A School-Based, Nurse-Administered Relaxation Training for Children with Chronic Tension-Type Headache

Bo Larsson
Centre for Caring Sciences, Uppsala University, Uppsala, Sweden

Jane Carlsson
Department of Clinical Neuroscience, Sahlgrenska Hospital, Göteborg University, Göteborg, Sweden

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Compared the efficacy of a school-based, nurse-administered relaxation training intervention to a no-treatment control condition for children (10–15 years old) with chronic tension-type headache and the outcome at posttreatment and a 6-month follow-up. The study was conducted in a controlled between-group design including 26 schoolchildren who were randomly assigned to the two treatment conditions. Results showed that headache activity in the children treated with relaxation training was significantly more reduced than among those in the no-treatment control group at posttreatment as well as the 6-month follow-up. At these evaluations, 69% and 73% of the pupils, respectively, treated with relaxation had achieved a clinically significant headache improvement (at least a 50% improvement) as compared to 8% and 27% of the pupils, respectively, in the no-treatment control group. Thus, a school-based, nurse-administered relaxation training program seems to be a viable treatment approach for children with chronic tension-type headaches.

KEY WORDS: headache; childhood; adolescence; relaxation therapy; school health.

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Headaches are one of the most common health problems as reported by school-children and adolescents in various countries (Aro, Paronen, & Aro, 1987; Garber, Walker, & Zerman, 1991; Goodman & McGrath, 1991; Kelly-Berg et al., 1991), and in these age groups tension-type headaches are the most prevalent headache complaint (Bille, 1962; Pothman, Frankenberg, Müller, Sartory, & Hellmeier, 1994). Recurrent or severe headaches might adversely affect school-children’s ability to concentrate or may lead to an increased school absence (Bille, 1962; Brattberg & Wickman, 1992). In addition, they are also one of the most common reasons for schoolchildren to use medication (Due, Holstein, & Marklund, 1991). Although recurrent headaches are only rarely regarded as a functionally important disorder by school health professionals, the disorder is one of the main reasons for seeking help at the school nurse’s office (Kornfält & Ejlertsson, 1981).

The limited empirical support for the efficacy of drug treatment and the potential risk of side effects make nonpharmacological approaches a promising treatment alternative for recurrent headaches in children and adolescents (Larsson, 1989; Larsson, Melin, & Döberl, 1990; Olness, MacDonald, & Uden, 1987). Among various nonpharmacological treatments, relaxation training is regarded as an attractive intervention approach among adolescents (Larsson & Melin, 1989). It is also highly credible among those adolescents who seek help for their headaches (Larsson & Melin, 1988a). In reviews of the effects of nonpharmacological treatments of recurrent headaches in children and adolescents, it has been concluded that relaxation and biofeedback training approaches produce equally positive outcomes in pediatric migraine (Fentress, Masek, Mehegan, & Benson, 1986) and are more effective than no-treatment conditions (Duckro & Cantwell-Simmons, 1989; Hoelscher & Lichstein, 1984). In addition, relaxation training has been found to reduce headache activity more effectively than a prophylactic drug treatment for migraine (Olness et al., 1987). A muscle relaxant drug (chlormezanone) superimposed on self-help relaxation did not further improve tension-type headaches in adolescents (Larsson et al., 1990).

Whereas relaxation training has been shown to produce equally positive outcomes in tension-type and migraine headaches in adults (Blanchard & Andraski, 1985), tension-type headaches seem to respond better to this treatment regimen than migraine in older adolescent students (Larsson & Melin, 1988a). In a recent study better outcomes of relaxation training were found for older adolescent students with migraine headaches than for younger students (Osterhaus et al., 1993). In controlled clinical studies, home-based biofeedback approaches have shown promising and cost-effective outcomes for children with migraine (Allen & McKeen, 1991; Burke & Andraski, 1989). A self-administered program including relaxation and coping strategies was also found to be as effective as a clinic-based, therapist-administered approach for adolescents (McGrath et al., 1992).
Many children and adolescents experience their headaches during school hours or relate them to various school activities (Bille, 1962; Brattberg & Wickman, 1993). In several studies a therapist-based relaxation training program for adolescent students with primarily tension-type headaches has been found to be more effective than attention-control and no-treatment conditions (Larsson & Melin, 1988a). Given the limited availability of trained therapists within a school setting, a cost-effective treatment program tailored to the specific school routines might be a viable intervention approach for children and adolescents with recurrent headaches. A largely self-administered, home-based relaxation training program has been shown to be effective for older adolescents (16–18 years old) with primarily tension-type headaches (Larsson, Daleflod, Håkansson, & Melin, 1987; Larsson et al., 1990; Larsson, Melin, Ullstedt, & Lamminen, 1987). In a controlled comparison it was shown that this treatment approach was as effective as a therapist-assisted relaxation training, however, being about three times more cost-effective in the use of therapist time (Larsson et al., 1987). Approximately 55% of the subjects treated with a self-help, home-based relaxation training attained a clinically significant improvement, which was replicated in a subsequent study (Larsson, et al., 1987). In a replication study, however, the effects were substantially lower in that only 19% of the students were clinically improved (Larsson et al., 1990). The poorer outcome of the self-help training approach might have been attributed to the use of an extended comparative group design including three treatment phases and that the adolescents trained or applied the relaxation procedures less often than in the previous studies. Overall, the effects of self-help training in the three studies were found to be well maintained over a 5- to 6-month follow-up period (Larsson & Melin, 1988a).

Several advantages for administering a treatment program for children with recurrent headaches within their school setting could be suggested. Such a program could be managed by the regular school health professionals, for example, the school nurse, who is often readily available to the children during school hours and between training sessions. To be able to offer as many headache sufferers as possible an effective treatment, a school-based intervention program could also be administered to students in a group format rather than on an individual basis. Although a self-administered, home-based training program might be the most cost-effective nonpharmacological treatment approach, the assistance and support by a school professional could further enhance the effectiveness and provide a practical intervention approach for schoolchildren with recurrent headaches.

The purposes of the present study were (a) to examine the efficacy of school-based relaxation training, administered (in contrast to our previous studies) by the regular nurse; (b) to include a younger group of schoolchildren (than in our previous studies), 10 to 15 years old suffering from chronic tension-type...
headaches; (c) to investigate the maintenance of treatment effects over a 6-month follow-up period; and (d) to replicate our school-based intervention approach in another location and school setting with a new set of therapists.

METHOD

Participants

In a survey of headaches conducted in eight schools in the city of Göteborg (450,000 inhabitants), 6% of 10- to 15-year-old schoolchildren self-reported headaches to occur "several times a week or daily" (Carlsson, 1996). Pupils having such a frequency of headaches in three randomly selected schools were invited by the school nurse to participate in a treatment study. Such a level of headache frequency was chosen as an inclusion criteria because in our previous studies, it had been shown to respond better to relaxation training than less frequent headaches (Larsson & Melin, 1988a). Oral and written information about the study were presented to the pupils and written information was provided to the parents. The pupils also had to fulfill the International Headache Society (IHS) criteria for chronic tension-type headache with a headache history of at least 6 months (Headache Classification Committee of the International Headache Society, 1988). The fulfillment of the headache inclusion criteria was assessed during an interview with the child and a parent, complemented with a physical-neurological examination of the child.

Of 30 eligible pupils, all except 1 agreed to participate in the treatment study. Three pupils dropped out during the baseline period: 1 moved to another school and another 2 pupils did not keep their diaries according to the instructions. Thus, 26 pupils were randomly allocated into a relaxation training group or to a no-treatment control group (13 pupils in each group). All children were girls except one boy in the no-treatment control condition.

The pupils had had their headaches for a mean of 2.1 years (SD 1.5; range = 0.5–10). The headaches had disturbed 9 (35%) of the subjects "often" in their schoolwork, whereas 18 (69%) and 2 (8%) reported their headaches to disturb their school work "sometimes" and "seldom or never," respectively. Although all students had sought a physician's help because of their headaches, no specific treatment had been provided except for milder analgesics. Sixteen (62%) students had a first-degree relative who also had headaches.

Outcome Measures: Headache Diary

The pupils were instructed to self-record their headache intensity in a diary on a 6-point scale ranging from 0 (no headache) to 5 (incapacitating headache)
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four times a day during a 3-week period at baseline, posttreatment, and a 6-month follow-up. Such a length of baseline period has been suggested to be adequate and reliable in measuring tension-type headaches (Blanchard, Hillhouse, Appelbaum, & Jaccard, 1987). The diary has also shown to be a social valid indicator of headache improvement in that self-reported headache change in older adolescents has been corroborated by parent recordings of their children’s headaches (Larsson et al., 1987). In addition, a significant correlation between the two informant sources was found. Good agreement has also been found between children’s and adolescents’ ratings of their migraine headaches and parent ratings of the children’s headaches in a diary (Andrasik, Burke, Attanasio, & Rosenblum, 1985; Richardson, McGrath, Cunningham, & Humphreys, 1983).

Based on the schoolchildren’s headache recordings in the diary three measures were yielded: Headache sum, our prime outcome measure, was calculated as the total mean headache activity per week of the intensity ratings (total scores ranging from 0 to 140). Headache-free days were the number of days per week when no headache at all was scored. Headache frequency was the number of discrete headaches per week (total scores ranging from 0 to 14).

A common way of evaluating a clinically meaningful headache change is to estimate the proportions of subjects who attain at least a 50% improvement or more (Blanchard & Andrasik, 1985). From the diary the percentage of change based on pre—post and pre—follow-up differences in headache sum was calculated for each student. On the basis of these scores, two categories of outcome were formed: “Clinically improved” corresponding to a 50% improvement or more, and “slightly improved or unimproved” students, representing less than a 50% reduction of headache activity.

**Treatment Procedures: Relaxation Training**

Three school nurses with no prior experience in relaxation training administered the materials to the pupils in 20-minute sessions during regular school hours. They received 2–3 hours of training before treatment was initiated and were supervised during the study by a physiotherapist (with extensive both clinical and research experience in the treatment of headaches) (J. C.), who also was present during the first treatment sessions with the children. The treatment sessions were conducted twice a week at the school nurses’ office during a 5-week period. The treatment procedures were based on a series of five audiotapes and a complementing manual previously used and evaluated in studies on older adolescents (Larsson & Melin, 1988b). Similar treatment procedures for adults with chronic headaches have been outlined in detail, for example, by Blanchard and Andrasik (1985). The pupils attended the treatment sessions in groups of 3–4 pupils and listened together to the audiotapes for approximately 10–15 minutes. An addi-
tional 5 to 10 minutes were used to respond to the children’s questions. The first tape aimed at teaching the pupils to relax in a sitting position, and to help them to differentiate an increased bodily tension from a relaxed state in a situation as free from stressful stimuli as possible. All students in this treatment condition started training with a larger number of muscle groups during the first three sessions. Next, followed a rapid cue-controlled method based upon a smaller number of muscle groups. Emphasis was laid upon practice of this technique on early signs of increased bodily tension and headache in everyday life. The pupils were instructed to train and apply the relaxation techniques in everyday life situations.

Statistics

Treatment outcome effects were analyzed by using ANOVAs with the various weekly headache activity characteristics as repeated measures, and chi-square test was used for dichotomous variables. Pearson product–moment correlation was used to analyze the relationship between two continuous variables. The study was approved by the ethics committee at the Sahlgrenska University Hospital in Göteborg.

RESULTS

Treatment Outcome

Headache Activity. The mean values and standard errors of the various headache activity measures across treatment conditions and evaluations at baseline, posttreatment, and the 6-month follow-up are presented in Table I. A split-plot ANOVA using the total headache activity measure, headache sum and time (pre, post, and follow-up) as repeated measure yielded an overall trend for a treatment, \( F(1, 24) = 3.72, p = .06 \), and a time effect, \( F(2, 48) = 2.92, p = .06 \). However, a significant treatment condition by time interaction effect was obtained, \( F(2, 48) = 5.91, p < .001 \). Tukey’s post hoc test showed that the relaxation training group was significantly more improved after treatment and at the follow-up evaluation \( (p < .01) \) than the pupils in the no-treatment control group. For headache-free days a significant time effect was obtained, \( F(2, 48) = 4.94, p < .01 \), and Tukey’s post hoc test indicated that there was a significant increase of headache-free days at posttreatment and follow-up assessments. Further, a trend for a treatment condition by time interaction effect was obtained, \( F(2, 48) = 2.94, p = .06 \). Tukey’s post hoc test indicated that the pupils who had received relaxation training had improved significantly \( (p < .05) \) more than those in the no-treatment control condition. For headache frequency a significant overall difference between groups was obtained, \( F(1, 24) = 4.12, p = .05 \), and
Table I. Means and SEMs for Headache Activity Measures at Baseline, Posttreatment and Follow-Up Assessments by Treatment Condition

<table>
<thead>
<tr>
<th>Treatment condition*</th>
<th>Baseline</th>
<th>Post</th>
<th>% Improvement from baseline</th>
<th>6-Month follow-up</th>
<th>% Improvement from baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache sum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relaxation training</td>
<td>M</td>
<td>19.6</td>
<td>7.0</td>
<td>64</td>
<td>10.8</td>
</tr>
<tr>
<td>SEM</td>
<td>3.7</td>
<td>2.0</td>
<td>3.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No-treatment control</td>
<td>M</td>
<td>18.0</td>
<td>19.2</td>
<td>-10*</td>
<td>25.9</td>
</tr>
<tr>
<td>SEM</td>
<td>2.8</td>
<td>3.6</td>
<td>5.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headache-free days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relaxation training</td>
<td>M</td>
<td>2.3</td>
<td>4.0</td>
<td>74</td>
<td>4.1</td>
</tr>
<tr>
<td>SEM</td>
<td>0.5</td>
<td>0.6</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No-treatment control</td>
<td>M</td>
<td>2.2</td>
<td>2.8</td>
<td>27</td>
<td>2.2</td>
</tr>
<tr>
<td>SEM</td>
<td>0.5</td>
<td>0.6</td>
<td>0.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headache frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relaxation training</td>
<td>M</td>
<td>4.7</td>
<td>3.1</td>
<td>34</td>
<td>2.9</td>
</tr>
<tr>
<td>SEM</td>
<td>0.5</td>
<td>0.8</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No-treatment control</td>
<td>M</td>
<td>5.4</td>
<td>4.6</td>
<td>15</td>
<td>5.5</td>
</tr>
<tr>
<td>SEM</td>
<td>0.6</td>
<td>0.8</td>
<td>0.8</td>
<td></td>
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</tr>
</tbody>
</table>

* n = 13 for each group.  
* A negative sign denotes an increase in headache activity.

the children treated with relaxation training improved more than those in the no-treatment control group. In addition, a significant time effect, F(2, 48) = 3.29, p < .05 was found, and Tukey’s post hoc test revealed that the pupils were significantly (p < .05) more improved after treatment as well as at the 6-month follow-up. However, no treatment condition by time interaction effect was obtained.

Clinical Significance. Treatment outcome was further examined by analyzing the distribution of students, who were regarded as “clinically improved” or “slightly improved or unimproved” between pre–post and pre–follow-up evaluations (Table II). Nine pupils (69%) who were treated with relaxation training had achieved a clinical improvement level (of at least 50%), whereas only one subject (8%) in the no-treatment control condition had attained such an improvement level, a difference that was highly significant, χ²(1) = 10.40, p < .001. Although a small improvement was noticed in the no-treatment control group at the 6-month follow-up (see Table II), the difference between the two treatment conditions was still significant, χ²(1) = 3.94, p < .05. Pearson product–moment correlation analysis revealed a nonsignificant association between children’s age and their headache (pre–post) improvement (r = .07).
Table II. Percentages of Schoolchildren in the Two Treatment Conditions Who Achieved a Clinically Meaningful Headache Improvement (at Least a 50% Change in the Headache Sum Measure)

<table>
<thead>
<tr>
<th>Treatment condition*</th>
<th>% Pre-post change</th>
<th>% Pre-follow-up change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relaxation training</td>
<td>69</td>
<td>73</td>
</tr>
<tr>
<td>No-treatment control</td>
<td>8</td>
<td>27</td>
</tr>
</tbody>
</table>

*n = 13 for each group.

DISCUSSION

The results of the present study show that a school-based, nurse-administered relaxation training program can effectively reduce chronic tension-type headaches in schoolchildren 10-15 years old (almost all consisting of girls) as compared to a no-treatment condition. The positive outcome of relaxation training was well maintained at a 6-month follow-up evaluation when the overall results were still better for those pupils treated with relaxation than among those in the no-treatment condition.

In previous research on older school adolescents (16-18 years old) suffering primarily from tension-type headaches, it was shown that both a therapist-assisted and a largely home-based, self-help relaxation program are effective in reducing the students' headaches (Larsson & Melin, 1988a). Overall, 55% of the adolescents treated with relaxation achieved a clinical improvement (at least a 50% improvement) and at a 5- to 6-month follow-up evaluation, 60% were still clinically improved (Larsson & Melin, 1989). Using the same criteria, in their school-based study, Osterhaus et al. (1993) found that 45% treated with a combination of relaxation training, temperature biofeedback, and cognitive coping techniques had achieved a clinically significant headache improvement. Similarly, in a clinic-based study, McGrath et al. (1992) reported that 67% of adolescents with migraine headaches had improved after a self-help, largely home-based relaxation training, whereas the corresponding figure for a clinic-based and therapist-assisted training condition was 44%. By contrast, lower improvement rates have been found for adolescents treated with various attention-control approaches (9-24%) (Larsson & Melin, 1988a; McGrath et al., 1992), and among those who only performed headache recordings (6-11%) (Larsson & Melin, 1988a; Osterhaus et al., 1993).

In the present study, 69% of a group of younger adolescent students with chronic tension-type headaches treated with a school nurse-administered relax-
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A school-based treatment program attained a clinically significant headache improvement as compared to 8% of the pupils in the no-treatment control group who self-recorded their headache activity only. Further, the positive outcome of relaxation training was well maintained at a 6-month follow-up with an improvement rate of 73%, whereas the corresponding figure was 27% for the children in the no-treatment condition. The improvement rates for the schoolchildren treated with relaxation training are slightly higher than those obtained in our previous studies for older adolescent students suffering primarily from (chronic) tension-type headaches (Larsson & Melin, 1988a), and comparable to those reported by McGrath and his colleagues (1992) for a self-administered psychological training program including relaxation procedures used in the treatment of a clinical group of adolescents with recurrent migraine. Although higher improvement rates were found among older adolescents with migraine headaches in the school-based study by Osterhaus et al. (1993), no association between the schoolchildren's age and their headache improvement was obtained in the present study. The replication of our previous studies conducted on older adolescent students (Larsson & Melin, 1988a) and similar outcomes obtained with a new set of therapists and schools in another city not involved in our previous research, further strengthen the validity of the findings in our research program. Overall, the findings show that a relaxation training program administered to younger adolescents by the school health care can reduce the students' chronic tension-type headaches.

Some limitations of the present study need to be pointed out. Due to a limited number of eligible pupils and school nurses interested in participating in the study, no attention-comparison group was included to control for, for example, amount of professional contact or therapist factors. However, in our previous studies on older adolescent students with chronic tension-type headaches and in studies on younger adolescents with migraine, subjects in various attention-control conditions improved less as compared to relaxation treatment. Although headache improvement was substantial among those school children who were treated with relaxation training, it should also be noted that their number of headache-free days increased on average from 2.3 to 4.0 days, thus suggesting that these children still need help to further reduce their headache complaints. In the present study all students (all girls except for one boy) were recruited through a screening procedure based on a survey of recurrent headaches in schoolchildren and our findings could therefore be generalized primarily to girls with chronic tension-type headaches. However, in our previous studies that included a larger number of adolescents boys, no gender differences in regard to outcomes were observed (Larsson & Melin, 1988a). A replication study should not only include a larger number of boys but also be extended to the study of pupils who seek help at the regular school health care because of recurrent headaches. Another important aspect to evaluate in future research is the impact of headache improvement on the schoolchildren’s functional behaviors both in the school and at home. The
restricted size of the present sample of headache sufferers and, subsequently, the relatively weak statistical power is likely to explain the weak treatment outcome effects obtained for the various headache frequency measures. Similarly, because of the limited sample size, it was not possible to analyze predictors of outcome, for example, related to the children's school or psychosocial functioning. Finally, it should also be emphasized that the school nurses who conducted the treatment sessions in the present study were highly motivated to participate and interested in relaxation training for schoolchildren with recurrent headaches.

To promote better health among schoolchildren and adolescents their educational program should also incorporate information regarding recurrent headaches and treatments that are helpful. A relaxation training program administered as part of the school health program, for example, by the school nurse seems to be an effective and practical treatment approach. Such treatment might be a viable first approach for those 6% of the schoolchildren who report chronic tension-type or migraine coexisting with tension-type headaches occurring at least several times or week (Carlsson, 1996). Because the school nurse is often readily available to the schoolchildren during regular school hours and also can assist those children who face problems during relaxation training, she might also be the best professional to provide help to pupils with recurrent headaches. The application of, for example, cue-controlled relaxation training procedures in everyday school activities may also seem more natural and important when the treatment is school-based. Besides our own treatment material consisting of audiotapes and a manual produced for Swedish adolescents, a professional handbook is also available in English to guide health care professionals such as psychologists, physicians, or nurses in helping them to manage recurrent headaches in schoolchildren and adolescents (McGrath, Cunningham, Lascalles, & Humphreys, 1990).

REFERENCES

