The Effects of Biofeedback Assisted Relaxation Training Upon Vascular, Muscle Contraction, and Mixed Headache Disorders

by

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Abstract

Headaches are one of the most common complaints of people seeking medical treatment. This study investigated the effects of thermal biofeedback assisted relaxation training upon child and adult tension, migraine, and mixed (i.e., tension and migraine) headache disorders. The intervention was introduced in a staggered multiple baseline fashion across four children and three adults. Data were collected on headache frequency, duration, and severity, pain behaviors, and biofeedback training results. Measures collected by participants, significant others, and the investigator supported the positive effects of the treatment program. Increased headache free days were reported by all participants. In addition resting time due to pain, analgesic intake, and pain behaviors were reduced following treatment. Multiple measures for the observation and treatment of headaches are discussed as well as similarities and differences in participant reports of pediatric and adult headache disorders identified.

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The Effects of Biofeedback Assisted Relaxation Training Upon Vascular, Muscle Contraction, and Mixed Headache Disorders

Headaches are one of the most common somatic complaints, affecting 80-90% of the general adult population (Philips, 1977). In clinical practice it is the major complaint of about half of the people who seek help from a physician (Friedman & Merritt, 1959). Recurrent headache attacks comprise one of the more frequent clinical entities seen by pediatric neurologists (Jay & Tomasi, 1980). Organic etiologies (e.g., brain tumor) are found in only 5-13% of pediatric clientele with chronic headaches (Jay & Tomasi, 1980).

At least 40 million Americans suffer chronic recurrent headaches. They spend four billion dollars on medication yearly. Sixty-five million workdays are lost annually due to migraine alone. Headaches severe enough to limit activities or require bedrest are reported by 13% of the male and between 15-25% of the female population (Department of Health, Education, & Welfare, 1979).

Headaches may be divided into three major types: vascular, muscle contraction, and traction/inflammatory (Dallesio, 1980).

Vascular Headaches

Vascular headaches are pulsatile in character and are characterized by recurrent attacks widely varied in frequency, intensity, and duration. These headache attacks are typically unilateral in location and associated symptoms may include anorexia and nausea with possible vomiting. Some attacks may be preceeded by, or associated with, neurologic symptoms (sensory and/or motor) and mood disturbances (e.g., irritability). Often a positive familial

history is noted with this headache disorder. Cranial arterial dilatation is implicated in the painful headache phase, but causes no permanent changes in the involved vessel. There are three main subtypes of vascular headaches, each sharing some, but not necessarily all of the above described features.

"Classic" migraines are headaches with transient visual and sensory, motor, or mood "prodromes" (symptoms indicative of approaching headache). "Common" migraines are headaches lacking striking prodromes and are more often bilateral. "Cluster" headaches are predominantly unilateral and on the same side, usually associated with flushing, diaphoresis (perspiration), rhinnorrhea (watery nasal discharge), and increased lacrimation (tearing). These headaches are brief in duration and typically occur in groups lasting up to several weeks or months separated by long remissions (Diamond & Dalessio, 1982).

Muscle Contraction Headaches

Muscle contraction or tension headaches are terms used interchangeably to describe headaches of nonspecific type which are neither vascular nor associated with traction and inflammation. The pain is described as a steady, nonpulsatile ache. It may include "tightness" of the forehead, temples, or in the back of the head, a "bandlike" sensation about the head which may progress to a caplike distribution, and muscular cramping of the neck and upper back areas. These head pains may occur unilaterally or bilaterally (Diamond & Dalessio, 1982).

Tension headaches may be fleeting and are often characterized by frequent changes in site and intensity. This type of headache, localized in one region, may be sustained with varying intensity for weeks, months, and possibly years. Headache severity may be decreased by the headache sufferer assuming a specific position (e.g., supporting the head with his/her hands). Postural guarding (voluntarily limiting head, neck, and jaw motion) may be observed as another attempt to decrease discomfort. If pressure is applied to the involved musculature, the pain may become severe and elicit dizziness, tinnitus (a ringing sound in the ears), and lacrimation. These symptoms may also spontaneously accompany the headache (Diamond & Dalessio, 1982).

Traction/Inflammatory Headaches

This category comprises headaches elicited by inflammation, traction, and displacement or distention of the pain sensitive structures of the head, usually blood vessels. The location, severity, and duration of these types of headaches vary depending on the etiology of the headache.

Etiology.

A migraine attack occurs in two stages. The first, the premonitory (warning) stage or aura, is often marked by sensory disturbances but may be marked by nothing more than a vague uneasiness. The second stage consists of the headache and its accompanying symptoms (Speer, 1977).

The hypothesis that migraine is caused by instability of the

circulation of the brain is widely accepted. During the aura certain cerebral arteries constrict, greatly reducing blood flow and the supply of oxygen. If this is severe, the sensitive areas of the brain that receive messages from the sense organs are temporarily disturbed (e.g., resultant temporary blind spots). This stage lasts only a few minutes (Speer, 1977).

The headache stage is characterized by an apparent rebound reaction in which the scalp arteries dilate and other migraine symptoms occur (e.g., pallor). The pain is thought to represent the response of pain receptors in the blood vessel walls to stretching (arterial distension). This stage may last from eight to twelve hours but on occasion may remain for several days (Speer, 1977).

Eight to twelve million Americans suffer from migraine, 60% of sufferers are women. The pain onset may be in childhood, but most commonly it is during the second and third decades of life (Diamond & Dalessio, 1982).

Anyone may suffer a migraine headache given sufficient stimulus. The migraine sufferer is believed to have a lower threshold to various stimuli than the headache-free individual. The threshold for migraine seems to be of an inconsistent hereditary pattern. The effect of precipitating headache factors appears to depend upon the rapidity of change in the internal or external environment (Lance, 1978).

Migrainous symptoms (e.g., numbness, one-sided weakness, nausea) may result after mild head injuries. Traction or stretching of cranial vessels is believed to initiate the migrainous attack via vasospasm (Lance, 1978).

Stress is believed to be the most common precipitating factor for migraine. The onset of classic migraine within minutes of emotional upset is typical. Noise, glare, flickering light, or unpleasant weather conditions (e.g., changes in barometric pressure) may induce nervous tension and resultant headache. The release of neurohumeral agents within the autonomic nervous system may be the underlying mechanism (Lance, 1978). During the aura phase of the headache attack the platelets aggregate (collect) and serotonin is released resulting in the scalp artery constriction. Platelet aggregation is decreased during the headache phase. The serotonin level is diminished (taken up by vascular and perivascular tissues and catabolized to 5-hydroxyindale acetic acid or 5HIAA which is excreted in urine). Vasodilation results and perivascular sterile inflammation occurs. The serotonin level and blood vessel wall size is normalized at the post-headache phase. With the nerve endings sensitized, the scalp musculature is tender to touch (Dalessio, 1982).

Some migraine headaches have their onset while the individual is asleep. Lightening of sleep, rapid eye movement onset, decreased blood serotonin levels, and altered catecholamine levels have been noted (Lance, 1978).

Hypersensitivity to food may precipitate a migraine. Fatty foods, chocolates (contain phenylethylamine), ripe cheeses (contain tryamine), and alcohol have been identified as typical foods provoking the migraine headache attack. Skipping a meal may precipitate

migraine probably because of hypoglycemia which stimulates noradrenalin production (Lance, 1978).

The role of endocrine secretions as a provocative migraine factor has not been clearly established. Ovarian involvement may explain the occurrence of "menstrual migraine," which may be aggravated by oral contraceptive usage. Classic migraine may be exacerbated during early pregnancy and diminish with age and menopause. Common migraine, however, may be relieved during pregnancy and accentuated with menopause (Sandoz Pharmaceuticals, 1979).

There are no observable physical signs of migraine in between attacks. Excessive pulsation of the temporal arteries and prominence of the forehead and temporal veins may be noted during the headache phase. The face and scalp may be sweaty with a severe headache. Mental confusion, stupor, dysarthria (slurred speech), dysphasia (inability to choose the correct word or phrase), and ataxia (muscular incoordination) may be apparent throughout the headache (Lance, 1978).

Excessive muscle contraction is the primary mechanism of tension headaches (Ad Hoc Committee, 1962). Sustained muscle contraction of the face, neck, and scalp result in tension headache, yet not everyone with these characteristics develop headache. A hereditary factor is suspected as an underlying mechanism. It has been speculated that vascular reactivity in the scalp and neck musculature with the accumulation of pain-provoking substances in muscle, or a central deficiency of inhibitory transmitter substances induces the

muscle-contraction headache (Lance, 1978).

Upon physical examination the majority of tension headache sufferers demonstrate deep facial wrinkles. The temporal and masseter muscles may stand out and twitch (Lance, 1978). Within the diffusely aching head, neck, and upper back musculature many tender areas, or "nodules," may be found on palpation (Diamond & Dalessio, 1982).

The etiology and treatment of traction/inflammatory headaches are dependent upon the intracranial distress. For example, a headache may be the first symptom of a brain tumor due to the expanding lesions irritating the pain-sensitive structures of the head. Appropriate treatment for this headache complaint may require surgical intervention (Diamond & Dalessio, 1982).

Some psychologists have proposed that certain psychological factors precipitated headache occurrence. Chronic headaches were believed to represent an inability of the individual to effectively cope with the uncertainties of life or possibly a symptom of underlying thought or behavior disorder (Dalessio, 1982). Headaches have also been described as a manifestation of severe depression or conversion hysteria (Rothner, 1979). Others speculated the migraineur was not more subject to stress than his non-migrainous counterpart, but he reacts more to stress (Lance, 1978). Psychological studies of headache clinic patients typically have revealed elevated scores on neurotic scales; yet the relationship between these abnormalities and headache onset remain unclear (Diamond & Dalessio, 1982).

The lack of a purely objective measure of headache pain has

complicated its treatment. The practitioner must therefore depend upon behavior to assess pain. Pain behavior may be expressed in a verbal (e.g., crying), motor (e.g., rubbing forehead), and/or physiologic (e.g., pallor) manner. All three behaviors are subject to conditioning or learning procedures and will reflect sociocultural influences in addition to neurological activity (Lang et al., 1972).

Fordyce (1976) stated all pain behaviors may be viewed as respondent or operant. Respondents are elicited by antecedent noxious stimuli and are typically reflexive (e.g., increased pupillary diameter). Operants, however, are emitted behaviors which are influenced by the reinforcers which follow them (e.g., taking analgesics might be rewarded by a decrease in perceived pain). According to Skinner (1953) any behavior followed by a favorable consequence is more likely to recur; whereas any behavior followed by an aversive consequence will be less likely to recur. The alleviation of pain is negatively reinforcing and whatever decreased pain is likely to be repeated and sought after.

Chronic pain patients demonstrate a mixture of respondent and operant pain behaviors (Sternbach, 1980). Respondent pain behaviors are elicited by antecedent stimuli. Operant pain behaviors tend to occur when followed by positive reinforcements or when healthy behaviors are punished or not rewarded. Once a behavior is in a person's repetoire, its positive reinforcers need not be frequent to maintain it.

For most of the people suffering from recurrent headaches the

pain is the "disease," and its elimination constitutes an effective treatment. Therefore a systematic operant conditioning approach would be appropriate as the focus is on relieving distressing symptoms.

The approach to headache management is dependent upon diagnosis and the physician's training. The primary emphasis is aimed at removing the precipitating factor(s) if possible (e.g., discontinuation of birth control pills). Headaches associated with alcohol or interpersonal stress could be eliminated by removing the cause. In the vast majority of cases, however, therapy must be directed at either acute symptomatic relief (abortive) or longterm prophylactic (warding off) medication. The majority of headaches are alleviated with over-the-counter drugs such as acetylsalicylic acid (Aspirin) or acetaminophen (Tylenol) (U.S. Department of Health, Education, and Welfare, 1979). Ergotamine tartrate is the prescription drug of choice for the migraine attack. The beneficial effect is probably related to its vasoconstrictive action on the smooth muscle of the extracranial blood vessels. Combining caffeine with ergotamine tartrate reduces the amount of the later required for abortion of the migraine attack. This may be administered by oral or rectal route and must be given early in the attack. During an attack, sedatives and pain relieving drugs are often used to relieve the patient's symptoms (Friedman, 1972). Antidepressants have also been used prophylactically in migraine management (Diamond & Dalessio, 1982). Symptomatic treatment of tension headache may be achieved through the use of non-narcotic analgesics combined with sedatives

and tranquilizers having muscle relaxant qualities.

Elimination diets (e.g., avoidance of alcohol, aged cheese, chocolate, and other foods/beverages with vasoactive qualities) have been prescribed for patients whose self-reports indicated headache occurrence after comsumption. The migraine patient is typically instructed to eat three well balanced meals a day and avoid an over-abundance of carbohydrates at any given meal so as to maintain a normal blood sugar level (Diamond & Dalessio, 1982).

Pain relief may also be achieved through attainment of proper posture, hot packs, and gentle massage to the local areas of tenderness (Friedman, 1972). In addition, psychotherapy has been recommended to assist the patient with "conflict resolution" and the alleviation of depression which may be an "underlying" headache factor (Friedman, 1972).

Drugs are considered the initial treatment of choice for headache disorders (Diamond & Dalessio, 1978). Patients with headache, however, frequently overuse or abuse their medications. In pediatric practice, between 25,000 and 100,000 cases of serious intoxication with Aspirin occur yearly, sometimes resulting in death (Diamond & Dalessio, 1982). Analgesic abuse may result in chronic kidney disorder, ulcer disease, bleeding, dyspepsia (impaired digestion), anemia, personality disorders (e.g., chemical dependency), and unexplained neurologic symptoms (e.g., episodic unconsciousness) (Diamond & Dalessio, 1982). Analgesic abuse may also appear with other medications. Compounds containing barbiturates have a significant

potential for addiction.

The potential dangers of pharmacological treatment and the lack of direct, controlled psychological intervention have prompted a growing interest in relaxation and biofeedback training as a headache management modality. Biofeedback uses instrumentation to teach the participant to bring previously involuntary bodily functions under voluntary control (Diamond, 1979). The goals of relaxation training are: to develop an increased awareness of relevant internal physical functions; to establish control over these functions; to generalize control from a clinical setting to everday life; and to focus attention on mind/body integration (Peper et al., 1979). Relaxation training has employed Jacobson's autogenic training, and passive relaxation/meditation. The Biofeedback Society of America advocates the procedures of Budzynski et al. (1973) for the treatment of tension headaches. With auditory feedback of frontal electromyograph (EMG) the subjects reported significantly decreased hourly headache activity in correlation with the observed reduced EMG microvolt levels.

Successful biofeedback treatment of migraines has emphasized three protocols: (1) thermal biofeedback, in which the skin temperature is monitored at a consistent site while the patient is asked to warm his or her hand, with the guidance of the instrumentation (Andreychuk & Skriver, 1972); (2) autogenic feedback training in which the autogenic phrases are combined with thermal biofeedback training (Sargent, Green & Walters, 1972); and (3) biofeedback

training for the external temporal artery in which the patients are asked to constrict this artery (Feuerstein, Adams, & Beiman, 1976).

Numerous studies have claimed biofeedback assisted relaxation training to be effective in the treatment of adult headaches (Blanchard, & Epstein, 1977; Epstein & Blanchard, 1977; Peck & Kraft, 1977; Phillips, 1977b; Shapiro & Surwit, 1976; Stroebel & Glueck, 1976). Serious methodological flaws detract from their credibility: (1) retrospective studies with inconsistent data collection; (2) small treatment populations; and (3) mixed headache disorders were not addressed (Blanchard et al., 1982). In addition, support for the effectiveness of biofeedback and relaxation training in pediatric headache management is limited. Diamond and Franklin (1975) used an uncontrolled application of autogenic training with EMG and thermal feedback in treating childhood migraine headaches. Twenty-nine of these thirty-two children reported reduced headache frequency and severity.

This study attempted to evaluate in a systematic manner the effects of combining thermal biofeedback, diaphragmatic breathing, autogenic, progressive-relaxation, and passive relaxation/meditation procedures in treating both adults and children with vascular, muscle contraction, and mixed headache disorders.

Method

Subjects

There were originally twelve participants in this study. All

subjects were consecutive referrals from physicians in response to a request for study participants. Three of the subjects, all children, had spontaneous remission of their headache during the baseline period. Two subjects were dropped from the study because it was not possible to consistently obtain self-report measures which were the major dependent variables. The remaining seven participants can be described as follows: All were female. All were referred by Kansas City area neurologists whose evaluations revealed chronic benign headache disorders: three as migraines, two as mixed headache disorders (i.e., vascular and muscle contraction), and two with scalp muscle contraction headaches. All had a positive family history for headaches with their headache onset ranging from two to fifteen years. Other past medical history was unremarkable. None of the subjects had satisfactorily responded to conventional medicinal therapy. Prescribed medications are listed in Table 1.

Table 1

Prescribed Medication(s) for Each Participant

Child 1	Pentobarbital Sodium Suppository (Wans Suppository): one every six to eight hours daily as needed
	Butalbital (Fiorinal): one to two tablets every four hours daily as needed
	Nadolol (Corgard): one 40 mg tablet daily
Child 2	Zomepirac Sodium (Zomax): one tablet every four to six hours daily as needed
Child 3	Acetylsalicylic Acid (Aspirin): one to two tablets every four hours daily as needed
	Butalbital (Fiorinal): one to two tablets every four hours daily as needed
	Propranolol Hydrochloride (Inderal): one 80 mg tablet daily
Child 4	Acetylsalicylic Acid (Aspirin): one-half to one tablet every four hours daily as needed
Adult 1	Acetaminophen (Tylenol): one to two tablets three to four times daily as needed
Adult 2	Acetylsalicylic Acid (Aspirin): one to two tablets every four hours daily as needed
Adult 3	Acetaminophen (Extra Strength Tylenol): one to two tablets three to four times daily as needed

Sociocultural descriptions were as follows: Four were children, aged nine to 17, and three, adults 28 to 35 years old. All were Caucasian. All were of a middle to upper middle class economic background. None of the subjects had been, nor were concurrently, receiving disability support or compensation for their continued pain complaint. All participants scored minimal life change units on the Social Readjustment Rating Scale (Holmes & Rahe, 1967). There was no evidence of state or trait anxiety or depressive symptomatology as measured by the Spielberger (1970) and Beck (Burns, 1980) Inventories before or after treatment. Educationally, the four children were all students in the Kansas City Public School District. All of the adults were high school graduates, one being college educated. All of the adults were employed full time outside of the home setting. None of the subjects had reported school or job absenteeism for at least one year prior to participation in this study.

Family situations were as follows: Three of the children had one other sibling. One was an only child. One adult female was divorced and a single parent of two children. Of the other two adult females, both had intact marriages. One had no children and the other gave birth to her first child during the follow-up phase of this study.

Setting

The study was conducted in a private office setting. The office had a home-like atmosphere and was furnished with a comfortable recliner chair and low lighting. Room temperature was maintained

between 68 and 72 degrees Fahrenheit and was free from drafts.

Apparatus

A Cyborg thermal model P642 unit (Muscle Re-education Systems and Biological Feedback Instrumentation/Boston, Massachusetts) was used to monitor skin temperature and to provide visual feedback to subjects while in the office. This instrument automatically combines absolute temperature tracking with a continuously moving visual signal. Direction and rate of temperature change are monitored at resolutions up to .01 degree in Fahrenheit. The participant was connected to the instrument by a temperature probe (thermistor) taped comfortably to the non-dominant hand index finger. This biofeedback unit was line powered and equipped with a medically safe converter. The P642 unit has a temperature range of 23.0 to 113.0 degrees Fahrenheit. Its accuracy is estimated at ± 0.3 degree Fahrenheit.

Each subject was provided with a portable nine volt battery powered "Stress Arrester" thermal biofeedback unit for practice within her natural environment (e.g., home, work, school setting). This model BF-110 has a temperature range of 32.0 to 230.0 degrees Fahrenheit with accuracy estimated at ± 0.2 degree Fahrenheit. The temperature change resolution is .1 degree Fahrenheit. This unit also automatically combines absolute temperature tracking with a flashing visual display. The thermistor was held in place with a velcro strip on the skin of the non-dominant hand index finger.

Design

Two multiple baseline across subjects designs were utilized (Hersen & Barlow, 1978). One was a multiple baseline across four children and the other a multiple baseline across three adults. Throughout the baseline periods the dependent variables were recorded on a daily basis for each participant. The baseline periods ranged from five to 18 days. Treatment occurred when the subject's self-reports indicated relatively high headache severity and/or duration. Follow-up data have been collected at one month, three month, six month, and one year intervals.

Procedure

Baseline. Participants or their parents signed an informed consent form (see Appendix A) after the nature of the experiment had been fully explained. During the initial appointment each participant was interviewed in the presence of her significant other (i.e., parent, spouse, child). The Headache Evaluation Form information (see Appendix B) was obtained by the therapist from participant reports, medical record review, and observation. The significant other was asked to validate the participant's reports as well as to add any other pertinent information.

Dependent Variables

Self-report measures. Participants recorded headache diaries (see Appendixes C & D) regarding headache frequency, duration, severity, exacerbating pain factors, and analgesic intake on a daily basis during baseline, treatment, and follow-up. Participants were asked

to rate their headache severity in two ways, time sample and peak headache. Time sampling occurred at approximately 9 a.m., 1 p.m., 6 p.m., and 9 p.m., using the following six point scale: 0 = "no pain," 1 = "pain there if attended to; no effect upon activities of daily living (ADL);" 2 = "irritating pain; able to ignore pain and continue with ADL (including work and social activities) yet need to "take it easy:" 3 = "moderate pain; only do what is absolutely necessary;" 4 = "unable to concentrate; can perform tasks independently; forced to rest;" and 5 = "severe pain; unable to perform any work or social activities; confined to bed or rest; require assistance with ADL." Participants separately recorded peak severity once at the end of the day using the six point scale.

Social validation of headache occurrence and down time. Each participant's significant other recorded suspected daily headache occurrence(s) independently of the participant (see Appendix F). The significant other recorded on a standard data sheet the approximate time of headache onset and disappearance, how the headache occurrence was communicated (e.g., "She took medication.", "She rubbed her forehead.") and his/her response(s) to the pain talk and/or behavior(s) (e.g., "I encouraged rest.", "I consoled her."). This data sheet was completed daily throughout the baseline, treatment, and follow-up periods.

The significant other also recorded "down time" (i.e., time spent resting due to headache activity on a time sampling basis (once on the hour for three consecutive hours). Down time was scored when the participant was observed assuming a reclined position not

for sleep, recreational, or leisure time activity. These data were collected throughout the baseline, treatment, and follow-up periods on a daily basis (see Appendix G).

Tension, pain, and thermal recordings during treatment phase. The child's significant other recorded the participant's self-reports of perceived tension level (see Appendix J) on an 11 point scale with "zero" meaning complete relaxation and "ten" meaning extreme tension both before and after the participant practiced the relaxation exercise. The significant other also elicited and recorded the participant's perceived pain level on a six point scale with "zero" equal to no pain and "five" equal to severe headache pain before and after the practice session. For two consecutive minutes at fifteen second intervals the child's significant other recorded her non-dominant index finger temperature prior to and after practice with the relaxation tape. At consecutive one minute intervals, as identified on the relaxation tape, the child's hand temperature was recorded as visually displayed on the biofeedback unit (see Appendix J).

Therapist collected measures. On six separate occasions (three with and three without headaches) during baseline, ten consecutive one minute thermal biofeedback recordings were taken when the participant reported being headache free and also when she was experiencing a headache. On those occasions when the participant was suffering from a headache, the severity was recorded (see Appendix H). Participants were in a supine position with their eyes closed and their extremities uncrossed while these recordings

were taken. These recordings were performed in the above described manner. All of these thermal biofeedback recordings by the therapist were performed in the participant's home.

During each of the five scheduled biofeedback assisted relaxation training sessions the experimenter recorded the participant's self-reports of perceived tension and pain levels on the respective 11 and six point scales (see Appendix J) both prior to, and after, the participant's rehearsal of the relaxation technique. For two consecutive minutes at fifteen second intervals the participant's non-dominant index finger temperature was recorded prior to and after verbal prompting of the current relaxation protocol trial and at one minute intervals throughout relaxation practice. After relaxation practice the participant was asked if she perceived any psychophysiological changes (e.g., warming of hands, peace of mind). Any responses were noted (see Appendix J).

The therapist performed a pill count in the patient's home at least every five days throughout baseline and treatment. Each participant kept her non-prescribed analgesics in a separate container making this medication not readily available to other family members and thereby minimizing pill count error. Table 2 summarizes the dependent variables, their frequency of collection, and by whom.

Treatment procedures. Following at least a five day baseline, participants were scheduled for five sessions of biofeedback assisted relaxation training.

Table 2

Type and Frequency of Data Collection

	Measure	Frequency
Therapist Collected	1. Thermal Biofeedback Recordings	3x Baseline With/out Headaches Pre & Post Treatment Sessions 1x@ 1,3,6 & 12 months Follow-up
	2. Psychological Inventories	Pre & Post Treatment Phases
	3. Pill Counts Within Home Setting	Every 5 Days Throughout Baseline & Treatment Phases
	4. Recordings of Headache Occurrence, How Communicated & Response(s) to Participant	Daily Throughout Baseline, Treatment & Follow-up Phases and Three Consecutive Hour Time Sampling
Significant Other Collected	5. Recordings of Down Time on the Hour x 3 Consecutive Hours	Daily Throughout Baseline, Treatment and Follow-up Phases
	6. Recordings of Participant Tension & Pain Levels Pre & Post Relaxation Exercise	Daily Throughout Treatment Phase
	7. Pre & Post Relaxation Exercise Thermal Biofeedback Recordings.	Daily Throughout Treatment Phase
	8. Significant Other Survey	On One Occasion At Conclusion of Treatment
Participant Collected	9. Recordings of Headache Frequency, Duration & Intensity	Daily Throughout Baseline, Treatment & Follow-up Phases
	10. Recordings of Pain Medication Intake	Daily Throughout Baseline, Treatment and Follow-up Phases
	11. Recordings of Activity & Down Time	Daily Throughout Baseline, Treatment and Follow-up Phases
	12. Consumer Satisfaction Survey	On One Occasion At Conclusion of Treatment

Session one: didactic information on the nature of stress and breathing exercises. Information was provided verbally and in written form on stress and relaxation responses (see Appendix L). Physiological parameters of sympathetic nervous system activation were reviewed to cue the participant for relaxation practice and possible headache abortion. The concept of decreasing musculoskeletal tension and hand warming were identified as the desirable treatment outcome for relaxation training (see Appendix M).

Verbal and physical prompts were provided for diaphragmatic breathing. The participant was instructed to take twice as long to exhale as to inhale. The respiratory rate was shaped to four to six respirations per minute. A cassette tape of breathing exercises for relaxation induction was provided for the participant's home practice sessions (see Appendix O).

Session two: autogenic phrases. The participant was instructed in passive concentration techniques in which she silently repeated to herself seven standard verbal formulas of physiological and mental relaxation; for example, "My arms are heavy and warm with relaxation." Each participant was provided with a cassette relaxation tape instructing them in autogenic training for home use (see Appendix P).

Session three: progressive relaxation. A modified Jacobsonian relaxation protocol was utilized to instruct the participant in systematic muscle contraction followed by muscle relaxation of the sixteen major muscle groups; for example, "Wrinkle up your forehead

now. Study the tension. Now smooth your forhead out while focusing on the relaxation." Such relaxation exercises were provided on a cassette tape for the participant's use (see Appendix Q).

Session four: guided imagery. The participant was asked to imagine peaceful scenes and pleasant sensory stimulation conducive to relaxation and in opposition to any perceived painful stimulus. Imagery helpful in relieving musculoskeletal discomfort and or achieving hand warming was encouraged; for example, "I imagine the warmth of the sun relaxing my neck muscles." (see Appendix R).

Session five: integrating relaxation techniques into activities of daily living. Each participant was provided with a written format of learning skills to improve coping with distressful situations and to enhance the relaxation response; for example, "Every time you hear the telephone ring, mentally scan your body for any stress indicators. Then concentrate on letting go of any discovered tension. Take in a deep breath, hold it, and gently exhale while returning to your present task." (see Appendix S).

The sessions were conducted once a week for approximately one hour. The therapist modeled each exercise prior to the participant's rehearsal. Significant others observed each treatment session and recorded the thermal biofeedback training results at the requested time intervals on the provided data collection form (see Appendix J). Participants were asked to practice relaxation skills at home twice daily for five to 20 minutes. Thermal training results were to be recorded at one of these practice sessions. Participants

were encouraged to perform the recorded home practice session at the approximate same time daily.

Throughout the baseline, treatment, and follow-up phases the headache diaries and headache occurrence/non-occurrence inventories were reviewed weekly to make certain the participant and significant other were consistently and correctly completing the data collection forms. Each treatment session included verbal and written didactic information on the current treatment technique. A tone was sounded at one minute intervals on the participant's relaxation tapes to cue the significant other to record the numerals visually displayed on the portable temperature trainer.

Post-treatment. Follow-up data were collected at one, three, six, and twelve month intervals. At these times the participant completed a headache diary and daily activities inventory on a daily basis for an entire week. Participants were encouraged to practice relaxation exercises on a daily basis. Significant others recorded daily headache occurrence/non-occurrence independently of the participant for the entire given week. Ten consecutive one minute thermal biofeedback recordings were recorded by the therapist on one occasion for each follow-up phase. Both the participant and her significant other completed a Consumer Satisfaction Survey and Significant Other Survey respectively (see Appendix T) at the conclusion of treatment to determine the perceived effectiveness of treatment.

Results

Blanchard et al. (1982) recommended the assessment of headache-free days—a measure highly significant to the patient. In this study headache-free days were determined by examining headache diaries completed by patients. Table 3 shows the effect of biofeedback assisted relaxation training on the percentage of headache-free days throughout the baseline, treatment, and follow-up periods. At the end of treatment children had a four to 56% increase in headache-free days. Child 1 remained headache-free throughout the follow-up periods. Adults were improved from five to 28% by the termination of treatment. All participants reported further increases in the frequency of headache-free days through follow-up.

Table 3

Percent Headache Free Days

			Month of Follow-up			
	Baseline	Treatment	One	Three	Six	Twelve
Child 1	40%	96%	100%	100%	100%	100%
Child 2	0%	43%	50%	100%	86%	100%
Child 3	6%	10%	44%	86%	100%	86%
Child 4	35%	71%	94%	100%	100%	100%
Adult 1	33%	61%	94%	100%	86%	86%
Adult 2	28%	33%	42%	71%	71%	86%
Adult 3	62%	76%	94%	100%	86%	100%

The percentage of time samples with pain behavior occurrence was reduced for all subjects from the baseline to treatment period with the exception of Child 3 who demonstrated a slight increase (Table 4). On no occasion of time sampling throughout the follow-up periods did any of the participants demonstrate pain behavior.

Table 4

Percent Time Samples With Pain Behavior

	Baseline	Treatment	Month of Follow-up One	Three	Six	Twelve
Child 1	60%	0%	0%	0%	0%	0%
Child 2	14%	2%	0%	0%	0%	0%
Child 3	8%	9%	0%	0%	0%	0%
Child 4	4%	3%	0%	0%	0%	0%
Adult 1	5%	2%	0%	0%	0%	0%
Adult 2	19%	7%	0%	0%	0%	0%
Adult 3	12%	6%	0%	0%	0%	0%

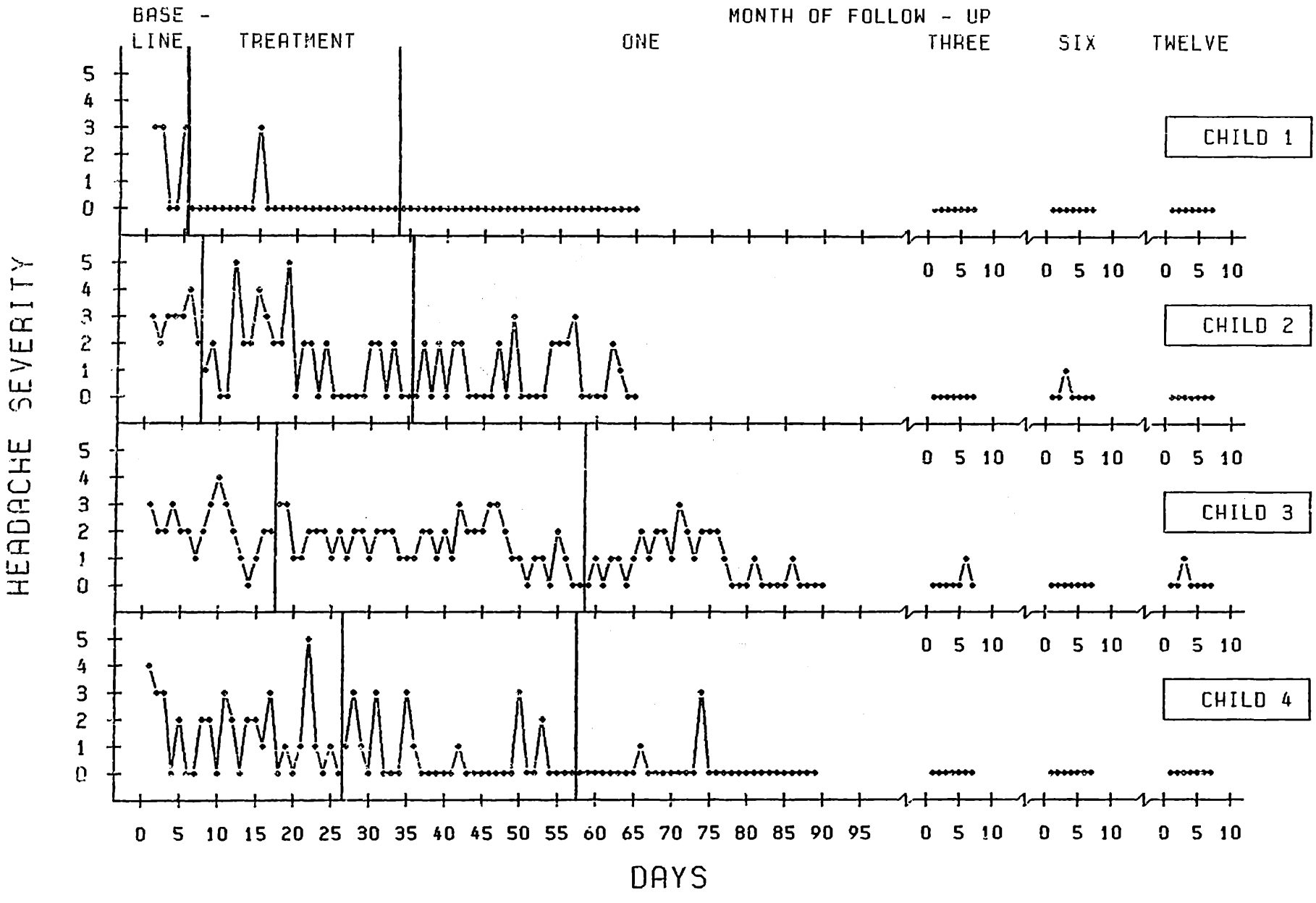
The mean headache peak severity was reduced at least 24% for all participants by the end of treatment (Table 5). As suggested by Figures 1 and 2, however, a high degree of variability in peak headache severity for both populations continued from the baseline to treatment period.

Table 5

Mean Headache Peak Severity (0-5)

	Baseline	Treatment	Month of Follow-up One	Three	Six	Twelve
Child 1	1.8	0.12	0.0	0.0	0.0	0.0
Child 2	2.86	1.43	0.83	0.0	0.14	0.0
Child 3	2.06	1.56	0.84	0.14	0.0	0.14
Child 4	1.45	0.58	0.13	0.0	0.0	0.0
Adult 1	1.67	0.86	0.13	0.0	0.14	0.14
Adult 2	1.17	0.70	0.61	0.29	0.29	0.14
Adult 3	0.90	0.49	0.06	0.0	0.14	0.0

Figure 1


BASE - LINE
TREATMENT
MONTH OF FOLLOW - UP
ONE
THREE
SIX
TWELVE
CHILD 1
CHILD 2
CHILD 3
CHILD 4
HEADACHE SEVERITY
0 1 2 3 4 5
0 5 10
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95
DAYS

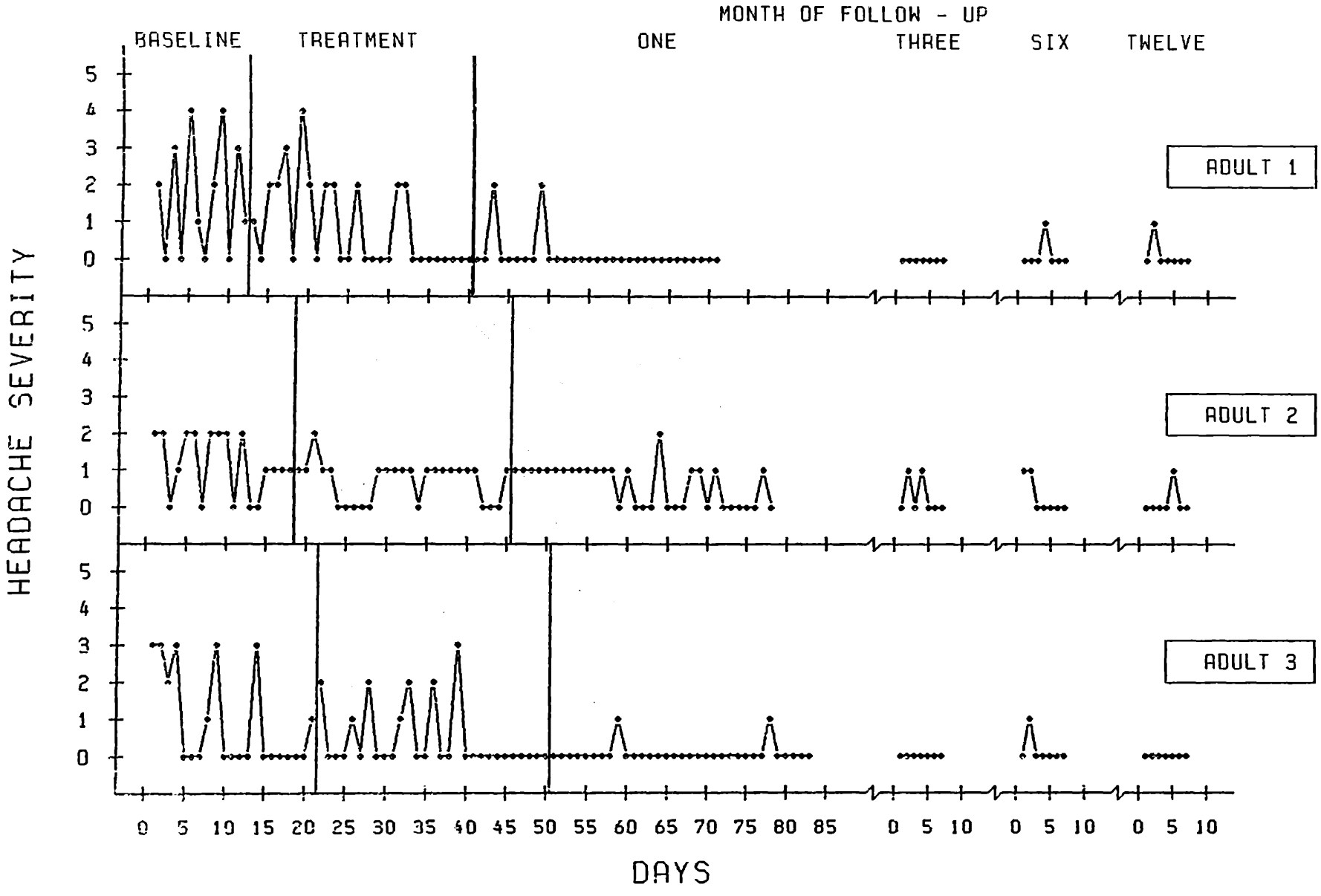

MONTH OF FOLLOW - UP
BASELINE
TREATMENT
ONE
THREE
SIX
TWELVE
HEADACHE SEVERITY
ADULT 1
ADULT 2
ADULT 3
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 0 5 10 0 5 10 0 5 10
DAYS

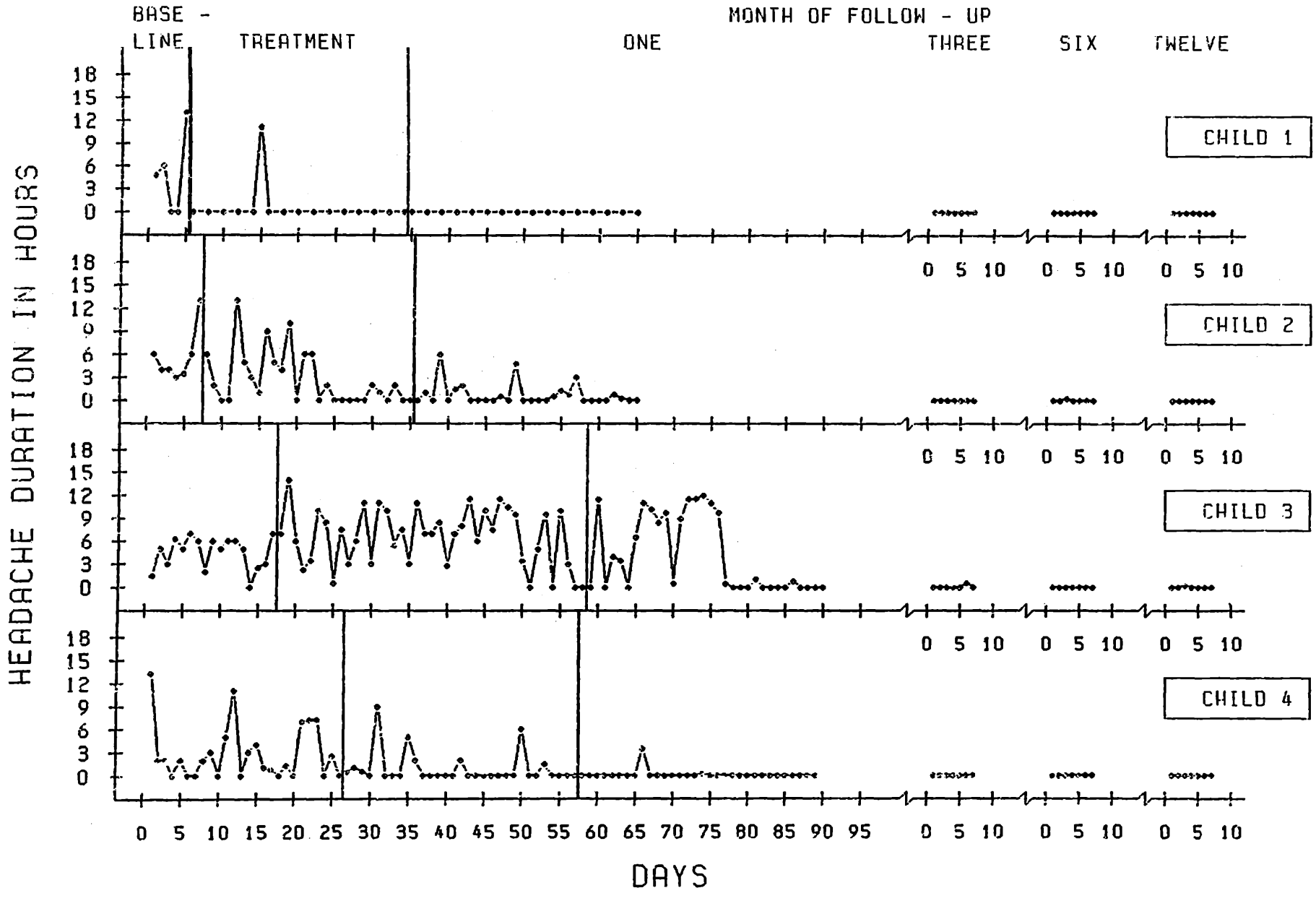
Table 6 illustrates the mean daily headache duration in hours. With the exception of Child 3, there was at least a 51% improvement among the children and six percent among the adults. Figures 3 and 4 demonstrate the typical gradual reduction of headache duration resulting from treatment introduction.

Table 6

Mean Daily Headache Duration (Hours)

			Month of Follow-up			
	Baseline	Treatment	One	Three	Six	Twelve
Child 1	4.75	.40	0.0	0.0	0.0	0.0
Child 2	5.64	2.75	0.74	0.0	0.04	0.0
Child 3	4.49	6.54	4.14	0.07	0.0	0.04
Child 4	2.86	0.89	0.12	0.0	0.0	0.0
Adult 1	2.50	1.72	0.13	0.0	0.07	0.07
Adult 2	8.54	8.04	3.83	0.61	0.39	0.12
Adult 3	1.5	0.57	0.11	0.0	0.04	0.0

With the exception of Adult 1 all participants had discontinued prn (as needed) analgesic use at the one month post-treatment assessment (Table 7). Child 1 remained on the prescribed prophylactic medication regimen (Corgard) throughout all experimental phases.


BASE - LINE
TREATMENT
MONTH OF FOLLOW - UP
ONE
THREE
SIX
TWELVE
HEADACHE DURATION IN HOURS
CHILD 1
CHILD 2
CHILD 3
CHILD 4
0 3 6 9 12 15 18
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95
0 5 10
DAYS

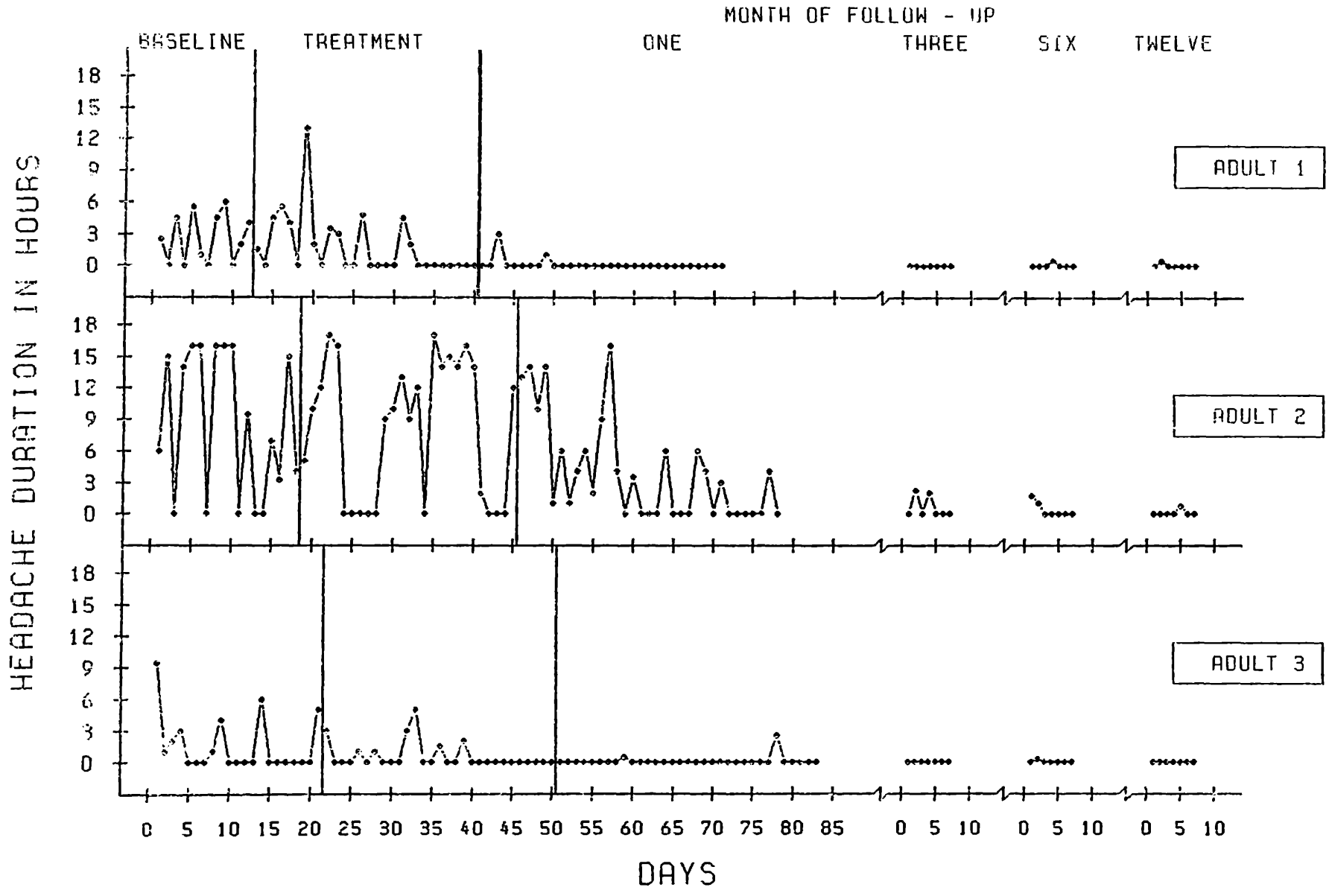

MONTH OF FOLLOW - UP
BASELINE
TREATMENT
ONE
THREE
SIX
TWELVE
HEADACHE DURATION IN HOURS
ADULT 1
ADULT 2
ADULT 3
0 3 6 9 12 15 18
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 0 5 10 0 5 10 0 5 10
DAYS

Table 7

Daily Analgesic Intake

	Baseline	Treatment	Month of Follow-up One	Three	Six	Twelve
Child 1						
Pentobarbital Sodium Sup (Wans Sup)	$\bar{x}$ = .60 r = 0-1	$\bar{x}$ =.04 r = 0-1	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0
Butalbital (Fiorinal)	$\bar{x}$ = .20 r = 0-1	$\bar{x}$ = .04 r = 0-1	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0
Nadolol (Corgard)	$\bar{x}$ = 40 r = 40	$\bar{x}$ = 40 r = 40	$\bar{x}$ =40 r =40	$\bar{x}$ =40 r =40	$\bar{x}$ =40 r =40	$\bar{x}$ =40 r =40
Child 2						
Zomepirac Sodium (Zomax)	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0
Child 3						
Acetylsalicylic Acid (Aspirin)	$\bar{x}$ = .71 r = 0-1	$\bar{x}$ = .05 r = 0-1	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0
Butalbital (Fiorinal)	$\bar{x}$ = .06 r = 0-1	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0
Propranolol Hydrochloride (Inderal)	$\bar{x}$ = 80 r = 80	$\bar{x}$ = 6.4 r =0-20	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0
Child 4						
Acetylsalicylic Acid (Aspirin)	$\bar{x}$ = .12 r = 0-1	$\bar{x}$ = .13 r = 0-2	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0
Adult 1						
Acetaminophen (Tylenol)	$\bar{x}$ = 2.25 r = 0-7	$\bar{x}$ = 1.07 r = 0-12	$\bar{x}$=.12 r=0-2	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0
Adult 2						
Acetylsalicylic Acid (Aspirin)	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0
Adult 3						
Acetaminophen (E.S. Tylenol)	$\bar{x}$ = .19 r = 0-2	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0	$\bar{x}$ = 0

As illustrated in Table 8 resting time secondary to pain was reduced for all participants following treatment.

Table 8

Mean Daily Resting Time Secondary To Pain (Hours)

	Baseline	Treatment	Month of Follow-up One	Three	Six	Twelve
Child 1	3.4	0.17	0.0	0.0	0.0	0.0
Child 2	0.29	0.14	0.0	0.0	0.0	0.0
Child 3	0.24	0.22	0.0	0.0	0.0	0.0
Child 4	0.69	0.09	0.0	0.0	0.0	0.0
Adult 1	0.67	0.33	0.0	0.0	0.0	0.0
Adult 2	0.0	0.0	0.0	0.0	0.0	0.0
Adult 3	0.05	0.0	0.0	0.0	0.0	0.0

The therapist collected thermal recordings support a trend for hand warming with most participants and for most of the relaxation exercises (Table 9). Figures 5 and 6 indicate the trend toward hand warming for all participants during at least a 28 day treatment phase.

Table 9

Thermal Training Record (°F) (Therapist Collected)

	Breathing		Autogenic		Jacobsonian		Imagery	
	pre $\bar{x}$	post $\bar{x}$	pre $\bar{x}$	post $\bar{x}$	pre $\bar{x}$	post $\bar{x}$	pre $\bar{x}$	post $\bar{x}$
Child 1	79.8	82.7	90.2	96	84.3	88	83.8	91
Child 2	96	96	81.1	84	86	86	88.7	92.7
Child 3	87	82.5	90	88.9	80.2	80.4	92.6	93.9
Child 4	95.5	96.5	92.4	93	88.5	92.4	90.6	94.8
Adult 1	82.1	84.3	83.7	88.2	86.5	92	85.2	93.1
Adult 2	93.9	94.8	92.5	94.2	94.6	93.2	94	91.8
Adult 3	90.9	92.4	94.9	93.3	92.1	94.4	94.2	95.7

Figure 5

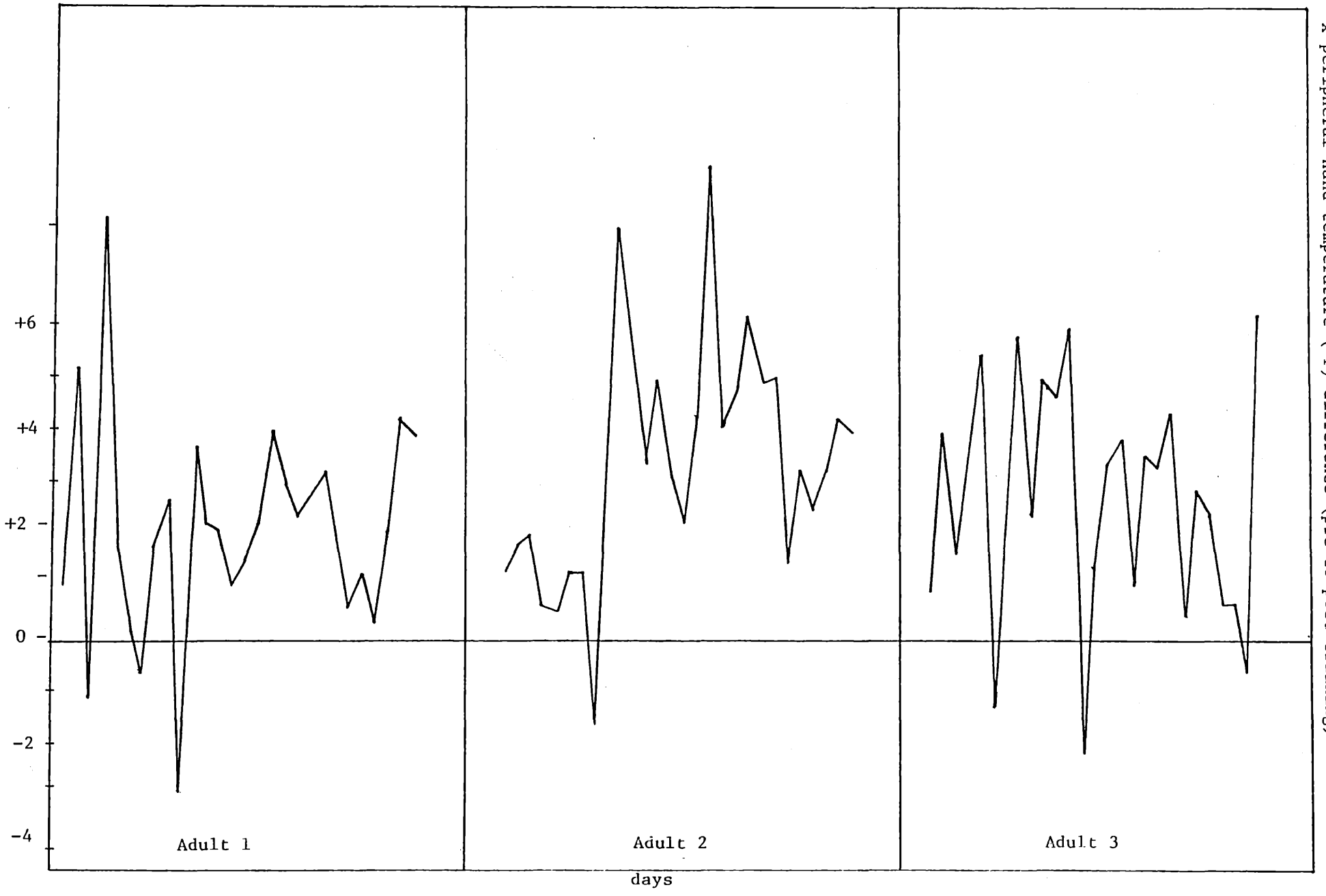
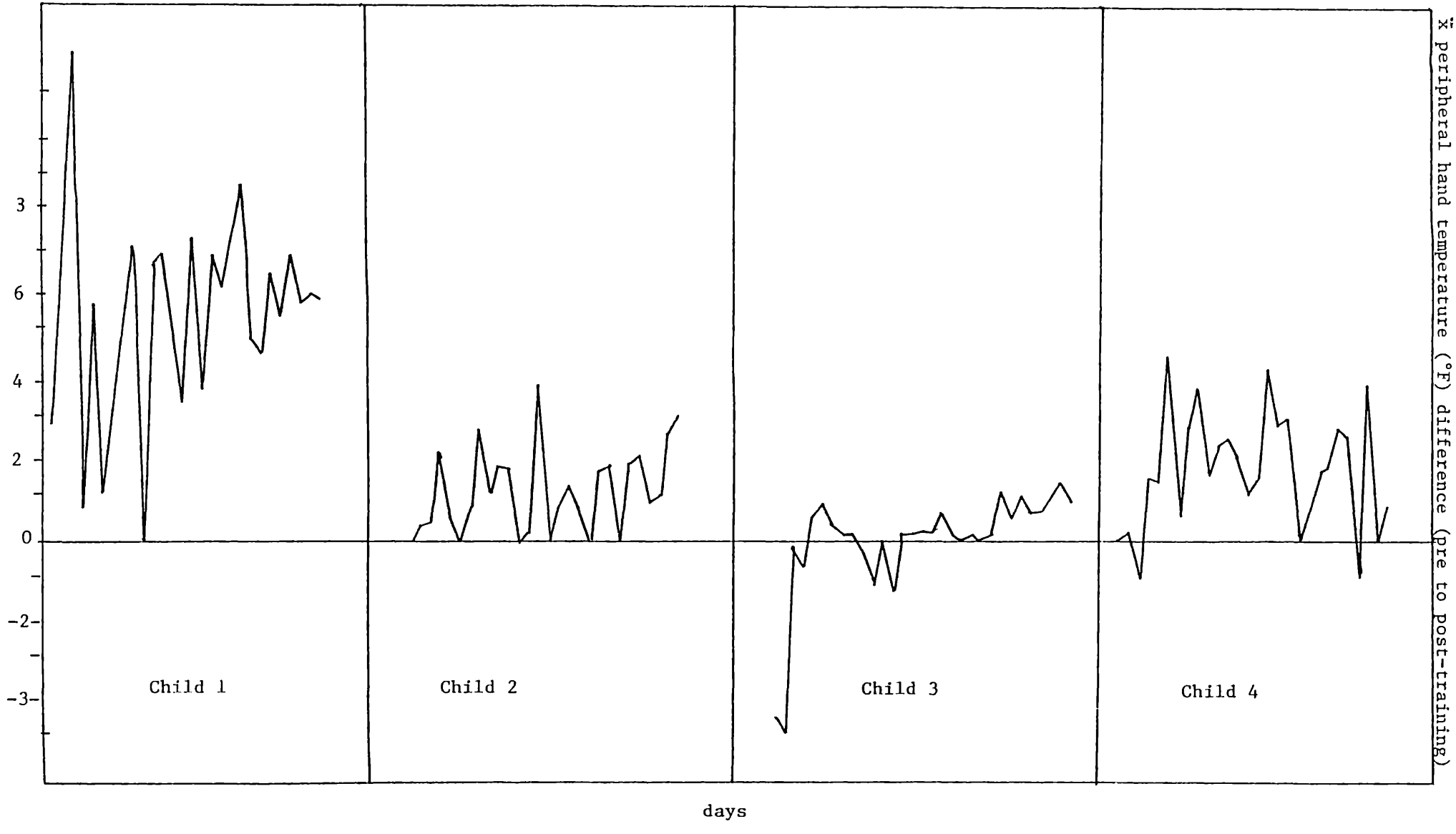

+6
+4
+2
0
-2
-4
Adult 1
Adult 2
Adult 3
days
x̄ peripheral hand temperature (°F) difference (pre to post-training)

Figure 6


3
6
4
2
0
-2-
-3-
Child 1
Child 2
Child 3
Child 4
days
x̄ peripheral hand temperature (°F) difference (pre to post-training)

Participant records of headache frequency were compared with significant other recordings. Percentage agreement on daily headache occurrence measures were calculated by summing the instances when the significant other perceived headache occurrence and the participant recorded headache occurrence then dividing this sum by the total intervals and multiplying by 100. Across all participants and phases, agreement on headache occurrence averaged 83% with a range of 78% to 92%.

At no time during any of the treatment sessions or reliability checks did the therapist observe pain behaviors. Therefore it was not possible to assess the reliability of significant other recordings of pain behavior.

Pill counts were compared to participant records of medication intake for 20% of the baseline and treatment days. Average agreement between these two measures was 96% (range 50% to 100%) across all conditions for all participants.

On the Satisfaction Surveys both participants and their significant others indicated biofeedback assisted relaxaiton training produced markedly decreased headache frequency, severity, and duration, medication intake, and down time. They perceived an improved feeling state (e.g., feeling much more pleasant) after relaxation practice. All reported they would enthusiastically recommend this treatment approach to other headache sufferers.

Discussion

This experiment analyzed the effect of biofeedback assisted relaxation treatment upon child and adult headache disorders. Increased headache free days were reported by all subjects after the introduction of the biofeedback/relaxation procedures, as compared to baseline conditions. The fact that headache free days increased at different times for each participant and generally after the biofeedback/relaxation protocols were implemented suggests other unknown factors were probably not responsible for this increase. Therefore it is reasonable to conclude biofeedback assisted relaxation training produced the increased headache free days.

Similar to Sargent et al. (1973 a, b) pediatric headache disorders demonstrated more rapid resolution than the adult headache complaints despite their duration and severity being comparable. In this study baseline resting time secondary to pain was more frequent and moderately higher for the child population. Prescribed analgesics were at a higher occurrence for the pediatric headache sufferers. Analgesic intake, however, was essentially equal for adults and children.

A threat to internal validity by history, resulting from the Extra Strength Tylenol tampering publicity as of September 30, 1982, must be taken into consideration when examining Adult 3's medication cessation. This subject discontinued the analgesic during day three of the baseline condition which coincided with the negative publicity regarding Extra Strength Tylenol.

Child 3 did not demonstrate significant headache relief during the treatment phase. Child 3's slower response to the treatment intervention may have resulted from her being tapered from her daily Inderal dose due to the side effects of lethargy and depression. Inderal withdrawl has been reported to induce headaches (Physicians' Desk Reference, 1984).

It must be noted that although follow-up reports (Table 3) indicate no recurrence of headaches, the participants reported experiencing occasional headaches yet their occurrence was not reflected in the time sampling.

Generally, an increased relaxation response was perceived by all participants before pain relief was obtained. Hand warming was not necessary for the participant to perceive an increased relaxation response or decreased pain severity. No relaxation protocol appeared to afford a greater relaxation response or quicker analgesic effect. Breathing for relaxation induction, however, was reported by all participants to be the preferred technique, primarily because it was readily integrated into daily activities.

Digital temperatures were essentially the same for the participants when they reported having a headache as well as being headache free. The theory that the vascular system of migraineurs is unstable and prone to vasoconstriction (Atkinson, 1976; Wolff, 1948) may be called into question with this finding.

Initially neither adult nor child headache sufferers reported

known precipitating headache factors. After using the headache diaries for approximately ten days precipitating pain factors were identified. Strenuous exercise, skipped meals, and fatigue were identified by two (Child 2, 3) of the four children as antecedent factors. In contrast all three adult headache sufferers perceived emotional distress (e.g., frustration, anxiety) as being a frequent precipitating headache factor.

Emitted pain talk/behaviors (pain behaviors not elicited by questioning from the significant other) were higher for the adult population. Verbal complaints (e.g., participant telling significant other), mood change (e.g., irritability) and rubbing the pain site (e.g., forehead) were reported as the most frequent pain behaviors with the adults. Ignoring the pain talk/behavior was the most frequent response identified by the significant other. Pain talk/behaviors were typically elicited amongst the pediatric population. Usually the significant other asked the child if she were having a headache. When the child reported headache occurrence, the significant other typically responded by administering analgesics and encouraging a diminished activity level.

With the exception of the biofeedback recordings, all of the measures used in this study have the limitation that they are self-report of a subjective experience. Yet, as reported by Blanchard et al. (1981) it is encouraging to note change indicated by the participants' reports was detectable by a significant other, lending social validation to these self-report measures.

Implications for future study indicate the continued use of multiple measures for the observation and treatment of pain. As this experiment illustrated, headaches affect one's behaviors in a multitude of ways. For example, one person may choose to rest as a pain response whereas another individual may take analgesics for pain alleviation. To determine the success and maintenance of treatment interventions, measures need to be collected over a period of at least one year (Solbach & Sargent, 1977).

The use of biofeedback assisted relaxation training appears to be a practical treatment intervention for the alleviation of common child and adult headache disorders. The author speculates, however, chronic headache sufferers may be the ideal treatment candidates due to the failure of other traditional medical approaches (e.g., analgesics, elimination diets) resulting in their being more motivated and compliant with self-help programs.

Implications for future study must also include the use of this treatment intervention with a larger and more diverse population (e.g., inclusion of male subjects and other cultural/socioeconomic backgrounds). After successful replications, component analysis could be done to exclude possible unnecessary components of the treatment program (e.g., providing just thermal biofeedback training, elimination of a relaxation protocol).

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Appendixes

Appendix A

Consent To Experimental Treatment And Authorization to Admit Observers

I hereby authorize JOYCE M. ENGEL, O.T.R. to perform treatments in Relaxation Training with Biofeedback upon myself,_____. This treatment is being provided by JOYCE M. ENGEL upon the advise and recommendation of my physician,_____, M.D.

The Department of Human Development supports the practice of protection for human subjects participating in research. The following information is provided so that you can decide whether you wish to participate in this study. You may withdraw from the study at any time you desire.

This study is designed to evaluate the effects of a variety of relaxation techniques with biofeedback monitoring upon decreasing headache effects. Throughout the study you will be asked to record the frequency, duration, and intensity of headache pain, your pain medication intake, and any time spent resting due to this pain complaint. For a minimum of 28 consecutive days you will be asked to record your hand temperature at the requested time intervals provided on the data collection sheet. All of the data gathered shall be used anonymously in written reports.

Possible benefits experienced with the application of relaxation training with biofeedback may include the alleviation of the pain complaint or a reduction in the frequency, duration, and/or intensity of the pain perception.

Possible side effects experienced during relaxation training may include muscle cramping, anxiety producing thoughts, sexual

arousal, falling asleep, coughing/sneezing, and subjective feelings of a "loss of control." These side effects are typically experienced as infrequent and short-lived. Suggestions for counteracting these potential side effects shall be offered as needed. No compensation shall be provided for physical injury or emotional distress resulting from participation.

I also permit the presence of such observers as may be deemed it in addition to physicians and medical personnel while I am undergoing the Relaxation Training with Biofeedback.

Any inquiries concerning this experiment should be addressed to the principal investigator, JOYCE M. ENGEL. She may be contacted at (816) 276-8350 or (816) 353-5905.

_____ _____

Subject Date

_____ _____

Joyce M. Engel, O.T.R.
Principal Investigator

Date

Appendix B

HEADACHE EVALUATION FORM

Name: Client Number:
Age: Therapist:
Referring Physician: Date:
Client Handedness:

1. Diagnosis (s) of Headache (s) Present:
   ____Migraine, Cluster, or Vascular ____Psychogenic ____Muscle Contraction or Tension ____Mixed

2. Age and Circumstances of Onset (Physical/Emotion Trauma)_____
   _____

3. Family History of Headache ____+____-

4. Characteristics of Pain:

   A. Location: ____Frontal ____Nuchal ____Occipital
      ____Unilateral ____Bilateral
      ____Temporal ____In/Behind Eye ____Coronal

   B. Frequency of Attacks: ____Constant ____Daily ____Episodic
      ____Period of Remission

   C. Duration of Pain: ____Minutes ____Hours ____Days
      ____Week(s)

   D. Description of Pain: ____Pulsating ____Throbbing
      ____Constant ____Steady ____Fullness/ Tightness About Scalp ____Stabbing
      ____Aching

   E. Symptom Intensity:

      5=Unable to perform any work or social activities; confined to bedrest
      4=Unable to concentrate; can only perform simple tasks independently; forced to rest
      3=Pain moderate; only do what is absolutely necessary
      2=Pain irritating; able to ignore pain and continue with ADL (including work and social activities); forced to "take it easy"
      1=Pain there if attended to; no effect upon ADL

   F. Time Onset of Attack: ____Night ____Early Morning
      ____Upon Arising ____Progresses During Day ____Awakens Pt. During Sleep

5. Symptoms: ____Ocular Prodromes ____Paresthesias ____Mobility Deficit ____Smell Disturbance ____Nausea ____Vomiting ____Photophobia ____Sonophobia ____Diaphoresis ____Fluid Retention ____Nasal Stuffiness ____ Lacrimation (R and/or L) ____Ptosis and/or Dilation of Pupil ____Feverish Sensation, Chills ____Polyuria ____Diarrhea ____Pallor ____Carbohydrate Craving

6. Precipitating Factors

   A. Environmental: ____Bright Light ____Weather Changes ____Pollution ____Cold Air Exposure

   B. Psychological:

      1. Anxiety_____

      2. Tension_____

      3. Depression_____

      4. Stressors (family, significant other and/or work-related difficulties) See Social Readjustment Rating Scale ___
      _____
      _____
      _____

      5. Onset of Pain: ____After Period of Stress ____During Stressful Situation ____Weekends ____During Vacation

   C. Internal Factors: ____Occur Around Menses ____Tryamine Containing Foods ____History of Hypoglycemia ____History of Thyroid Diagnosis. See Headache Diary_____
      _____

7. Emotional Factors (Depression as I or II Event)

   A. Physical c/o Depression:

      ____Sleep Disturbance (initial insomnia, frequent nocturnal awakenings, early morning awakening) ____Dyspnea ____Weight Loss/Gain ____Constipation ____Weakness/Fatigue ____Cardiovascular Disturbances ____Palpitations ____ Paresthesias ____Nausea and/or Vomiting ____Urinary Frequency ____"Spells" - Dizziness ____Sexual Disturbances ____Menstrual Changes ____Appetite Disturbances ____Decreased Libido ____Fullness Chest and/or Head

B. Emotionalc/o Depression:

____Blues, Sadness, Low Spirits ____Crying/Tearfulness ____Guilt/Shame ____Hopelessness/Helplessness ____Unworthiness ____Unreality ____Anxious ____Irritable ____Rumination Over Past, Present, Future ____Mourning

C. Psychic c/o Depression:

____Morning Worst Time of Day ____Poor Concentration ____Poor Memory ____No Interest, Luck Ambition ____Suicidal Ideation ____Suicide Attempts ____Decreased Self-Esteem

D. History of Psychiatric Treatment ____Yes ____No
Family History of Mental Illness ____Yes ____No
Psychological Testing Performed_____

E. Use of Psychotropic/Antidepressive Medications (list dosage and results with use)_____
_____

8. Medical History

A. Past Illnesses: ____Head Injury/Trauma ____Disease Eyes/Ears/Nose/Sinus ____Infectious Disease ____Endocrine Disorders ____Hypertension ____Angina Pectoris
Other_____

B. Concurrent Disease _____

C. Trauma_____

D. Surgery_____

9. Known Allergies:_____
_____

10. Physical/Neurological Examination Results:

A. Cerebellar Functions:_____

B. Cranial Nerves:_____

C. Motor Functions:_____

D. Sensory Functions:_____

E. Pathologic Reflexes:_____

11. Medication Rating (Circle and Indicate Amount of Medication and Relief of Headache, Complete, Moderate, Mild, None)

    A. Aspirin, Tylenol, Datril, Excedrin_____

    B. Darvon, Fiorinal, Midrin_____

    C. Valium, Librium, Tranxene, Vistaril_____

    D. Cafergot, Eynergen, Sansert_____

    E. Alcohol_____

    F. Coffee, Cola Drinks_____

    G. Codeine, Empirin with Codeine, Percodan_____

    H. Elavil, Triavil, Etrafon, Sonequan, Aventyl, Tofranil, Norpramin_____

    I. Demerol_____

    J. Other_____

    K. History of Chemical Abuse ____Yes ____No

12. Client Observation

    A. Pain Behaviors:

    B. Pain Topics:

    C. Gait Pattern:

    D. Postural Guarding:

    E. Cervical Range of Motion:

13. Diagnostic Tests (List Date Performed and Results)

    A. Lab:_____

    B. X-Rays:_____

    C. CT Scan:_____

    D. EEG:_____

    E. Angiogram:_____

    F. Lumbar Puncture:_____

14. Is Client scheduled for follow-up with referring physician?

_____

15. What if anything seems to relieve the pain besides medications?
____Walking ____Sitting ____Sleeping ____Rocking____Rubbing Body Parts ____Heat ____O_2 inhalation ____Psychotherapy ____Biofeedback ____Acupuncture ____Manipulation ____Physical Therapy ____ Diversion

16. How do family/friends respond to you when you experience pain?

_____

_____

17. Occupational History

A. Self-Employed ____PT ____FT

B. Employee ____PT ____FT

C. Student ____PT ____FT

D. Homemaker ____PT ____FT

E. Retired ____

F. Pension/Disability ____

G. Frequency of Work Time Missed Due to Headache

____less than one week ____2-3 weeks ____more than one month

____unable to estimate

HEADACHE DIARY

Patient Name _____

Therapist _____

Ref. Physician _____

Severity of Headache	Date	Time Onset & Ending of HA (Identify hr & am/pm)	QID Pain Level (0-5) 9A	1P	6P	9P	Highest Pain Severity Experienced Within Last 24 Hours (0-5)	Emotional & Physical Factors (use scale) Precipitating or Exacerbating Pain	Food &/or Drink (use scale) Precipitating or Exacerbating Pain	Med. Taken, Dosage, & Time	Relief of HA (1-10) w/use of medication	Relief of HA (1-10) w/use of relaxation tech.
5 - severe pain; unable to perform any work or social activities; confined to bed or rest; require assistance for ADL												
4 - unable to concentrate; can perform tasks independently; forced to rest												
3 - pain moderate; only do what is absolutely necessary												
2 - pain irritating; able to ignore pain & continue with ADL (including work & social activities) yet need to "take it easy"												
1 - pain there if attended to; no effect upon ADL												
0 - no pain												

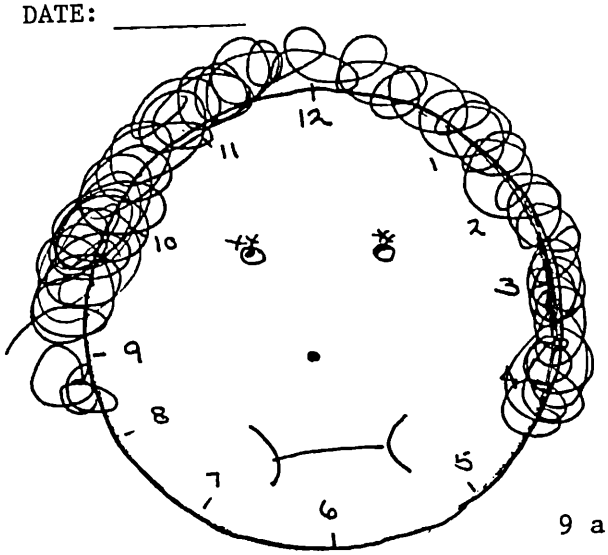
	Date	Time Onset & Ending of HA (Identify hr & am/pm)	QLD Pain Level (0-5)	Severity of HA (use scale)	Highest Pain Severity Experienced Within Last 24 Hours (0-5)	Emotional & Physical Factors (use scale) Precipitating or Exacerbating Pain	Food &/or Drink (use scale) Precipitating or Exacerbating Pain	Med. Taken, Dosage, & Time	Relief of HA (1-10) w/use of medication	Relief of HA (1-10) w/use of relaxation tech.
Emotional & Physical Factors										
A - Emotional upset with Spouse/ Lover/Family/ Friend(s)										
B - Emotional upset on the job										
C - Business success (+) or failure (-)										
D - Vacation and/or weekend										
E - Strenuous physical exercise and/or labor										
F - Crisis										
G - Post-crisis period										
H - New job/ position/ responsibilities										
I - Menstrual period										
J - Travel										
K - Physical Fitness										
L - Depression										
M - Boredom or Loneliness										
N - Anger										
O - Frustration										
P - Anxiety										

	Date	Time Onset & Ending of HA (Identify hr & am/pm)	HID Pain Level (0-5)	Highest Pain Severity Experienced Within Last 24 Hours (0-5)	Emotional & Physical Factors (use scale) Precipitating or Exacerbating Pain	Food &/or Drink (use scale) Precipitating or Exacerbating Pain	Med. Taken, Dosage, & Time	Relief of HA (1-10) w/use of medication	Relief of HA (1-10) w/use of relaxation tech.
Food and/or Drink									
a - aged cheese									
b - fermented foods (pickled or marinated) (sour cream/ yogurt) (herring)									
c - chocolate									
d - monosodium glutamate (Chinese foods)									
e - nuts									
f - fermented sausage									
g - caffeinated drinks (coffee, tea, cola)									
h - wine									
i - beer									
j - alcohol (bourbon, gin, vodka)									
Relief of HA (1-10)									
1 - complete									
2-5 - moderate									
6-9 - mild									
10 - no relief									

Appendix D

NAME: _____

DATE: _____



a.m.

p.m.

Please mark on the clock what time your headache began.

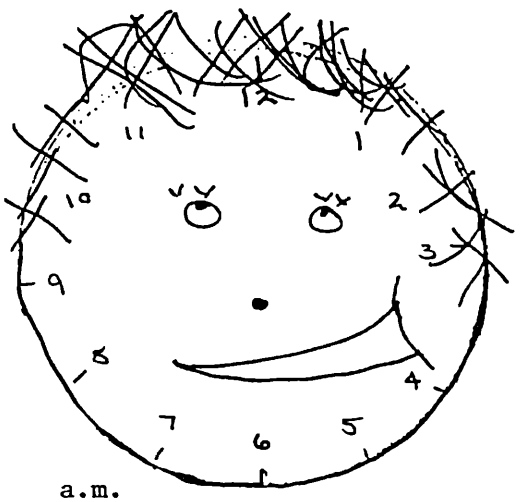
My pain level was a : (circle one of the given numbers)

9 a.m. --- 0 - 1 - 2 - 3 - 4 - 5

1 p.m. --- 0 - 1 - 2 - 3 - 4 - 5

6 p.m. --- 0 - 1 - 2 - 3 - 4 - 5

9 p.m. --- 0 - 1 - 2 - 3 - 4 - 5



a.m.

p.m.

Please mark on the clock when your headache went away - yeah!

My highest pain level today was a: 0 - 1 - 2 - 3 - 4 - 5

Please mark down what medicine you took today & at what time _____

What do you think caused your headache &/or made it worse? _____

_____

Appendix E

Behavioral Definitions

Pain Talk (PT): PT is scored whenever the designated individual moans, groans, cries, and/or states anything in a whimpering, whining tone of voice in which the context of conversation is a complaint ("That hurts."), demand, or request made because the person is in pain ("Do that for me because I don't feel good."), or verbal refusal to attempt prescribed task because of pain complaint ("I can't do anything. I'll hurt if I do that."). Pain related story telling ("I had such a bad headache...") is also designated as pain talk.

Pain Behavior (PB): PB is scored whenever the designated individual clutches, rubs, or holds the identified painful body part, grimaces, or is drug-seeking.

Special cases:

+ PT is not scored when the designated individual offers a complaint of pain believed to be acute (i.e., of recent onset with a duration less than six months and not indicative of ongoing tissue destruction (Sternbach, 1974).

+ PT is not scored when the individual describes the pain complaint when asked to do so by the health practitioner for purposes of evaluation.

+ PB is not scored when the individual briefly (one second duration) touches any body part.

Appendix F

Child's Name:_____

Recorder:_____

Date:_____

1. Did your child appear to have a headache within the last 24 hours?

____Yes ____No

2. If "yes", at approximately what time did you notice the headache occurrence and disappearance? (e.g. 9 a.m. to 3 p.m.)

3. How was the headache occurrence communicated? [Please check the appropriate response(s)].

____ child told me

____ I asked my child

____ he/she was crying

____ he/she asked for medication

____ mood change

____ he/she rubbed painful body part

____ decreased activity level

____ other (please explain)

4. How did you respond to your child's pain talk and/or behaviors? [Please check the appropriate response(s)].

____ I ignored his pain talk and/or behaviors

____ I comforted my child (e.g. embraced, consoled, fed)

____ I sought medical advice

____ I gave him/her medication

____ I encouraged him/her to decrease his/her activity level (e.g. rest, stay home from school/work, discontinue home chores)

____ I applied heat or cold compresses to the painful site

____ Other (please explain)

Appendix G

Daily Activity Log

Name_____

Day of Week_____

Date_____

DIRECTIONS: Please put an "X" in the box for the major activity for each hour.

Thanks!

MAJOR ACTIVITY

	Resting Due to Pain	Playing (Games, TV, Sports)	Sleeping	Eating	Homework	Home Chores	School	Work
Midnight								
12-1								
1-2								
2-3								
3-4								
4-5								
a.m.								
5-6								
6-7								
7-8								
8-9								
9-10								
10-11								
11-12								
noon								
12-1								
1-2								
2-3								
3-4								
4-5								
5-6								
eve								
6-7								
7-8								
8-9								
9-10								
10-11								
11-12								

Appendix H

Patient's Name: _____

Practitioner: _____

Peripheral Hand Temperatures
Pre-Training Readings with Headache Complaint

Minute	Trial 1	Trial 2	Trial 3
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Mean Value	____	____	____
Room Temperature	____	____	____

Appendix I

Pre-Training Readings without Headache Complaint

Minute	Trial 1	Trial 2	Trial 3
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Mean Value	____	____	____
Room Temperature	____	____	____

Appendix J

Trainee_____

Trainer_____

Date_____

THERMAL TRAINING DATA SHEET

On a scale of zero through ten with "0" meaning complete relaxation and "10" meaning extreme tension, how would you rank your present tension level? (circle one: 0 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10)

What is your present pain level? (circle one: 0 - 1 - 2 - 3 - 4 - 5)

Baseline Measurements (before training)		Measurements (during training)		Post-training Measurements (after training)	
Time (sec)	Temperature (°F)	Time (min)	Temperature (°F)	Time (sec)	Temperature (°F)
0	____	0	____	0	____
15	____	1	____	15	____
30	____	2	____	30	____
45	____	3	____	45	____
60	____	4	____	60	____
75	____	5	____	75	____
90	____	6	____	90	____
105	____	7	____	105	____
120	____	8	____	120	____
		9	____		
		10	____		
		11	____		
		12	____		
		13	____		
		14	____		
		15	____		
		16	____		
		17	____		
		18	____		
		19	____		
		20	____		

Now, how would you rate your relaxation level on the same scale of zero through ten? (circle one: 0 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10)

Now, what is your pain level? (circle one: 0 - 1 - 2 - 3 - 4 - 5)

Do you feel any changes in your body? (check as many responses as appropriate) ____skin oiliness ____perspiration ____gassiness ____acid stomach ____indigestion ____need to urinate/defecate ____cold hands ____sweaty hands ____cold feet ____sweaty feet ____flushed face ____burping ____abdominal muscle tension ____breathing pattern ____diarrhea ____constipation ____heart beat ____jaw clenching/teeth grinding ____tremulousness ____neck muscle tension ____back muscle tension ____ muscle spasm ____ muscle cramps ____dizziness ____swallowing pattern ____dry mouth ____nausea ____peace of mind ____fatigue ____ restlessness

Other Comments:

How would you describe the change? (check as many responses as appropriate) ____less frequent ____more frequent ____less intense ____more intense ____shorter duration ____longer duration

Other Comments

Training Session #____

Appendix K

Name_____

Thermal Training Data Sheet

	Pretraining	Training	Post-Training
Date_____			
Mean Value			
Relaxation Level			
Pain Level			
Date_____			
Mean Value			
Relaxation Level			
Pain Level			
Date_____			
Mean Value			
Relaxation Level			
Pain Level			
Date_____			
Mean Value			
Relaxation Level			
Pain Level			
Date_____			
Mean Value			
Relaxation Level			
Pain Level			

Appendix L

Patient Introductory Stress Lecture

Stress refers to the changes in everyday life. It is not a disease, but a condition of life. Stressful events can be positive, called "eustress", or negative, called "distress". Something may be eustressful for one person and distressful for another.

Stressors, or changes, can stem from your body, emotions, or environment. Stressors demand adjustment. Your reaction to such demands is influenced by an innate "fight/flight/or fright" response. This response was inherited from our ancestors with the goal being self-protection and survival.

Physically, your body undergoes the following changes when you experience the fight/flight/fright response: When the stimuli coming in through your sensory systems, for example your eyes and ears, are perceived as a threat, the body's regulating centers inform the body to gear up in preparation for confrontation, fight, or escape, flight. Some individuals perceive a threat as being so great that their fear immobilizes them. With this "stress response" the sympathetic nervious system becomes activated. The pupils dilate so you can see better. Hearing becomes acute. The skeletal muscles especially of the neck, arm, low back, and leg areas tense up in anticipation of action. Blood is shunted to your brain to supply the necessary oxygen to facillitate thinking. The heart and respiratory rates increase to meet the demand. Your extremities, your hands and feet, become cool due to the blood flow also being sent to your

trunk region for possible skeletal muscle motion and increased cardiopulmonary (heart and lung) demand.

If overactivation of the sympathetic nervous system occurs too frequently or the body is not given relief from these biochemical changes, potential target organ breakdown may occur.

Not only can distress cause disease, but it can exacerbate existing psychophysiological disorders. Physical ailments found to be related to stress include headaches, peptic ulcers, colitis, diarrhea, arthritis, circulatory problems, muscle tension, and sexual dysfunction.

It would be impossible as well as disadvantageous to escape from all the stressors of your life. Hopefully, you shall learn how to counteract possible habitual reactions to distress which may precipitate or exacerbate your headache pattern. The "relaxation response" is the exact opposite of the stress response. The relaxation response allows a recuperative effect. Blood pressure, heart rate, respiration, and circulatory functions all return to their normal status. Often peace of mind is also achieved with relaxation training.

To gain insight into what some of your recent stressors may have been, please complete "The Social Readjustment Rating Scale". Filling out the "Stress Response Questionnaire" may also provide us with some information about how your mind and body interact.

Over the next six weeks, you shall be instructed in a variety of techniques aimed toward relieving physical complaints and enhancing your emotional outlook.

Appendix M

Biofeedback Thermal Training

Activation of the sympathetic nervous system, as in a stress response, results in vasoconstriction or a narrowing of the blood vessels. This resulting change in blood flow is revealed through a drop in the skin temperature. In contrast, the relaxation response is perceived as a warming of the skin and is a gradual physiological change.

Skin temperature fluctuates in response to environmental, biochemical, and emotional factors. Changes in environmental temperature place a demand on thermoregulatory mechanisms to appropriately constrict or dilate peripheral vessels to maintain the body's core temperature. For example, perspiration is the body's way of cooling down. Nicotine, caffeine, and alcohol cause a vasoconstrictive response. Blushing is an example of vasodilation where as in opposition you may have experienced the cold, clammy hands or apprehension resulting from vasoconstriction.

Skin temperature biofeedback is achieved with a thermistor, a temperature-sensitive variable resistor (POINT TO THERMISTOR). This velcro band (POINT TO VELCRO BAND) is used to attach the thermistor to your fingertip. As you achieve vasodilation or hand warming, the digital readout (POINT TO BIOFEEDBACK DISPLAY) will reflect a higher number. Vasoconstriction would be shown by a lower number. Remeber the goal we're working toward is hand warming.

Throughout the training you shall learn a variety of different

generalized relaxation techniques. These techniques will facillitate your achieving a warming, pulsing, tingling, or throbbing response throughout your entire body. Warming always accompanies a full relaxation response. Hopefully as your body becomes more relaxed, you'll experience less pain.

Appendix N

Tips And Techniques For Relaxation

Practice of deep relaxation should be done at least once daily for about 15 to 20 minutes. If you are trying to relieve pain or tension, practice twice daily.

Do not practice just after eating.

You may want to practice relaxation before sleeping as this often helps you to rest more fully.

Wear comfortable loose clothing.

Take off your shoes. Keep you feet warm with socks if necessary.

You may lie down or sit in a recliner or comfortable chair with your feet up. Later progress to sitting with your feet flat on the floor.

Rest with your feet and hands uncrossed.

When you first begin practicing, choose the location carefully. A quiet room with the lights off is most conducive to relaxation. The temperature should be comfortable and ventilation adequate.

Some people find it helpful to unplug the phone before they relax. Ask others to respect your quiet time.

Things you may experience during relaxation exercises:

You may feel warmth, heaviness, tingling, numbness or a sensation of floating. You may feel a distortion of size or shape of your body or things you are touching. You may twitch or jerk as you release tension. You may feel drowsy. If you experience any of these sensations, it's nothing to be alarmed about as they're all

common occurrences and will quickly subside once you resume normal activities.

Come out of your relaxation gradually. Begin by moving toes, fingers, then larger joints (knees, elbows). Take a deep breath, stretch, and slowly open your eyes.

Examples of relaxation exercises for those times when there is no time:

3-4 deep breaths from diaphragm. Let air out slowly through pursed lips. Think to yourself the word "relax" or "one" as you exhale.

Rotate head in slow circle.

Pull shoulders back and pull them forward; shrug shoulders, tensing and relaxing your muscles.

Gently massage forehead, temples and/or back of neck with your fingertips. Close your eyes as you do so.

Exercise and activity are needed to balance relaxation. A brisk walk is an excellent form of exercise and many people find this relaxing, too. Check with your doctor before beginning any strenuous exercise program.

Appendix O

Breathing For Relaxation Induction

Our breath is our life. Air is our first food. Without air life ceases within a matter of minutes. Every cell within our body requires continuous oxygen to carry out its specific function. Often, however, we don't pay any attention to our breathing except perhaps in an emergency situation. For example, during a fire a common breathing difficulty is shortness of breath. Yet our breathing pattern can provide us with a great deal of information about the physical and emotional demands placed upon ourselves at any given moment: We may pant after running a long distance. We may briefly hold our breath when we're startled. And who doesn't know the sigh of relief? When we tense up our breathing pattern changes often without our awarenss. Frequently the individual experiencing moderate to severe pain typically demonstrates bracing and/or suppression of breathing.

The process of breathing is similar to the functioning of the old-fashioned blacksmith's bellows. As you open the handles, the bellows expand thereby allowing air in. As you would press the handles back together, the bellows would flatten causing the air to be forced out. When the volume of the bellows increases, the internal pressure decreases creating a vacuum effect which draws in the outside air. As the bellows collapse, the volume decreases, and the increasing internal pressure forces the air to be expelled.

The diaphragm is the body's bellow. It is a dome shaped muscle which separates the lung and abdominal cavities. (POINT TO BASE

OF RIB CAGE). As you breathe in the diaphragm is pushed down, which allows the rib cage to slightly expand thereby increasing the lung capacity. A negative pressure is then created forcing the diaphragm back up to where it gently massages the heart thereby increasing the relaxation potential. When all is working smoothly as I've just explained, what results is maximum volume and minimal pressure. (DEMONSTRATE ABDOMINAL BREATHING).

Typically we use less than half of our lung capacity in normal breathing. Breathing for relaxation purposes involves our allowing the body's normal functioning to occur.

How do you breathe? Place one hand across your chest (PLACE HAND IN HORIZONTAL POSITION ACROSS UPPER CHEST) and your other hand across the abdomen (PLACE OTHER HAND IN HORIZONTAL POSITION ACROSS ABDOMEN). Be aware of which hand moves the most and how many respirations you have per minute. (DO THIS SELF-AWARENESS EXERCISE FOR ONE MINUTE).

Now let's experience taking a full breath. Used periodically, this exercise utilizes the lung's full capacity and many people feel "energized" after briefly doing this. Occasionally some individuals feel light-headed or dizzy while breathing in this manner. If you should experience this, just resume your normal breathing pattern.

Lie in a comfortable position with your arms and legs uncrossed. Gently close your eyes. Exhale deeply, contracting the abdomen. Inhale slowly as you expand your belly. Continue inhaling through your nose as you expand the chest. Continue inhaling as you raise

the shoulders up towards your ears. Hold for a few comfortable seconds (3 SECOND PAUSE). Now release your shoulders, relax your chest, and contract the belly (REPEAT FIVE TIMES).

Appendix P

Autogenic Training

Autogenic training is a systematic program designed to teach your mind and body to quickly respond to verbal commands for return to homeostasis (i.e., the opposite of the stress response).

Autogenic training consists of auto suggestions or self-talk plus yoga techniques. A psychiatrist, Johannes Schultz, discovered in 1932 that a hypnotic trance could be achieved merely through thinking of "heaviness" and "warmth" of the extremities. This treatment technique uses passive concentration on combinations of phrases. It involves repetitions of verbal formulas organized into seven standard exercises that are oriented toward ideal emotional and physiological functioning. The standard exercises are:

My arms and legs are heavy.

My arms and legs are warm.

My heartbeat is calm and regular.

I breath in relaxation and exhale all tension.

My abdomen is warm.

My forehead is cool.

My mind is at peace.

Initially as you practice this technique, it's beneficial to assume a comfortable and undisturbed position, for example, lying on your back with your arms and legs uncrossed and your eyes gently

closed while in a quiet room. As I give you verbal prompts, repeat these phrases to yourself silently. Successful outcome of this technique would be achieving these described feelings. Some people instead of feeling the "heaviness" and "warmth" perceive the increasing level of physiological relaxation as a "tingling", "numbing," "floating," or a bodily expansion sensation. These are also normal feelings of relaxation.

On the thermal biofeedback unit or the finger thermometer the relaxation response will be demonstrated through an increase in hand temperature.

Appendix Q

Progressive Relaxation

It is believed to be impossible to experience both physical tension and emotional stress at any given time according to Edmond Jacobson. He devised a progressive deep muscle relaxation protocol which was found to reduce one's blood pressure, pulse, perspiration, and respiration rates.

Unlike the autogenic relaxation protocol, Jacobson asserted that his relaxation technique required no suggestion, will power, or imagination. Jacboson assumed the body responded to anxiety provoking thoughts with increased muscle tension or bracing. As a result this heightened physiological tension reinforced the subjective complaints of anxiety. He believed that progressive relaxation techniques were the answer to breaking up this viscious cycle.

Do you every notice your muscles bracing or holding your body rigidly when you're experiencing a headache? Are you aware of increased muscle tension of the forehead (POINT TO FONTALIS MUSCLE), temple (POINT TO TEMPORALIS MUSCLE), jaw (POINT TO MASSETER MUSCLE), or neck (POINT TO OCCIPITALIS MUSCLE) areas when you're having a headache? When your headache is just starting, do you worry about its becoming more severe or wonder when it will go away? Perhaps this exercise will be beneficial to you in relieving your headaches and any resultant anxiety.

Most people are unaware of when they have chronically tense muscles or when they are bracing them. Progressive relaxation allows one to develop a keen sense of awareness of the difference between muscle tension and relaxation. Jacobson believed that if one recognized muscle contraction, s/he would be able to notice the opposite or relaxation. To show the patients what they shouldn't do, he had them practice tensing a variety of muscle groups. Then when you become aware of your increasing muscle tension you can reverse that stress response and activate the relaxation response.

Jacobson had also discovered that all thought processes and emotions tend to decrease during extreme muscular relaxation. He believed that each emotion has a muscular component, therefore complete relaxation must lack emotion. This may be why you may perceive a quieting of your emotions as you practice these techniques.

We shall aim for achieving a total body relaxation effect. Throughout this training we shall place a special emphasis on relaxing the facial and neck musculature as often it is their sustained muscle contraction which may precipitate or exacerbate the headache.

Jacobsonian Relaxation Exercise Program

Breathe from your abdomen, taking deep, regular breaths and letting the air out slowly as you relax.

Tense the muscles of your forehead by raising your eyebrows. Hold... Relax.

Tense your forehead muscles again by squeezing your eyes shut. Hold... Relax.

Press your lips tightly together and clench your jaws, tensing the muscles of your mouth and cheeks. Hold...Relax.

Open your mouth wide, stretching your mouth muscles. Hold...Relax.

Bend your head as far back as possible. Hold...Relax.

Bend your head to one side. Hold...Relax.

Bend your head to the other side. Hold...Relax.

Bend your head forward, bringing your chin into your chest. Hold... Relax.

Raise your shoulders as high as possible. Hold...Relax.

Bring your shoulders forward. Hold...Relax.

Pull your shoulders back. Hold...Relax.

Bend one arm at the elbow, tensing the muscles of your entire arm

and clenching your fist. Hold...Relax.

Stretch your arm straight out in front of you. Hold it tensely... Relax.

Bend your other arm at the elbow, tensing your muscles and clenching your fist. Hold...Relax.

Stretch this arm straight out in front of you. Hold...Relax.

Tighten the muscles of your stomach by pulling them inward. Hold... Relax.

Arch your back, tightening the muscles of your low back. Hold... Relax.

Tighten the muscles of one leg by bending your knee and bringing it gently toward your chest. Hold...Relax.

Straighten this leg out, pointing your toes then bringing your toes back. Hold each position tightly...Relax.

Tighten the muscles of your other leg by bending your knee and bringing it up toward your chest. Hold... Relax.

Straighten this let out, pointing your toes and bringing your toes back. Again hold each position tightly...Relax.

Try to lie or sit quietly for five to fifteen minutes in a relaxed state.

Comments

Hold each position for 3 to 5 seconds. Relax for 7 to 10 seconds.

Allow yourself to relax and feel the tension flow from your body.

If outside thoughts or noises distract you, turn your thoughts inward and concentrate on your breathing.

If there are any areas of your body which continue to feel tense, contract and relax these muscles again.

As you practice this technique and become more experienced, try to "let go" of tension without contracting first. Some muscle groups you may still need to contract tightly first before you relax, especially those which seem the most tense.

Facial and Cervical Range of Motion Exercises

Here are some simple exercises to do at home, 10 repetitions each session, 2 sessions a day. These exercises will help you relieve any muscle contraction that may have built up with the day's activities. To do them, sit erect, focus upon relaxation and move gently. Don't force any of the movements!

I. Facial Area

A. Raise your eyebrow, study the tension, and relax.

B. "Scrunch" up your eyes, hold the tension, and release.

C. Clench the jaws together, then gently drop the jaw while keeping the lips lightly sealed.

II. Neck Area

A. Slowly turn your head to the right, hold, and return it to the center. Do the same to the left.

B. Drop your chin down slowly toward your chest, hold, and relax. Slowly bring your head back up.

C. Tilt your head straight over towards your right ear, hold, and return it to the center. Do the same on the left side.

Appendix R

Guided Imagery

Guided imagery is another way of achieving the relaxation response through using your imagination. With this technique you are encouraged to imagine pleasing sensory stimulation which will elicit or cause you to feel relaxed, comfortable, safe, and pain free. Then you shall be asked to allow this relaxation to spread throughout your entire body.

Let us assume that our thoughts become our reality, that is you are what you think you are. For example, if you think upsetting thoughts, you soon begin to feel upset. Often such negative thoughts tend to "snowball" and our distress ends up being based on the future, not our present reality. In order to overcome such unpleasant feelings, you can refocus your thoughts to a positive, healing orientation. The effectiveness of this approach is dependent upon your belief that you will get better and that you can learn to control the pain instead of the pain controlling you.

The components of guided imagery involve your assuming a comfortable body position, gently closing your eyes, allowing tension to disappear, and deep rhythmic breathing. You can achieve a guided imagery through allowing your mind to follow through with a current fantasy. Or you could imagine transcending yourself to a relaxing environment -- the beach, mountains, or forest. What do you feel, see, and smell? You may wish to imagine doing a relaxing activity such as floating on a cloud or sitting by a warm fire.

If you find that the pain limits your attending to this task, you may choose to visualize a symbol that is the opposite of your pain experience. For example if you perceive your pain as being a "burning" sensation you may wish to concentrate on a "cooling" image such as a waterfall.

There are no limits to your imagination, so enjoy!

Appendix S

Integrating Relaxation Skills

Sit or lie in a comfortable position with your eyes closed. Spend 30 - 40 seconds in deep breathing. Lift your arms slowly over your head and hold them there while taking a deep breath. Hold the breath (3 second duration). Slowly lower your arms as you exhale. When your arms return to your chair or bed, breathe and let your whole body go limp. Hold your hands in front of you as if praying. Take in a deep breath and hold it (3 second duration). Now hold your arms tightly together until you feel them tremble. Then exhale and let yourself go completely limp. Continue breathing deeply (1 minute duration). Now imagine the top of your head being bathed in sunlight. Feel this warmth. As you feel this warmth, imagine your body being an empty vessel. Now feel the warmth spreading into the vessel. Feel the warmth going down your body... to your feet...ankles...legs...hips...abdomen...chest... shoulders. Feel the warmth and heaviness throughout your body. Allow the feeling to happen and proceed on its own. Enjoy the sensations of deep relaxation. Continue to breath in a slow, deep regular manner (1 minute duration). Now as you prepare to return to your normal level of awareness, concentrate on bringing back with you these feelings of deep relaxation. Take in a deep breath, hold it (3 second duration, gently exhale (6 second duration), gradually open your eyes and take a big comfortable stretch.

"When Things Are Tough, The Touch Get Going!" or How To Stay Motivated for Self-Change Programming

You have learned a variety of techniques over the past few weeks aimed toward relieving physical complaints and enhancing your emotional outlook. Often the positive psychophysiological feedback achieved through practice is enough to motivate you for continuation. Yet old habits are hard to break. So in recognition and respect for that stubbornness to do the least amount of work, the following motivational tips are offered.

When you find your motivation lacking and/or you're missing daily practice sessions, focus in on the following questions:

1. Why do I follow through with my treatment expectations?
2. Am I doing this for myself or someone else?
3. If I didn't have pain, how might my life be different?
4. Am I receiving any possible benefits for having this continued ineffective pain management?
5. What's more important for me to do than follow through with the treatment recommendations?
6. Can I do both the alternative activity and pursue the treatment recommendations?

Taking Charge

1. If after weighing the pros and cons you decide to "go for it", allow yourself adequate space and time for pursuing the prescribed treatment.

2. Missing one practice session won't hurt. What does hurt is how this may set up a cycle for continued lack of follow through. Remember, you have the right to replenish your energy source!
3. Don't be too enthusiastic about your self-change programming. It may lead to burn-out (e.g., lack of interest and feelings of guilt for not following through).
4. Sometimes tension symptoms persist despite your strictly adhering to the prescribed medical regime. In some cases it is not unusual for the symptoms to be serving the purpose of signals of something not working in your life. If you suspect this, be a "private self-investigator" and examine your clues of distress.
5. Practice doesn't make perfect, but it often does make better! Be patient, persistent, and give yourself time.

Appendix T

Subject's name:_____

Age:_____

Consumer Satisfaction Survey

1. How did relaxation training with biofeedback affect the frequency of your headaches?

   1. ____markedly decreased
   2. ____slightly decreased
   3. ____no change
   4. ____slightly increased
   5. ____greatly increased

2. How did relaxation training with biofeedback affect the severity of your headache pain?

   1. ____markedly decreased
   2. ____slightly decreased
   3. ____no change
   4. ____slightly increased
   5. ____greatly increased

3. How did relaxation training with biofeedback affect the duration of your headaches?

   1. ____markedly decreased
   2. ____slightly decreased
   3. ____no change
   4. ____slightly increased
   5. ____greatly increased

4. Did you notice a change in required resting time when having the headaches because of practicing relaxation training with biofeedback?

   ____I never required rest because of the headaches

   or

   1. ____markedly decreased
   2. ____slightly decreased
   3. ____no change
   4. ____slightly increased
   5. ____greatly increased

5. Did you notice a change in pain medication intake for the headaches because of practicing relaxation training with biofeedback?

   1. ____markedly decreased
   2. ____slightly decreased
   3. ____no change
   4. ____slightly increased
   5. ____greatly increased

6. Did you feel any change in your mood from practicing relaxation training with biofeedback?

1. ___much more pleasant
2. ____somewhat more pleasant
3. ____no change
4. ____somewhat less pleasant
5. ____much less pleasant

7. Did the therapist adequately explain the purposes of the various relaxation techniques with biofeedback?

1. ____very adequately
2. ____somewhat adequately
3. ____adequately
4. ____somewhat inadequately
5. ____very inadequately

8. How available was your therapist for your needs?

1. ____available all the time
2. ____available most of the time
3. ____sometimes available
4. ____seldom available
5. ____never available

9. How pleasant was your therapist to work with?

1. ____very pleasant
2. ____somewhat pleasant
3. ___pleasant
4. ____somewhat unpleasant
5. ____very unpleasant

10. Would you recommend this treatment program to other individuals suffering from headaches?

1. ____enthusiastically
2. ____yes
3. ____maybe
4. ____no
5. ____never

Any additional comments are most welcome.

Thank you.

Subject's name:_____

Significant other's name:

_____

Relationship:_____

Significant Other Satisfaction Survey

1. How did relaxation training with biofeedback appear to affect the frequency of the subject's headaches?

   1. ____markedly decreased
   2. ____slightly decreased
   3. ____no change
   4. ____slightly increased
   5. ____greatly increased

2. How did relaxation training with biofeedback appear to affect the severity of the subject's headache pain?

   1. ____markedly decreased
   2. ____slightly decreased
   3. ____no change
   5. ____slightly increased
   5. ____greatly increased

3. How did relaxation training with biofeedback appear to affect the duration of the subject's headache pain?

   1. ____markedly decreased
   2. ____slightly decreased
   3. ____no change
   4. ____slightly increased
   5. ____greatly increased

4. Did you notice a change in pain topic/behavior occurrence due to the subject's practicing relaxation training with biofeedback?

   1. ____markedly decreased
   2. ____slightly decreased
   3. ____no change
   4. ____ slightly increased
   5. ____greatly increased

5. Did you notice a change in the subject's pain medication intake for the headaches because of practicing relaxation training with biofeedback?

   1. ____markedly decreased
   2. ____slightly decreased
   3. ____no change
   4. ____slightly increased
   5. ____greatly increased

6. Did you notice a mood change in the subject when practicing relaxation training with biofeedback?

1. ____much more pleasant
2. ____somewhat more pleasant
3. ____no change
4. ____somewhat less pleasant
5. ____much less pleasant

7. Did the therapist adequately explain the purposes of the various relaxation techniques with biofeedback?

1. ____very adequately
2. ____somewhat adequately
3. ____adequately
4. ____somewhat inadequately
5. ____very inadequately

8. How available was your therapist for your needs?

1. ____available all the time
2. ____available most of the time
3. ____sometimes available
4. ____seldom available
5. ____never available

9. How pleasant was your therapist to work with?

1. ____very pleasant
2. ____somewhat pleasant
3. ____pleasant
4. ____somewhat unpleasant
5. ____very unpleasant

10. Would you recommend this treatment program to other individuals suffering from headaches?

1. ____enthusiastically
2. ____yes
3. ____maybe
4. ____no
5. ____never

Any additional comments are most welcome.

Thank you.