Relaxation Training in School Classes Does Not Reduce Headache Complaints

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SYNOPSIS

The effect of teacher-presented Progressive Relaxation Training (PRT) on headaches, fear of failure and school problems was studied in school students. During ten physical education lessons, students received either PRT (n=110) or placebo training (n=92). The effect of the training was investigated in students who indicated the presence of headaches in a pre-training diary. No significant differences were found between both training groups regarding headache frequency, duration and intensity and the psychological variables. On the basis of these and previous findings, it is recommended to present PRT to fairly small groups of self-selected subjects instead of complete classes.

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INTRODUCTION

Progressive Relaxation Training (PRT) in its various adaptations, has frequently been found to be effective for the treatment of adult migraine and tension headache patients.[1] In children, PRT has also been used successfully for a broad range of problems, such as poor handwriting and reading achievement, delayed language development, asthma and insomnia.[2] Richter et al.[3] treated young migraine patients (9-18 years of age) individually with six one-hour sessions of PRT. They found a significant decrease in headache frequency in the PRT group compared to the placebo-control group, but no differences in headache duration and intensity.

In Sweden, Larsson and coworkers[4-6] evaluated the effect of PRT presented during regular school hours on migraine and tension headaches in a series of studies. The students receiving PRT showed a significant improvement in headache activity compared to subjects in the control group, which comprised self-monitoring, information contact or problem discussion. The improvement in the PRT groups was still present at a follow-up measurement after about half a year. In addition, a self-help procedure of relaxation training, in which a series of audiotapes and a manual were used by the patients, proved to be equally effective as a therapist-assisted procedure.[5,6]

The implementation of PRT during physical education classes has the advantage of rendering available an important health promoting instrument which is to some extent independent of external support and can be expected to be very efficient because a large number of students can be included. The feasibility of this procedure has been demonstrated by Setterlind,[7] who found that about 90% of school students liked to participate in "PRT lessons" and more than 60% reported a decrease in stress through the training.

So far, the effect of PRT incorporated into a school programme has not been studied in association with headache complaints. Therefore, we implemented PRT during regular physical education lessons. The training sessions were presented to complete classes and also included the students without headaches. This procedure was chosen to avoid too much interference with the regular school programme and to prevent stigmatization of the students with headaches. The effect of the PRT was studied on headaches, fear of failure and school problems. The latter variables were selected because in our epidemiological study on headaches in school children, fear of failure and school problems were found to be positively correlated with headache frequency and intensity.[8]

METHOD

Subjects. In response to a presentation of our previous research findings on headache prevalence in school students, the head teachers of three secondary schools agreed to their school's participation in this study. These were: 1. a school offering education ranging from lower vocational to pre-university education in Almere (a medium-sized town in the Netherlands), 2. a school for higher general and predominantly pre-university education in Amsterdam and 3. a school for lower general secondary education in Amsterdam.

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The 19 classes of the participating teachers were allocated at random to a Progressive Relaxation Training or a Placebo Training group. Of the 369 students who participated in the project, 271 (73%) completed both a pre-test and post-test headache diary. Of these 271 subjects, 202 (75%) reported at least one headache in the pre-test period of three weeks: the *headache group (HG).* Within the HG group a subgroup with weekly headaches in the pre-test period was determined: the *frequent headache group (FHG),* n=119. The study focussed on the PRT effects in the HG and FHG groups.

Measurement. *Headache activity.* During the three weeks before and after the training period, each subject kept a diary on the presence of headaches, their duration and the intensity level which described the pain best. Recordings were carried out at four set times: breakfast, lunch, dinner and bedtime, and spanned the period between the present recording and the previous one. The intensity rating scale ranged from 0 (absent) to 5 (very severe). *Fear of failure* was measured using Hermans' subscale for Debilitating Anxiety of the Achievement Motivation Test (PMT-K) for children. The PMT-K is well-validated for the population under study.[9,10]

School problems were assessed with a short list on difficulties with lessons, concentration and homework and worrying about school marks and promotion to the next grade. The answering alternatives ranged from none (1) to many (4) and the sum resulted in a total score for "school problems".

Training experience. Three questions were used to evaluate the students' experience with the training. The amount of "self-training" was measured by a question about the frequency of training outside the physical education lessons, "participation" by asking "to what extent did you participate in the headache training" and "satisfaction" by asking about their degree of satisfaction with the training. The answer alternatives were dichotomized on the basis of the distribution of the answers as follows; self-training: yes *vs* no; satisfaction: very low and low *vs* moderate, high and very high; participation: poor *vs* good and very good.

Measurement of fear of failure and school problems was restricted to schools 1 and 3 and the training variables to school 1 due to limitations in the school curriculum.

Procedure. Physical education teachers at the schools received a verbal presentation on the proposed study and a video presentation about the application of PRT. The video tape was made in the pilot phase of the project and showed a physical education teacher presenting PRT to his students. After the presentation, the teachers received a written description of the training procedure. The students' parents were informed of the project by letter and their permission was obtained. Further, the medical services at the schools were informed and supported the project.

The participating teachers received a written description of the Progressive Relaxation Training (PRT) based on that of Bernstein and Borkovec.[11] In the following week they practiced the training under the supervision of an experienced psychologist who visited them at school. The Placebo Training (PT) consisted of a series of physical concentration exercises (balancing on a wooden beam, balancing a stick on the finger and concentration before shooting basketball penalties) of equal duration as those in the PRT. The PT sessions had the same duration as those of the PRT. The PT was developed in the pilot phase and was considered a credible control training. It lay within the teachers' experience, while it was relatively new for the students. Students were not informed as to which training was the experimental training and which was the placebo training.

Together with the psychologist, each teacher explained the purpose of the PRT, the PT and the procedure to the students. The relevance of the training for headache and stress reduction and the importance of the application of the exercises at home, during stress and in anticipation of a headache, was repeatedly emphasized before and after the training sessions. The first two lessons were presented in the presence of the psychologist, the next eight lessons by the teachers alone. During the lessons, the time devoted to the training was gradually diminished from 20 to 10 minutes, due to the students' increasing ability to relax.

Students completed the fear of failure and school problem scales three weeks before the training. Next, they received the headache diary with oral and written instructions for the next three week period (pre-test). They had to return the completed part of the diary after each week. This procedure was repeated at the end of the training period (post-test). The students received a small reward (about $7.50) for returning the completed post-training diary.

Data reduction. For *headache frequency,* the number of headaches in three weeks were counted and extrapolated to four weeks for comparison to other findings. *Headache duration* was calculated as the mean duration of a headache period in hours and *headache intensity* as the mean intensity of a headache period.[(1)]

Data analyses. First, analyses were carried out on the pretest differences between the PRT and PT groups for HG and FHG subjects using Student's t-tests for independent samples. In the case of differences of $p>.10$, training effects (PRT *vs* PT) were evaluated by t-tests on the post-test measures. In the case of difference of $p<.10$, pre-test measures were included as a covariant in ANCOVAs on the corre-

[(1)] In case of absent headaches during the post-test, headache duration and intensity could not be determined and received a missing value for this period.

sponding post-test measures. This approach has been advocated as a preferable alternative to the analysis on change scores.[12,13] The dependent variables were, in successive analyses: headache frequency, duration, intensity, fear of failure and school problems. The analyses on fear of failure and school problems concerned a subgroup of our sample (n=135), as the measurement of these variables was restricted to two schools.

Finally, *Chi-square* tests were carried out to analyse differences between the PRT and PT subjects in training experience ("self-training", "satisfaction" and "participation"). The tests were performed for the HG subjects only as the measures were collected at one school (n=110).

RESULTS

The characteristics of the HG and FHG subjects are presented in Table 1.

Table 1

Characteristics of HG and FHG subjects. Standard deviations are shown between parentheses.

Characteristics	HG		FHG	
	PRT	PT	PRT	PT
Number of subjects	110	92	65	54
Mean age	13.5(1.5)	13.7(1.5)	13.5(1.3)	13.9(1.5)
Sex				
female	53	46	33	32
male	57	46	32	22
Number of classes	9	10	9	10

The distribution of age and sex were similar for the PRT and PT groups. Nine classes participated in the PRT and ten in the PT.

Effect of training. The mean headache measures, fear of failure and school problem scores for the HG and FHG subjects are presented in Table 2 and 3, respectively.

Table 2

Mean headache measures, fear of failure and school problems at pre-test and post-test in the HG subjects. Standard deviations are shown between parentheses.

Measures	PRT		PT	
	pre	post	pre	post
Headache				
frequency*	5.6(5.9)	3.8(4.5)	6.6(7.6)	4.7(5.5)
duration	2.1(2.1)	2.9(3.1)	2.1(1.8)	2.7(2.7)
intensity	2.0(0.8)	2.2(0.8)	2.1(0.7)	2.2(0.8)
Fear of failure**	7.3(3.6)	7.5(3.6)	7.5(3.8)	7.5(4.1)
School problems**	8.7(2.7)	8.8(2.4)	8.1(3.0)	8.3(3.1)

* extrapolated to four weeks
** on a subsample

Table 3

Mean headache measures, fear of failure and school problems at pre-test and post-test in the FHG subjects. Standard deviations are shown between parentheses.

Measures	PRT		PT	
	pre	post	pre	post
Headache				
frequency*	8.2(6.4)	5.4(5.2)	9.9(8.5)	6.7(6.3)
duration	2.2(1.9)	2.5(2.5)	2.7(1.9)	3.2(2.9)
intensity	2.1(0.7)	2.3(0.8)	2.2(0.7)	2.2(0.7)
Fear of failure**	8.2(3.4)	8.3(3.9)	8.1(3.8)	8.2(3.9)
School problems**	8.8(2.8)	9.2(2.3)	8.7(3.1)	8.8(3.4)

* extrapolated to four weeks
** on a subsample

No pre-test difference between PRT and PT reached a p-value of .10. Therefore training effects were tested with t-tests on the post-test measures.

For both the HG and FHG subjects, no significant differences were found between PRT and PT on the post-test headache frequency, duration and intensity, nor on fear of failure and school problems. Paired t-tests showed that there was an overall significant decrease in headache frequency between pre-test and post-test levels ($t(201)=5.24$, $p<.001$) in the HG subjects, while their headache duration and intensity increased significantly ($t(136)=2.48$, $p<.05$) and ($t(149)=2.58$, $p<.05$, respectively). In the FHG subjects as a whole, headache frequency decreased significantly too ($t(118)=5.47$, $p<.001$), while increases in duration and intensity approached significance ($p<.10$), see Figures 1, 2 and 3.

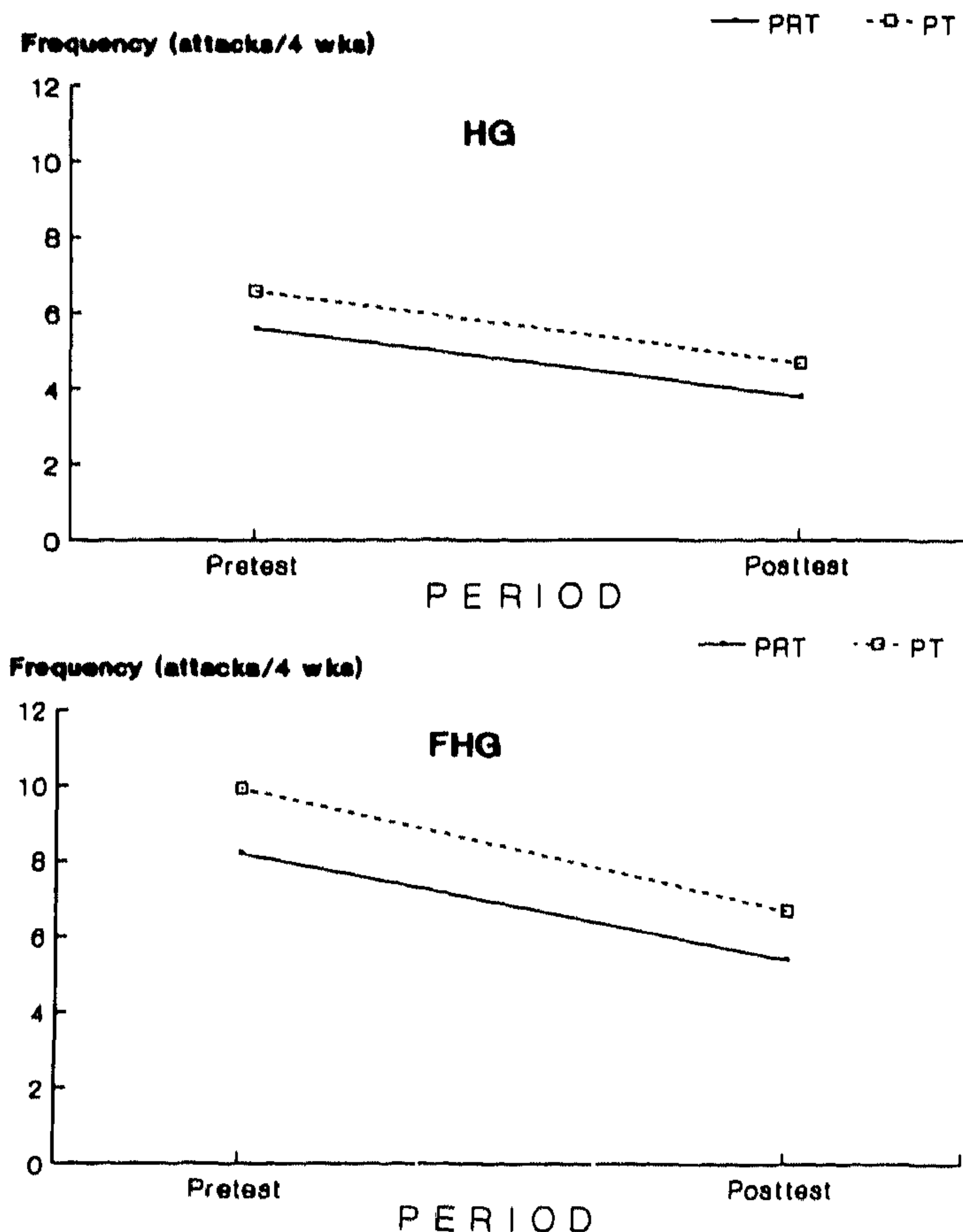

Fig 1.—Headache frequency as a function of training and period for HG (top) and FHG (bottom) subjects.

No significant training effects were found for the HG and FHG subjects on fear of failure and school problems. Further, neither fear of failure nor school problems changed significantly against time in these groups.

Training experience. A total of 64% of the subjects practiced the exercises outside the physical education lessons and 30% did so on a weekly basis. There was a trend for PRT students to practice more than PT students ($1X^2(1)=3.45$, $p<.10$). About two thirds of the PRT and the PT groups mentioned being moderately to very satisfied with the training (difference n.s.). Finally, more than 90% of each group reported good or very good levels of participation (difference n.s.).

DISCUSSION

No significant training effects were found in the HG or FHG groups on headache frequency, duration and intensity for the PRT which was presented during lessons at school. Also the effect of the PRT on school problems and fear of failure was not significant.

At first sight, our findings seem to be inconsistent with those of other studies[3-6] in which both statistical and clinical improvements were found in school students after PRT. This beneficial effect on headaches was mainly present in students with severe headaches.[3,14] In our study, however, the PRT did not show a significant effect on headaches in the subjects with weekly headaches. In post hoc analyses, PRT was

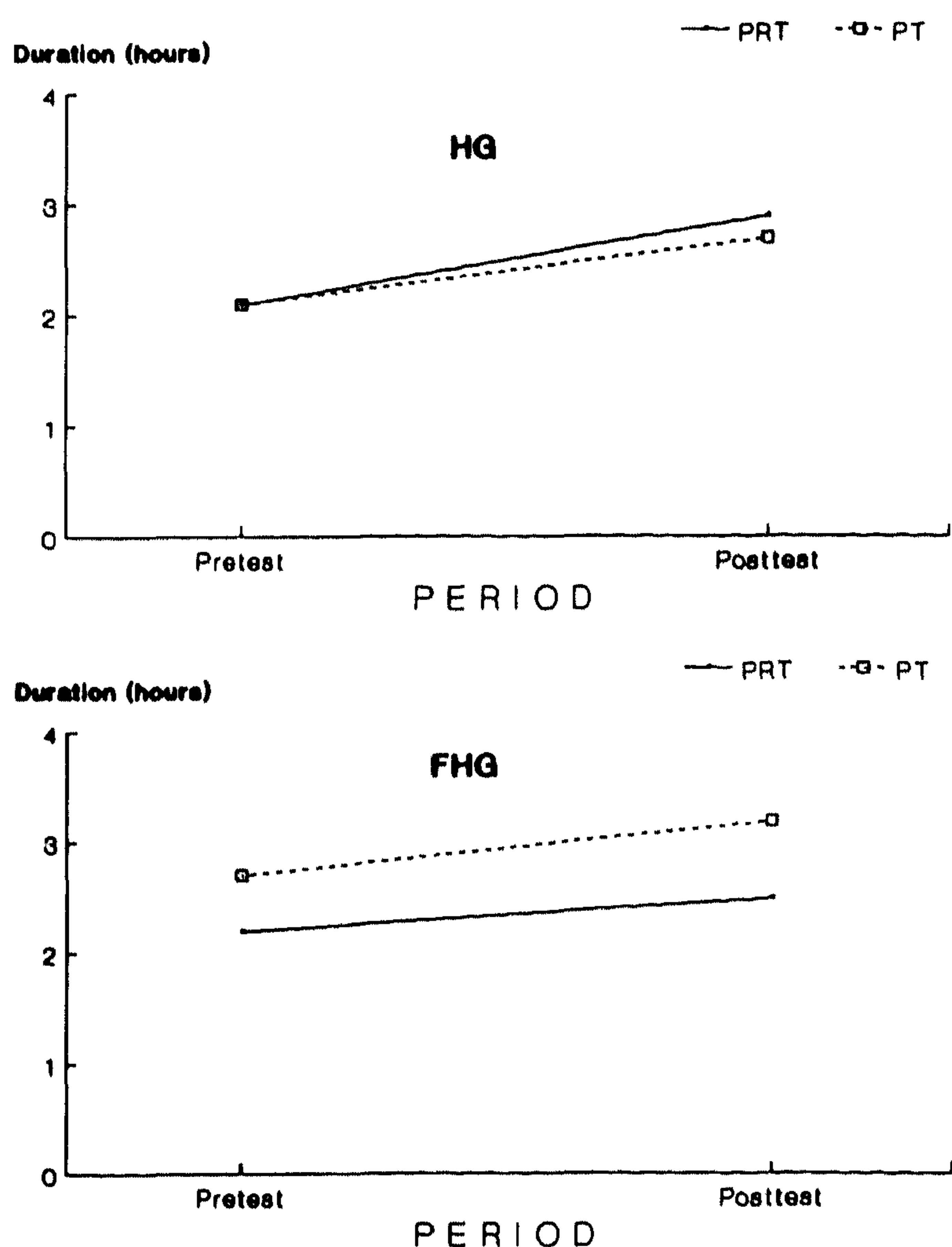

Fig 2.—Headache duration as a function of training and period for HG (top) and FHG (bottom) subjects.

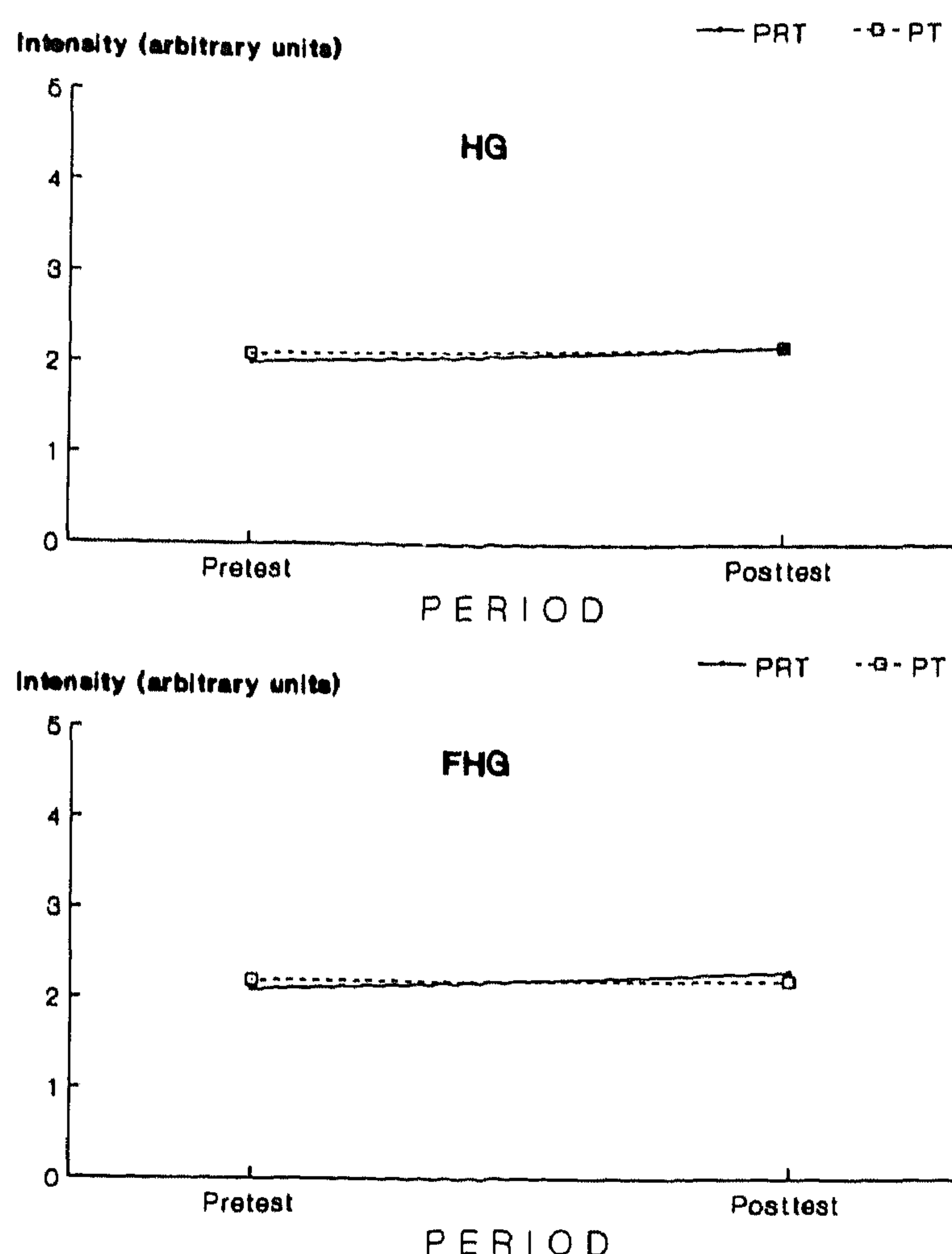

Fig 3.—Headache intensity as a function of training and period for HG (top) and FHG (bottom) subjects.

not found to have a larger effect than PT on headaches in the students with more severe headaches (intensity≥3) either.

This study and the previous ones differed considerably with regard to subject selection and procedure, which might explain the discrepant findings. In the present study, training programmes were offered to all the students, whereas in other studies these were only offered to a selected group of headache patients, who volunteered for participation because they hoped to get relief for their headaches. Further, the headaches in our sample were less frequent and intense than those reported by the subjects in, for example, the Swedish studies.[4-6] Even our group with frequent headaches had less than half the number of headaches of the subjects in the latter studies. This might have led to less motivation for participation in the present sample.

While the advantage of our procedure might have consisted of high efficiency and a lack of stigmatization of young headache patients, its obligatory character may have diminished the motivation to participate, too. The training variables were explored in a subgroup of 110 students. More than 90% of the participants mentioned a good level of participation. However, only 18% of the PRT students were satisfied or very satisfied with the training. The PRT students showed a greater trend to apply the relaxation training outside the physical education lessons than the PT students, possibly because these exercises were easier to apply outside the gymnasium. But, no

one practiced the exercises on a daily basis, while performing "homework" twice a day is advocated in behaviour therapy.[15]

Another procedural difference concerned the number of students participating in each training session. As each class contained a number of students varying between 10 and 20, our training sessions involved many more participants than the usual three or four in most other studies. Also the presentation of the training by the students' own teacher instead of a professional from outside might have rendered the training less engaging for the students.

Overall, headache frequency decreased significantly from pre-test to post-test, while headache duration and intensity increased. This effect was present in both training groups and there are several explanations. First, it might be ascribed to a nonspecific effect of both training methods. Second, it might be associated with time-bound differences in the general circumstances of the students between the pretest and post-test periods, i.e. the presence of examinations, etc. Third, it might be due to an effect of increasing noncompliance against time. Keeping a headache diary encounters a great deal of noncompliance in a young population.[16] Possibly, noncompliance increased against time, leading to selective reports of long or severe headache attacks only.

On the basis of a pilot study, we decided to restrict the duration of keeping a diary to three weeks. Nevertheless, 27% of our initial sample had to be discarded because of incomplete diaries. The use of relatively short diaries leads to increases in sampling error, particularly in a nonclinical population. However, the large number of subjects in our study might have compensated for this.

CONCLUSION

Reviewing both the present negative and the previous positive results with regard to the application of PRT to headaches in school students and the differences in the procedures used, we advise against the presentation of PRT as an integral part of school lessons in a class consisting of unselected students. Instead, we recommend presenting PRT in a school setting to small groups of self-selected subjects (after medical screening) who have volunteered because of severe headache complaints. Procedures such as those applied by Richter et al.[3] and Larsson et al.,[4-6,14] might serve as useful models.

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