

Treatment of Childhood Migraine With Autogenic Training and Skin Temperature Biofeedback: A Component Analysis

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Using a controlled group outcome design, skin temperature biofeedback with autogenic training and autogenic training only was compared to a waiting list as a treatment for childhood headache. Thirty children with migraine headaches, ages 7 to 18 years were randomly assigned to one of the three conditions. Statistical analyses of headache activity indicated that children in the treatment groups improved in headache frequency and duration but not intensity as compared to the waiting list control group. These findings were consistent through a 6 month follow-up. In terms of clinical improvement, 80% of the biofeedback group, 50% of the autogenics group, and none of the waiting list control group were symptom-free. These findings were discussed in relation to past childhood headache studies and implications for current treatment of children with headaches.

Key words: childhood migraine, biofeedback, autogenic

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Reports on the success of behavioral or psychological treatments of childhood migraine have increased over the past 10 years. Early studies examined the effectiveness of skin temperature biofeedback with autogenic training as well as other types of relaxation procedures.^{1,2} Several studies evaluated the effectiveness of skin temperature biofeedback as compared to relaxation procedures such as autogenic training or progressive muscle relaxation. In general, the results indicated that skin temperature biofeedback or relaxation procedures were equally effective in reducing headaches compared to control groups.³ Although these studies compared the two treatment approaches, most used small numbers of children with less than 10 per group or combined other procedures besides relaxation or biofeedback. In order to determine the effective components of the initial treatment packages that were studied in earlier investigations, a systematic approach needs to be undertaken. Gottman and Markman⁴ describe dismantling of the treatment program to discover the "potent" aspects of a treatment package. In the current study, the component to be studied was skin temperature biofeedback.

Cephalic vasomotor biofeedback, EMG biofeedback relaxation training, cognitive coping skills training, contingency management, and skin temperature feedback with autogenic training have been reported to be useful interventions for childhood migraine headache. Many of the studies have been single case reports or small group studies. Of the interventions evaluated, skin temperature biofeedback with autogenic training has been investigated frequently. Labbe' and Williamson¹ reported a controlled group study evaluating skin temperature biofeedback with autogenic training compared to a control group that only kept headache diaries. The treatment group demonstrated significant reductions in headache frequency, intensity and duration at the end of treatment and 6 month follow-up. Fentress and colleagues evaluated EMG biofeedback with progressive muscle relaxation and compared it to only progressive muscle relaxation training. Results of their study indicated that total headache hours and global headache activity were reduced in both groups. However, the progressive muscle relaxation only group reported a significant decrease in frequency. Both groups maintained treatment gains at a 1-year follow-up. Fentress et al⁵ conclude that the addition of EMG biofeedback did not produce a clear advantage in the treatment of childhood migraine.

Results of several case studies and small group reports indicate the effectiveness of skin temperature biofeedback with autogenic training over no treatment or a control condition for childhood headache.^{3,2} However, there have not been any studies reported that clearly examine the relative effectiveness of the skin temperature biofeedback component as Fentress et al.⁵ did with EMG biofeedback. The present study is a randomized, controlled group trial, designed to assess the

"potency" of the skin temperature biofeedback component in the treatment of childhood migraine.

METHOD

Subjects.-Forty-six children were recruited from the community through public announcements in the newspaper and physician referrals. Recruits were included in the study if they had received a secondary diagnosis of vascular or migraine headache by a physician; reported at least two migraine headaches per month; and met three of the following six criteria: headaches predominantly one-sided; headaches usually accompanied by nausea or vomiting; relief after rest; positive family history for migraine headaches; pulsating or throbbing pain; visual, sensory, or motor prodromes. Of the forty-six children recruited, 30 completed the study. Thirteen were girls and 17 were boys, ages 8 to 18, mean age was 12 years.

Data on the dropouts were compared to those children participating in the treatment sessions. No differences were found in sex, age, or headache history.

Apparatus.-All experimental sessions were conducted in a one-room laboratory which had a one-way mirror and a Bar-calounger^(r) recliner. The room was lit by a 40-watt desk lamp. Air temperature was held relatively constant at $76^{\circ}\text{F} \pm 1^{\circ}\text{F}$, as temperature in the low seventy degrees Fahrenheit may cause hand temperature to decrease.⁶ The child was separated from the experimenter and physiological recording equipment while attempting to raise the skin temperature. The fingertip temperature of each subject was measured with a J & J Thermal Module T68. The skin temperature feedback group received a standard feedback light bar display with a continuous auditory signal. Skin temperature readings were obtained from the subject by affixing a single thermal sensor to the surface of the distal pad of the right index finger using surgical tape. Children were asked to keep the hand still and open with palm up.

Procedure.-An initial interview was conducted with the child and at least one parent. The study was described and the consent of participation form was signed by both parent and child. A medical consent form was given that was returned prior to beginning treatment. A semi-structured interview was conducted to gain information about headache history, educational, and psychosocial, and emotional functioning of the child. Parents and child independently completed a headache questionnaire; parents completed the Myth Type A.⁷ Children completed the Childhood Depression Inventory⁸ and How-I-Feel Questionnaire,⁹ a measure of state and trait anxiety. Children were then given headache booklets to complete over a 4-week baseline period. Data from the headache booklets were analyzed to achieve headache index, frequency, and duration scores. Refer to Labbe' and Williamson¹ for details on how to compute these scores.

Children were matched by age, sex, and baseline headache activity and then randomly assigned to one of three groups. Group I was a waiting list control group. Group II was skin temperature biofeedback with autogenic relaxation training and Group III was autogenic relaxation training only.

The waiting list control group was then instructed to keep headache records during the next 7 weeks (the treatment phase for the experimental group). All waiting list children came in half-way during the treatment phase, week 5, and at the end of the treatment phase, week 7, to turn in the headache booklets. For the experimental groups, each child participated in 10 treatment sessions lasting 45 minutes each. The sessions were spaced across a treatment period of 7 weeks, two sessions per week for the first 3 weeks, one per week for the last 4 weeks.

For the skin temperature biofeedback with autogenic training group, the child was asked to sit quietly for about 15 minutes in order to establish a baseline skin temperature. The next 15 minutes consisted of skin temperature biofeedback, and the last 5 minutes consisted of self-control of skin temperature. For the first treatment session, the operation of the skin temperature feedback system was explained to the child, and he or she was given the expectancy that learning to warm the hands was easy to do and would lead to improvement of headaches. Subjects were given autogenic training instructions indicating how to imagine their hands becoming warm as well as how to relax. The instructions were the same ones used in the Labbe' and Williamson¹ study and a detailed account can be found in that publication. Instructions about biofeedback and autogenic training were repeated during the first four sessions. The children were then briefly reminded of the instructions during the remainder of the sessions. The experimenter also reviewed headache booklets with the child and discussed practicing what they learned at home.

The children in the autogenic training only group were given the same expectancies and instructions as the skin temperature biofeedback group, but they were not provided with feedback.

All subjects were contacted 1 month and 6 months after the treatment phase and were asked to complete headache records for a 1-month period for each follow-up phase.

RESULTS

Analyses of variance were computed using a 3 (group) x 3 (phase) ANOVA for the headache scores. For the headache frequency score, between groups was significant, $F(2,29) = 4.98, P < .01$; as well as within groups, $F(3,90) = 23.01, P < .001$; and a within group interaction, $F(6,90) = 2.40, P < .05$. For headache duration scores, between groups was significant, $F(2,29) = 4.22, P < .02$; as well as within groups, $F(3,90) = 15.75, P < .001$; and a within group interaction, $F(6,90) = 6.57, P < .001$. For the headache index scores between groups was not significant, $F(2,27) = 1.78, P < .02$, however, within groups was significant, $F(3,90) = 3.26, P < .02$, as well as within group interaction, $F(6,90) = 2.64, P < .02$. Table 1 summarizes the results of ANOVAs for the headache variables.

T-tests were used to evaluate the between group differences that were found using the ANOVAs. T-tests indicated significant differences between the control group ($m=2.57$) and the skin temperature biofeedback group ($m=1.37$) with headache frequency. Across time, significant differences in headache frequency for all subjects occurred from baseline ($m=3.19$) to end of treatment ($m=1.31$), 1-month follow-up ($m=.86$) and 6-month follow-up ($m=1.02$). T-tests indicated significant differences in headache duration between the skin temperature biofeedback group ($m=2.12$) and the control group ($m=4.30$). Across time for all subjects, significant differences in headache duration occurred from baseline ($m=5.5$) to end of treatment ($m=2.69$), 1-month follow-up ($m=2.22$), and 6-month follow-up ($m=2.13$). T-tests indicated significant differences across time for all subjects from baseline ($m=.60$) to end of treatment ($m=.19$), at 6-month follow-up ($m=.11$), but not at 1 month follow-up ($m=.40$). Refer to the Figure for a graphic display

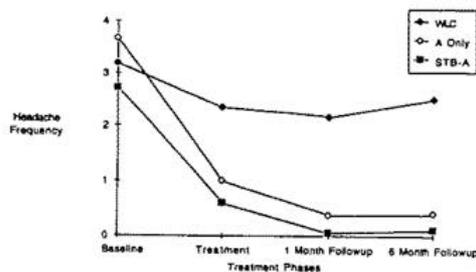
Table 1.-Means and Statistical Data Related to Specific Headache Variable Phase

Headache Variable and Group	Baseline	End of Treatment	1-Month Follow-up	6-Month Follow-up	F Value
Headache Frequency					
ST&A	2.71	.60	.05	.12	F (2,29)=4.98 P<.01
A only	3.67	1.00	.38	.42	
WLC	3.18	2.35	2.17	2.52	
Headache Duration					
ST&A	5.87	2.0	.30	.30	F (2,29)=4.22 P<.02
A only	6.71	2.36	1.25	1.30	
WLC	3.92	3.71	5.10	4.80	
Headache Index					
ST&A	.66	.11	.01	.01	F (2,29)=1.78 NS
A only	.74	.14	.03	.04	
WLC	.41	.31	1.17	.28	

ST&A = Skin-temperature biofeedback with autogenics training, A = Autogenics training, WLC = Waiting list control

of changes in headache frequency for all three groups over time.

In order to assess the clinical significance of the results, a percentage improvement score was computed for each child using the frequency score. If the percentage improvement score was 100%, meaning no headaches after 6-month follow-up, then the subject was classified as symptom-free. If a 50% to 99% reduction of headache frequency was found, then the child was classified as improved. If less than 50% reduction of headache frequency was found, then the child was classified as unimproved. As shown in Table 2, 100% of the treated children were classified as either improved or symptom-free at the 6-month follow-up. And 100% of children in the autogenics only group were



Fig—Mean headache frequency for the three conditions across treatment phases.

Table 2. - Percentage of Subjects Who Were Symptom Free, Improved or Unimproved at Each Phase

Group	n	Symptom-free n (%)	Condition Improved n (%)	Not Improved n (%)
End of Treatment				
ST&A	10	4(40)	6(60)	0(0)
A only	10	4(40)	5(50)	1(10)
WLC	10	2(20)	4(40)	4(40)
1 Month Follow-up				
ST&A	10	9(90)	1(10)	0(0)
A only	10	7(70)	3(30)	0(0)
WLC	10	0(0)	2(20)	8(80)
6 Month Follow-up				
ST&A	10	8(80)	1(10)	1(10)
A only	10	5(50)	5(50)	0(0)
WLC	10	0(0)	1(10)	9(90)

Note. ST&A = Skin-temperature biofeedback with autogenic training, A = Autogenic training, WLC = Waiting list control.

classified as either improved or symptom free at the 6-month follow-up period.

COMMENTS

Results of the study indicate that skin temperature biofeedback with autogenic training or autogenic training only reduces the frequency and duration of childhood migraine headache as compared to a waiting list control group. Headache intensity was not significantly reduced in the treatment groups as compared to the control group. The findings that headache intensity was not significantly reduced for the treatment groups is unexpected and is not consistent with earlier studies that demonstrated decreases in headache intensity with skin temperature biofeedback.^{1,2} However, children in the treatment groups reported significantly fewer headaches at a 6-month follow-up. Although similar results were obtained with either autogenic training with or without biofeedback; the skin temperature group demonstrated not only fewer headaches but headaches of shorter duration. Furthermore, if one examines the clinical significance of the results of the skin temperature feedback with autogenics group, this group was 80% symptom free at 6-month follow-up, whereas, the autogenics only group resulted in 50% of children who were symptom-free. In general, though, the results of this study do not indicate a statistically significant advantage by the addition of skin temperature biofeedback to the autogenic training. Fentress et al⁵ reported similar results when comparing EMG feedback with or without relaxation training. However, the addition of skin

temperature biofeedback may improve the clinical significance as more of the children using feedback were symptom-free. It was also noted by the experimenter that the children in the biofeedback group expressed more interest in the sessions and stayed on task better. Children may find the feedback interesting and rewarding and are thus more motivated to participate. Children may respond better to feedback than autogenic training only as it provides concrete evidence of their performance.

This study used a randomized, controlled experimental design with sufficient numbers of children to allow more powerful statistical analyses than most studies reported in this area. It also provided a replication of the Labbe' and Williamson 1984 study, which was the first controlled group study of the effects of skin temperature biofeedback with autogenic training on childhood headache. Results of the present study are consistent with past research reports^{2,3} and indicate that skin temperature biofeedback and autogenic training techniques are quite effective in reducing migraine headaches. These techniques are easily learned by children, are cost-effective, and appear not to result in any negative side effects.

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