within.
12. Need to go to the rest room after the session has begun.
13. Having guilt or fear because of certain religious beliefs.
14. Having a racing mind or compelling, intruding thoughts.

3. OVERCOMING RESISTANCE

Each resistant individual brings her/his own unique reasons for the fear of letting go. These reasons may vary from traumatic early experiences (e.g., a frightening ether

anesthetic as a child ("I can't breathe!") to early sexual abuse ("He would wait until I was asleep"). Some of these fears may be accessible to conscious processing and, if so, they can be addressed in the clinical setting. A good question to the client is, "Can you remember an earlier situation when you felt like this?" If the answer is "no" it may be that the trauma(s) or reasons have been forgotten or repressed. Often the forgetting process is one of the mind's, defenses against reliving painful memories.

Unconscious Resistance: When the client experiences an inability to relax and cannot explain why, it is very possible that early childhood trauma may have occurred. The client should always be encouraged to try to relax, With the permission to tense certain muscles or even take off the eyepiece for a short while the client will usually feel more secure and willing to attempt relaxing in this situation. After a few "interruptions" most clients settle down and allow the L/S stimuli. to "take them" to deeper levels.

NOTE: Individuals who at first have unconscious resistance may, upon relaxing deeply, encounter certain of the material which has emerged from the unconscious realm. This material will need to be integrated or it may result in increased anxiety or depression. It is helpful to encourage the client to be aware of such emerging material whether in felt negative emotions or in dreams, or manifested in unusual behavior. Some of this formerly repressed material may need to be "rescripted" and this procedure will be covered later. There are a number of therapeutic procedures for dealing with the emergence of repressed material. These range from counseling to long-term psychoanalysis. A relatively new process called "rescripting" will be described later.

THE THETA OR "TWILIGHT" STATE

In his POETICS Aristotle used the term "psychogogia" to describe the state of the spectator in the theater whose mind is "enthralled," "entranced," "absorbed," and "transported." This state of fascination is, according to Mavromatis (1987), one in which the representational system is fully engaged, and the individual cannot maintain salient qualifying 'meta-cognitions', that is, thoughts about the primary representation, such as 'this is only my imagination' or 'this is not really happening.'"

When clients begin to slip into theta (4-7 Hz), and especially when there are no beta or alpha frequencies mixed with the theta, most people lose consciousness (even though they may not admit it if asked, "Were you asleep?" most will say, "No, I was just thinking." However, if they are questioned carefully about the content of the thought process they will either say that they don't remember, or, that it had a "live-in" quality). Officially, they had entered stage 1 sleep, sometimes called the twilight state of the hypnagogic (from the Greek hypnos = sleep, and agnogeus = conductor or leader) state. while this state has many uses it is not necessary to go this deep for the purpose of training deep relaxation skills.

Early Ideas on the Theta State

Over the millennium human beings have placed special meaning in the cognitions characteristic of the twilight, theta or hypnagogic state. Shamanistic and other primitive ceremonies often included procedures designed to produce these states. It was believed (and still is in certain cultures) that the dreamlike images elicited in the twilight state allowed the dreamer to foretell events, instruct as to healing procedures, and give important information that could not have been gained in any conscious manner.

Mavromatis notes that in the third century AD, Iamblichus "the divine," writing on "God-sent" experiences and the conditions under which they take place, referred to a condition between waking and sleeping during which voices are heard by us and sometimes "a bright and tranquil light shines forth" (1895). In the 18th century Swedenborg reported his hypnagogic experiences and even detailed ways of inducing them (1950).

HYPNAGOGIC IMAGES

It has long been observed that spontaneous imagery, however fleeting, often arises from the twilight state. Scientists and clinicians argue over the meaning of these hypnagogic visions. There does seem to be a rather large amount of anecdotal data supporting the idea that these images spring from the unconscious (rather than being simply random phenomena) which reflect important and possibly unresolved areas of conflict or problem solving, albeit on the unconscious level.

These evanescent images often resemble static photographic stills which have a vivid, live-in quality. Green, Green and Walters (1971) noted four main characteristics of hypnagogic images: vividness, independence of conscious control, originality, and changefulness (see Stoyva (1973) for an excellent discussion of the conditions contributing to the hallucinatory phenomena characteristic of this state). Are *they the "stuff" of creativity?*

A number of famous individuals from the fields of science, music, literature and art have credited the imagery produced during the twilight state for creative solutions or inspiring thoughts. Koestler (1964), in recounting many examples of this phenomenon, concluded that the temporary relinquishing of conscious controls liberates the mind from certain constraints which are necessary to maintain the disciplined routine of thoughts but may become an impediment to the creative leap; at the same time other types of ideation on more primitive levels of mental organization are brought into activity."

In their laboratory at the Menninger Foundation Elmer and Alyce Green and Dale Walters have for years studied the relationship between twilight states, brainwave activity and creativity. For example, in one experiment the EEG patterns of three demonstrably creative individuals (a professor of physics, a psychiatrist, and a psychologist), were recorded as they maintained a reverie or twilight state which they associated with creative

thoughts. Each of these people were self-trained over periods of 15 to 30 years in internal scanning techniques. During the experiment two reported that they had produced what they called their customary hypnagogic-like imagery as they did their internal scanning - a looking inward with the exclusion of external stimuli. The third subject. showed a slowing of his alpha EEG frequency down to 8.3 Hz and reported that this was a preliminary mind-quieting, imageless stage in moving toward a deeper state (Green, et al, 1971). Apparently, certain creative individuals do acquire some ability to slow their EEG rhythms as they enter a self-induced twilight state in order to "mine" the hypnagogic gold of creativity.

Commenting on Swedenborg's approach, Van Dusen (1975) stated, "Since childhood Swedenborg had a personal practice that happens to be one of the ancient Hindu Yoga and Buddhist ways of enlightenment ... He would relax, close his eyes, and focus in on a problem with total concentration. At the same time his breathing would nearly stop. Awareness of the outer world and even bodily sensation would diminish and perhaps disappear. His whole existence would focus on the one issue he wanted to understand... The problem he was concentrating on would blossom out in new, rich and surprising ways."

With regard to creativity Deikman (1969, 1971) proposes that in the twilight or theta state a new vertical organization of concepts takes place, that is, an organization of the non-linear "logical" kind which permits intercorrelations of extensive, and normally entirely unrelated, and diverse schemata.

MODERN RESEARCH AND THE TWILIGHT STATE

Modern-day sleep researchers have defined the twilight sleep in terms of brainwave patterns and eye movements. Sleep researchers Foulkes and Vogel (1964), for example, spoke of the drowsy period just preceding Stage 1 sleep as characterized by a slowing of the alpha rhythm (8 - 12 Hz) accompanied by slow rolling eye movements (SEMS). As the individual passes into Stage 1 sleep the slowed alpha rhythm begins to break up and is replaced by an even slower, smaller amplitude theta rhythm (4 - 7 Hz). The duration of this transition, as one falls asleep, from a relaxed, waking alpha pattern to the disappearance of the alpha and the appearance of theta is roughly five to ten minutes. During this rather brief period (which, of course, can be maintained by the L/S device) people typically report emergent, hallucinatory, dreamlike experiences which are more disjointed and brief rather than those dreams associated with rapid eye movement (REM) sleep. Clinicians know that this state can result in the emergence into consciousness of hitherto repressed or forgotten memories. Thus the theta or twilight state is useful for the "mining" of such material.

Can Memories Be Encoded At The Dominant Brain Frequencies?

As noted above, anecdotal reports of the recovery or emergence of specific childhood images during theta frequency states (whether induced through the Twilight Learner hypnosis, or the L/S) may be due to the reproduction in the brain, by these procedures, of a frequency (theta), which was indeed the dominant frequency of the individual at the time the experience occurred. Could the reproduction of this early brain wave pattern facilitate the emergence of certain visual memories that were encoded with the EEG pattern that was dominant at that time?

Another hypothesis is that the reduction of cortical arousal that is occurring as one passes from an alpha/beta waking pattern to a theta state decreases the critical defenses and releases the nondominant hemisphere to project certain early memories. This hypothesis rests on the assumption that most traumatic early memories are somehow stored primarily by the nondominant brain. Since it is known that this hemisphere indeed does tend to process much of the negative emotions (Tucker, 1981), perhaps the above assumption and hypothesis are true.

Retrieval of Twilight State Material

Given that "Pandora's Box" can be opened through the gateway of a twilight state the question becomes how does one retrieve the material? The state is so delicate that the emergent thoughts and feelings are easily lost when consciousness returns. One suggestion is teach the client to report verbally (while still in the state) just a word or short phrase to identify the material. Then, after "awakening" the client can flesh-out the experience based on the brief cue words. If the client had been asked to give a more complete verbal description while still in the twilight state it would have brought an abrupt ending to the state. The production of a single key word or phrase usually allows the client to remain in the state and retrieve more material. It has been noted that a number of famous scientist, inventors and creative people learned rather interesting ways to retrieve material from the twilight state. Thomas Edison trained himself to get intuitive and creative solutions to problems by learning to fan asleep standing up against a wall. He would hold one arm out horizontally from the elbow. In his hand was a metal ball. Below, on the floor, was a large metal pan cover. As he fell asleep, the arm would fall and the ball would be released and clang on the metal pan cover below. This of course would awaken Edison, and he would immediately write down any flashes he remembered.

Is Learning Possible In the Twilight State?

Again, the answer is a qualified yes. Research by TX Barber (1957) showed that subjects were just as suggestible in a light sleep or in a drowsy condition as when hypnotized. A

remark by one, of the people in his dissertation is significant. "I was just sleepy enough to believe what you were saying is true. I couldn't oppose what you wanted with anything else." Barber stated that at the therapeutic level it is possible that suggestions could be presented to people while they sleep for purposes of helping overweight individuals to reduce, getting heavy smokers to quit, and helping timid people gain confidence.

Experiments carried out by Orne and Evans and their colleagues (Evans, et al., 1966, 1970) verified that an individual in Stage 1 sleep is capable of carrying out purposive behavior in response to suggestions given while he is asleep without any evidence of physiological arousal.

An experiment at Yale University produced a result that supported Barber's conclusions. The study by Felipe (1965) tested the effects of attitude change information presented via tape recordings to subjects during waking, drowsy, and deep sleep conditions. A portion of the attitude change information concerned interracial dating. Felipe used several pre-post attitude scales to measure any change that may have occurred during the three conditions. Only in the condition where the subjects were presented the message while drowsy did the attitude change reach significance. This finding is consistent with the premise that attitude change is potentiated in a drowsy or light sleep because of a lowering of defenses. Changes were negligible in the waking condition perhaps because the defenses were intact. Little or no effect was seen as a result of presenting the material during deeper sleep.

Even if learning during deep sleep is difficult to implement there is a good deal of evidence that learning can take place quite regularly during lighter sleep stages. Moscu and Vranceanu (1967), for example, presented lists of emotional and unemotional words to subjects during the first cycle of sleep. Upon awakening, subjects were able to recall 22% of the words and to recognize 59% of them from a list of 60 words. It is interesting that the subjects recognized more of the emotional than the unemotional words!

How About Sleep Learning?

Rubin (1968, 1970) has examined the Russian sleep learning literature in some detail and has concluded that there is evidence of learning particularly when the technique of "Hypnopaedia" was used. Unlike most other research in this area the Russian experiments incorporate repetitive practice over several days and even months, and there is a great emphasis on producing the correct "set" or expectancy for learning and retention before the presentation of the material.

The Russian investigators determined that retention of the material is optimized if the presentation takes place during the first 30 - 40 minutes of sleep. Rubin (1970) noted that the common denominator among successful sleep-learning studies is that "superficial sleep" (Stages 1 and 2) is the psychophysiological background for maximum receptivity.

Biofeedback and Twilight States

As noted in the cases of the three experimental participants above, the selftraining and discipline required to develop this skill probably took a number of years. Could this ability be trained faster with biofeedback? Joe Kamiya's landmark research at the Langley-Porter Neuropsychiatric Institute in the mid-sixties showed that feedback of a 400 Hz tone whenever alpha EEG was present allowed people to learn to increase the amount of alpha. About 1969 the Menninger Clinic **Psychophysiological laboratory and the** University of Colorado Medical Center's Biofeedback laboratory were each developing alpha and theta feedback systems. The team of Budzynski, Stoyva and Peffer quickly learned that the production of theta rhythms was much more difficult than that of the alpha frequencies. It was discovered however, that preliminary training in the lowering of forehead tension through EMG biofeedback was helpful. In fact, one study (Budzynski, 1976) compared high forehead tension with low tension individuals in the amount of theta EEG they were able to produce with biofeedback. Results showed that the low tension people were able to use Theta EEG biofeedback immediately to enhance the amount of theta energy. The high tension group however, required the preliminary frontal EMG training in order to move into theta training as a second Phase.

The Twilight Learner

In the early '70s Thomas Budzynski, at the University of Colorado Medical Center, developed a more sophisticated biofeedback device called the Twilight Learner (1973, 1976, 1977, 1981, 1986) that would sense the EEG, filter it for both alpha and theta energy, and then, when one or the other of these frequencies were present, turn on one of the two tape recorders, one for alpha and the other when theta was being produced. Each recorder contained a different message - - the alpha recording simply gave reassurance and deepening relaxation suggestions. The theta message was a series of short phrases or affirmations focused on the goal of the therapy. The advantage of this technique is that the affirmations are not resisted by the conscious mind as they are accepted by the unconscious.

In order to help users transition into a theta state the Twilight Learner features a Pink Noise (pleasant white noise) generator, since research had shown that the presentation of a pink noise stimulus promoted the appearance of theta energy in the EEG.

The Twilight Learner allows a therapist to produce a theta state in the client, and maintain it, as positive change verbal or imaginal material is presented. Because the client's critical defenses are decreased in this state the probability of the positive change suggestions being accepted are significantly increased. The preciseness of operation (the unit shuts off the theta tape recorder immediately if the brainwave pattern moves out of theta and into alpha or beta) ensures that the positive change material will not set up resistance

defenses in the brain. Such defenses are the reason many consciously processed affirmations do not change behavior.

The subjective experience of twilight learning is one of being quite drowsy, and occasionally hearing a voice. However, if one directs attention to the voice, it will immediately go away. The material is being stored in the brain much the same as verbal information assimilated during anesthetic surgery i.e., it cannot be recalled, but does influence behavior. (Evans and Richardson, 1988).

WHY IS THE TWILIGHT STATE IMPORTANT?

What is the purpose of working with a client in the twilight or theta state? Does the production of this condition allow some advantage over therapy in the normal, conscious state? Why have people been so fascinated with the twilight state over the thousands and perhaps millions of years that humans have had the ability to contemplate such things? We already know that the ancients believed the twilight state, and altered states in general, offered an opportunity to see future events, generate healing powers, and help with important decision-making.

Contemporary scientists have explored the use of twilight states with clinical applications in mind. Adams and his co-workers (1965), for example, examined the use of sensory deprivation to produce an altered state in order to present prerecorded tape messages intended to facilitate the reduction of symptoms, as well as to increase the self-esteem, self-acceptance and insight in psychiatric patients. The results indicated that the sensory deprivation group, compared with a control group which heard the same message under non-deprivation conditions, experienced more acceptance and more positive change in self-concept measures.

In a fascinating new text, **RESTRICTED ENVIRONMENTAL STIMULATION: THEORETICAL AND EMPIRICAL DEVELOPMENTS IN FLOTATION REST** (Suedfeld, R (IN FLOTATION REST, edited by Suedfeld, Turner, and Fine), it is shown how the experience of REST is quite functionally similar to a twilight state in that greater access to childhood memories and the uncritical acceptance of external suggestions is facilitated. (Budzynski, 1990)).

Summarizing, The TWILIGHT STATE is important because it represents a state of mind which facilitates the emergence of repressed material as well as creative associations, and the assimilation of certain types of information, both verbal and imaginal, without the usual critical screening which is operative during the waking, fully conscious state.

FACILITATING THE TWILIGHT STATES WITH L/S

Of practical interest to the clinician who wishes to use a theta state to rescript traumatic experiences, enhance creativity, or, for whatever other reason, is the capability of producing a reliable theta state each session if possible. The L/S devices can be of great assistance in this application. Although most L/S units are not powerful enough to force a theta EEG pattern they can increase the probability of the client's achieving a twilight state. Thus, the L/S device can be used along with the biofeedback device to optimize the production of the desired brainwave state.

When used in conjunction with an alpha/theta or twilight learning biofeedback system, the L/S device helps entrain the proper EEG frequency. As the entrainment begins to occur the biofeedback signals the appearance of the desired frequency, and the client starts becoming aware of the subtle condition in his brain/body experiencing that correlates with the production of the desired brainwave pattern. The L/S and the biofeedback devices thus work together to allow the client:

1. To relax faster.
2. To produce the desired waveform more precisely.
3. To develop the awareness of what experiential state is required to "get back" to this place again.
4. To get "there" faster and more reliably.

The fact is that the L/S helps entrain the brainwave frequencies, and if one chooses a frequency that happens to have been the one that was dominant in childhood at the time that the trauma occurred, it may facilitate the memory of the trauma and the rescription to follow.

RESCRIPTING

In the simplest terms, rescripting is used to neutralize traumatic memories. Theory predicts that after mscripting, these negative memories will no longer insinuate themselves into everyday thoughts, attitudes, feelings, and/or behavior. The technique involves, first, the uncovering of the scripts, second, the creation of counter-scripts which present a more positive outcome, and third, the repeated presentation of the counter-script, preferably while in a deeply relaxed or hypnotic state.

The L/S is used both to facilitate the uncovering and the rescripting itself. As noted above, the L/S, during the uncovering, can help produce this deeply relaxed state and, possibly, entrain the EEG pattern that was dominant at the time of the trauma. During the

rescription phase the L/S again helps produce the deep relaxation (or facilitates the hypnosis) as the positive outcome scene is repeatedly imagined.

Uncovering

As noted above, Richardson & McAndrew showed that a photic-stimulation frequency of 6 Hz produced more imagery than did stimulation frequencies of 10 or 18 Hz. In another study by researchers Lehmann, Koukou & Andreae (1979), during which subjects were encouraged to absorb themselves in fantasy, 9 percent of imagery reports were given during alpha EEG and 59 percent during theta.

Richardson and McAndrew (1990) stated that, "Of all the many procedures to bring about an equivalent of the naturally occurring hypnagogic state (Schacter, 1979) and which, in turn, facilitate the emergence into awareness of visual imagination images, the easiest, safest and potentially most precise in its effects, is photic stimulation."

In the reports of Glickson (1986), Kooi (1971), and Moses (1970), there is evidence that changes in flash frequency can produce corresponding changes in dominant EEG frequency. These conclusions, along with the data from the previously noted studies, would seem to indicate that the use of L/S may indeed facilitate the uncovering of suppressed or repressed memories in the form of visual flashbacks or at least symbolically coded visual information related to the actual events.

GUIDED UNCOVERING

Typically, a L/S program for uncovering is chosen so as to gently entrain from a waking EEG, ramping down slowly to a deep theta state (4-14z), remaining at this frequency for several minutes and then slowly ramping back up to a final alpha frequency of 10 Hz. This scanning of the lower frequencies increases the probability of triggering early traumatic memories. The therapist, in parallel, has verbally induced a deeply relaxed or hypnotic state and can then proceed to ask if the client would scan back in time to see if there was any memory that may be related to the present difficulty. In most cases the client can make a verbal response and a dialogue between client and therapist can ensue. The resulting emergence of traumatic material must be handled extremely carefully. The client should be given permission to reveal only what he or she feels can be handled on the conscious level.

NOTE: Uncovering is a very sensitive and potentially anxiety-evoking process and should be attempted only by properly trained mental health professionals.

Repressed Material

For repressed material it may be necessary to utilize ideomotor signalling (therapist asks the client's unconscious to signal a "yes" response with one finger and a "no" with another finger (Cheek(1976))).

Using this technique the therapist can ask binary questions that can zero in on the time and place if there was a single trauma. A good question therefore, is whether there was primarily one trauma that is provoking the present day difficulties. Single traumas lend themselves to a reasonably simple elimination of these problems through rescripting. Multiple trauma situations may require a good deal more time to neutralize.

At intervals, the therapist can ask if the client can "see" the memory. If so, the therapist can ask if it would be alright for the scene to be brought to consciousness. If there is an affirmative response, the trauma can be discussed later. If there is a "no" response then more binary questioning is necessary to fill in more detail. In certain cases there may not be any visual component available and the memory must be fleshed out with strictly binary questions.

If the client is unable or unwilling to respond even with the YES/NO finger signals then it can be suggested that some of the material may surface during a dream or in some unguarded moment. Having the client write a quick, "off the top of the head" autobiography of the early years may bring out such material. The Neurolinguistic (NLP) procedures are particularly well adapted to the uncovering process. For example, asking the client to imagine himself in a theater and a movie of some important early experience is about to begin. The movie starts out as a tiny projection on the screen. It can also be fuzzy and out-of-focus so as to protect from the elicitation of too high an anxiety level. The client then, at his own rate, gradually increases the size and clarity of the movie until he can see it clearly. A final phase of this movie technique is to have the client "move into" the movie and experience it. (See also Emmett Miller's *Software for the Mind* (1987) for excellent uncovering and rescripting ideas). Finally, photos from childhood often help to spring loose these memories.

APPLIED RESCRIPTING

One of the first therapists to write about the process known here as rescripting was Pierre Janet (1889) in his thesis, *Vautomatisme Psychologique*. (The description from this French work was translated by Nemiah (1984). A young woman who suffered from a great variety of frightening symptoms including intermittent blindness in her left eye, convulsions, pain, delirium, and, some years before, experienced scabs on the left side of her face. Interestingly, the scabs disappeared just before the left eye blindness and a left-sided facial anesthesia occurred. During hypnosis Janet discovered that when the patient was very young she had been forced to sleep with a child whose face was covered with scabs. Janet then took her back to that memory but suggested that the other child

was very attractive and had no scars. It was necessary to repeat the scene twice before the patient was willing to caress the face of the other girl whereupon the normal sensations returned to the left side of her face, and when she was awakened, she saw dearly with her left eye.

John Lilly (1972) referred to the process of first interrogating the human biocomputer, and second, programming the biocomputer. Schultz and Luthe (1959) called it, "Getting answers from the unconscious." After getting the answer, a specialized Autogenic phrase would be generated and the client would then recite the phrase while in a deep Autogenic state. Budzynski (1981) rescripted from a theta state, as did Green and Green (1986), who believed that the theta state was, "the royal road to the unconscious."

The Menninger 6-Step Process for Programming the Unconscious

Green and Green (1986) of the Psychophysiology lab at Meninger's, described a six step process for projecting visual images into the unconscious:

1. Move first into a state of EMG quietness and peripheral warmth.
2. While in the state, construct the visualization that is to be planted in the unconscious, a visualization that has already been carefully planned by the cortex, with ambiguities eliminated (for the unconscious is like a computer in some ways, and tends to take instructions literally).
3. Allow awareness to sink down into the theta state with the idea that the unconscious is now listening; it is now in "record mode."
4. Gently project the visualization into the "field of mind" as a Gestalt, with as little left-cortex activity as possible.
5. Terminate the session with a quiet command, such as "do it," "so be it," "the instruction is now terminated," or the like, in order to terminate unconscious receptivity (similar to using the "enter" key in programming a computer).
6. Bring awareness back to the surroundings carefully so as not to disturb the planted instruction.

RESCRIPTING WITH L/S

The modern version of Janet's method may include biofeedback of relevant responses, L/S entrainment, and a priming process (subliminal) audiotape in the background. The L/S and the biofeedback help shape the deep relaxation and cortical arousal level that is

optimal for recreating the traumatic memory. The biofeedback is used as a monitor of the physiology such that even below-conscious threshold responses can be detected. Typically, the therapist creates with the client a more adaptive, positive outcome to the original trauma.

Developing the Rescription

Janet rescripted by changing both the patient's response as well as the other person in the scene. Obviously, this appears to be a successful approach. In fact, rescriptions; can take several general forms. The client can change the way he or she was thinking in the situation (cognition), or the external behavior (behavior), or the words that were said (verbal), or any combination of the three. Usually, a change in external or verbal behavior Will produce a change in the other person's behavior and therefore, a different, hopefully more adaptive, outcome.

In recreating the scene it is important that as many sensory modalities as possible be brought into play. The client should be able to see, hear, feel (emotionally), touch, and perhaps even smell and taste in the rescription. Descriptors that involve how one feels should be built in to the scene. For example, at the end of a scene the client might cognize in the scene, "I look around and see and hear him running away, and even though my heart is pounding, I feel triumphant, on top of the world, now."

Here is an example of a rescription of a trauma that was not, by objective standards, much of a trauma at all, but because it occurred while the client was in a semi-conscious state, the triggering verbal statement became a deeply embedded script to be carried out by the body. The case involved a 52 year-old woman who had suffered brain damage as a result of a fall from a horse. After a 3 month hospitalization she developed a painful stinging sensation in her arms, particularly her left. The pain was severe enough that she would not put her arms in sleeves, and she wore a cape even on the coldest winter day. All medical tests, some very sophisticated, had revealed nothing of a causative nature. It was believed that the problem existed in her brain which had suffered damage in the fall. The uncovering involved ideomotor signalling during hypnosis. The client (her unconscious) was asked if it knew the cause of the painful arms and it answered yes. Making a long story short, the triggering stimulus was a remark made by a visiting relative as a nurse was inserting an IV in the client's arm. The remark was, "Gee, that looks like it would sting!" Apparently, the unconscious took this as a command to cause the arm to continue to sting indefinitely. The rescription was simple - an old but wise "Dr. Welby" type physician was introduced to the scene. When the triggering remark was made, the wise physician said, "Oh sure it stings for a few seconds, but then it feels as good as new." When the client awakened, the pain was gone! The scene was repeated under hypnosis in one other session that week. Follow-up at 6 months showed no return of symptoms.

Following the rescripting sessions the client is asked to re-image the rescripted scene 6 times each day until the next session. Again, it is very important that the client generate as vivid as possible each repetition. If this new script is to successfully counter the original trauma, it must accrue a positive power of equal or better strength.

BIOFEEDBACK AND L/S

Can biofeedback be combined with L/S? Yes, in fact the two are quite synergistic - with the biofeedback monitoring able to provide validation of the physiological changes that have taken place during the L/S session, and the US validating the client's belief that he/she can indeed does possess the ability to relax to a deep level. At St. Luke Medical Center's Behavioral Medicine department we often combine L/S with Dr. Budzynski's audiotape programs for stress, self-esteem, appetite or smoking control, along with biofeedback monitoring. Showing the client his physiological record at the end of the session establishes the set or belief that she/he has relaxed deeply during the session. The client now possesses the conviction that not only is it possible to relax to a deep level, but that the positive suggestions presented on the audiotape have been absorbed at different levels as well.

NOTE: An interesting phenomenon that may happen on occasion is what is called "the guardian response." As some clients begin to relax deeply they may exhibit a heightening of arousal in one physiological system, e.g., EDR (GSR or SCL), as all others move in the direction of lowered arousal. It is as though one must "stand guard" while the others relax. When this happens it signals that the unconscious does not yet trust the development of an unguarded, vulnerable low arousal state. This phenomenon can be tactfully pointed out to the client with the result that it will eventually disappear.

The feeding back of a computerized biofeedback display can be alternated with L/S presentations in order to see if the clients can match their own self-initiated reduction in physiological arousal (anti-stress) with that obtained during the US session.

Chronic pain clients can benefit by combining L/S with pain control audiotapes (see Resources Section) and biofeedback monitoring of selected muscle sites that are ordinarily held at painfully high levels of tension. If this combination is successful there will be a reduction in reported pain as well as physiological changes that are documented by the biofeedback. Again, the biofeedback verification of decreases in muscle tension helps establish the belief that the pain can be reduced.

NEW CLINICAL APPLICATIONS

There are several new applications of US worth mentioning at this time. One is its use during drug and alcohol withdrawal. Preliminary data indicates that L/S may compare

favorably with cranial electric stimulation (CES) in the treatment of withdrawal symptoms. Those clients who have been abusing Valium, Xanax, or other tranquilizing prescriptions may experience fewer and less severe symptoms during gradual withdrawal if they can manage daily or at least twice weekly sessions of L/S especially at theta frequencies. The alpha and theta frequencies may also help with other types of withdrawal since in most cases the abuser used the drug or alcohol to lower a somewhat hyperaroused cortex and the US can do that with no side effects.

Applications of L/S to certain learning disorders is another area of interest at this time. It would appear, from the anecdotal data gathered thus far, that L/S is very helpful in the training of hyperactive individuals. Thus, for example, Hyperactive ADD (Attention Deficit Disorder) clients seem to concentrate better after a session of L/S. The work of Ruth Jones of Salt Lake City is outstanding in this area of application. Over the last several years she has trained a surprisingly large number of these individuals to greater academic performance through the use of a combination of L/S and CES (cranial electric stimulation).

Audiocassette Programs with L/S

At the very least, the US can be an entry vehicle for inner space. As such it is admirably suited to carry affirmative verbal information into the brain. As noted above, Twilight Learning accomplishes this by waiting until theta frequencies are seen in the EEG before presenting the change message (CM). However, most self-help, positive information tapes do not require a theta state for assimilation, although a relaxed alpha pattern might indeed optimize the learning. The US is admirably suited to ferqpast most of the critical defenses, However, many Let's see how self-help tapes might fit into the picture.

An Audiotape Program Can Provide Long-term Structure and Motivation

Given that the L/S experience is intrinsically interesting, it can, over time, lose its uniqueness if it is used only as "an interesting trip." However, in its capacity as an "entry vehicle" as noted above, L/S becomes the means to the end of communicating important self-change information to the deeper parts of the mind. Relevant, important material can be presented quite precisely through audiotapes as the learner relaxes to the appropriate depth. It is theorized that the more deeply embedded emotional scripts may require a lower EEG arousal state, such as slowed alpha or theta in order to influence them. On the other hand, more nearly rote informational tapes can be presented at a relaxed alpha state. This may typically be achieved via an L/S program that would involve a descent from beta through alpha to theta, remaining there for most of the session, then ramping back up to alpha or beta at program's end. In contrast, the learning of a foreign language vocabulary might take place with an L/S program that stays primarily at 10 Hz alpha. The focus of this application of US is on the assimilation of the tape material rather than the

experience of the L/S itself. This application therefore does not result in the "declining results" phenomenon often seen when US is employed only for the unique experiential process.

A continuing program of self-improvement can be carried on for an indefinite period through the use of a series of properly structured, sequential, audiotape programs. Thus, the trainee completes sequentially a program on a given theme, e.g., self-esteem enhancement, followed by a series on stress coping. The trainee can then focus on a reaching goals series, before moving on to a fourth series containing appetite control suggestions. One could also continue on through additional programs on exercise, attaining financial security, maintaining health, self actualization and finally, transcendence. Since there is an ever increasing offering of self help programs one could continue with L/S aided self improvement indefinitely.

Recalling that the brain learns by assimilating whatever stimuli are presented to it, if the critical defense systems allow absorption, then the regular presentation of positive self esteem enhancing, self change information, within a paradigm that can temporarily lower the shields of these traumatically induced, low self esteem maintained defenses, result in the gradual refinement of self. As the self evolves into one of higher self regard, the critical defenses are automatically removed thus allowing greater freedom of expression, less fear, an increased ability to achieve without self sabotage, and a higher level of satisfaction and happiness.

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